Welcome to the fourteenth 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 ninth 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 31 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

Jeanne Brady, Ph.D.
Professor of Education
Interim Dean, College of Arts and Sciences

Brice Wachterhauser, Ph.D.
Professor of Philosophy
Provost, Saint Joseph’s University
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- Lauren Kozlowski

Ken Weidner, Dept. of Management
- Christine Dignam
Supporters of Student Research at Saint Joseph’s University
The students, faculty and staff wish to express their gratitude to the following individuals and companies whose generous gifts and grants have supported student research and scholarly activities at Saint Joseph’s University:

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The McGroddy Frontiers in Science Seminar Series
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The Office of the Dean, CA&S,
The Office of the Provost
In what has become a synthesis of the practical and the theoretical, my primary research stream focuses on music marketing. It seems a bit ironic to me that I spent twenty years in radio (and continue to consult radio stations and record labels) researching the music around the commercials and I now research music in the commercials and in general (including the music and radio industries). In any case, it has been the perfect extension of my past into my present and provides me the opportunity to bridge my professional with my academic career to inspire and prepare my students for the future.

My primary research focuses on advertising cues and effects especially popular music. I have the unpopular opinion that the combination of popular music and advertising actually creates a new cultural product and is, therefore, the perfect marriage of art and commerce. I have looked at popular music and advertising both quantitatively (attention, memory, and amount in primetime television) and qualitatively (in theory, popular culture, retail and social marketing). I incorporate my research into my music marketing, media management and marketing communications classes with my students not only learning from the results but often participating in the exploration.

My past and current radio and record relationships also afford me the opportunity to not only place my students in industry internships, independent scholarship and employment but to facilitate my advising of the SJU internet radio station (Radio 1851) and the record label (1851 Records) as well as the American Marketing Association (AMA).
The music and entertainment industries are those of constant motion. Any one change in technology or even a new trend in social media can alter the entire focus of either industry. With that being said, teaching classes on different areas of each respective industry can become an incredibly daunting task. In order to better understand the practices of either industry, one must first recognize the importance of reactionary analysis—where staying ahead of the curve requires a certain degree of informed predictions to generate a reaction based upon the climate of the industry. Across the globe, university classrooms are utilizing this type of analysis to further their understanding of both the music and entertainment industries.

The questionnaire I constructed for this project was designed to gather information regarding the specifics of each university’s program. I first gathered some basic information about the program and where it resides within the school’s curriculum. Branching off this, I needed to find out what these programs were implementing in order to relate their studies to modern practices. The questionnaire asked if the program utilized guest speakers from the industry, as well as how the program takes on experiential learning techniques. As previously mentioned, being in a position requiring reactionary analysis would require some level of experiential learning so the students could delve into a specific area of the industry and observe the machinations of the environment in real time.

In order to gain more insight into how universities structure their respective programs, I reached out to over eighty schools in the hopes of gathering commonalities from the aggregate data. With this data I plan to further identify how music and entertainment industry programs maintain current education practices. The conclusions that will be drawn from this data will be used as an avenue to further improve the music and entertainment industry programs offered here at Saint Joseph’s University.
Jesuit Universities are committed to educating students for a life of learning about and working for social justice. This mission prepares our students to make the personal, academic and professional choices that foster social responsibility and the well-being of others. It was a pleasure to work with Maggie Santella on her research exploring how policies and programs can uphold the basic needs and dignity of the homeless population. Maggie chose to structure her Summer Scholars work in a way that integrated evidence-based research with an experiential component.

The direct service component is something I found to be transformative in my understanding of social justice. During my year of service with the Jesuit Volunteer Corps, I was exposed to the poverty experienced by people not receiving a living wage in Jersey City, New Jersey. I heard the stories of the working poor who regularly chose between electricity, food and making their rent payment. I spent time volunteering outside of my JVC placement at Saint Lucy’s Homeless Shelter in their art therapy program. The program was set up to provide the residents an opportunity to explore their talents and begin to believe they were more than just the condition of poverty they were living in everyday. This direct service experience provided a deeper context for my own studying of poverty and social policy. Here at Saint Joseph’s University, I have been privileged to work with the Service-Learning program for the past 10 years. In addition, I have had the opportunity to teach the Poverty, Ethics and Social Policy and have also enjoyed teaching in the Ignatian College Connection Summer Enrichment Program.

Working for social justice is about working with people, not issues, in a culturally responsible and empathetic manner. In Maggie’s Summer Scholars Project, she chose to “work with” people who are homeless by integrating evidenced-based research with her direct service experience at a homeless shelter for men in Philadelphia. Maggie’s work also focused on analyzing the implementation and effectiveness of policies and programs created to serve the chronically homeless population. Her decision to also include interviews with the men at the shelter as well as the service providers reflects the value she holds in the perspectives of people who experience homelessness directly and indirectly. Maggie’s research exemplifies the idea of education and research for a more just society. One of the most impressive qualities about Maggie is her dedication to furthering her understanding of and service with the chronically homeless population. She began her work with the homeless population in her freshmen service-learning course and continues to find new way to deepen her commitment to justice for the population.
A Macro and Micro Analysis of Chronic Homelessness
Maggie Santella, ‘15

Faculty Mentor: Jill Amitrani- Welsh
Faith Justice Institute

Supported by the SJU Barbelin Scholars Program

A "chronically homeless" person is defined as "an unaccompanied homeless individual with a disabling condition who has either been continuously homeless for a year or more, or has had at least four episodes of homelessness in the past three years". I have spent time as a volunteer in a shelter for homeless youth and a shelter for chronically homeless adult men, and have observed the unique qualities of each type of shelter. The youth shelter I spent time in was very structured with rules, regulations and policies, while the shelter for the men was had fewer regulations like accepting men who were currently addicted to drugs or alcohol, not requiring the men to be employed (most of the men are on disability), and allowing the men choose if they wish to move forward to more independent living facilities or remain at the home for an extended period of time. The structure of the men’s shelter seemed better suited to their needs than a strict environment would be. Likewise, it is understandable that a shelter serving the needs of youth and young adults would need a more regulated environment for the safety and well-being of the shelter. Individuals who are chronically homeless are statistically more likely to be very disabled, have mental health issues, have drug and alcohol addictions, and have a history of resisting help. However, most will accept housing and services if they are structured appropriately, and most will stay in that housing rather than return to the streets. Each day, there are approximately 4,000 homeless people in Philadelphia, 20% of whom are experiencing chronic homelessness, and there are about 107,148 Americans who are chronically homeless on any given night.

I was initially interested in exploring how Philadelphia’s policies affect the chronically homeless population specifically as a further exploration of previous course work and service experiences. My research includes three main components: a literature review on the causes and conditions of those experiencing chronic homelessness, a critical analysis of policies and programs related to the chronically homeless population, and a social analysis of a six-week experiential education at a Philadelphia homeless shelter.

As my research concludes, I will continue to work on these three pieces as I synthesize them into a final sociologically based paper that will summarize, critique, and make recommendations on the current policies and what the City of Brotherly Love can do to show its love to its citizens. I have found that the implications of the current system of providers and services for those suffering from homelessness allow this population, the chronically homeless, to be predetermined to fail to succeed. The current systems do not account for social characteristics I have researched and witnessed at shelters, such as poor familial support and inability to transition into unfamiliar settings. Clinical characteristics are better addressed by the system compared to social characteristics, however I found that mental health and mental retardation are more prevalent than reported. In addition, if both mental health and mental retardation exist for the same person, there is a lack of congruency and communication between the services that are supposed to exist for each problem. I found that providers, such as case managers, with personal relationships with their clients, are burdened by the lack of funding and organization of the services the government provides. As I continue my experiential research, I will ultimately interview both clients and service providers at the shelter, as well as other service providers, and form a proposal for improvements to the current system of housing and service providers.
Most people would deny that consuming media – television, advertisements, film, videogames – has any effect upon them. But research says otherwise.

My research has two parts. First, I document some of the less-obvious features of media, the test how exposure to these features may influence our thinking, attitudes, and even behavior. For instance, one feature I have documented is that female victims of crime are described less personally in newspaper accounts than male victims; reading such accounts then engenders less sympathy for the victim and greater victim blame. African Americans who appear on crime shows such as *Law and Order* have lighter skin when they portray law enforcement officials and darker skin when they portray criminals. The result? We tend to see greater criminality in the dark-skinned African American. And how much more often do you read “men and women” than “women and men?” Male pronouns almost always precede female pronouns, which in turn makes us associate men with more positive attributes.

Recently I have turned my attention to the connection between psychological entitlement and media exposure. Academics and the general public are saying that we as a society are becoming more entitled. Could media contribute to this? First, we need to understand how an entitled person thinks. My Summer Scholar student helped further our understanding of entitlement by examining over 1500 statements provided by undergraduate students in response to hypothetical situations, and the students themselves tested as having various degrees of psychological entitlement.

I am currently experimenting with the effect of exposure to advertisements – and we are exposed to copious amounts of them! – in particular those that tell us how entitled we are (“Because you deserve it!”) So far, what I have found is that even brief exposure to such ads serves as an “on” switch, turning on entitled feelings and ways of thinking among those who test high in trait entitlement. After viewing “entitled” advertising, those high in entitlement report greater intentions to cheat and engage in other selfish behaviors. They also, sadly enough, report greater prejudicial feelings towards various out groups. My hope is that by learning what turns “on” entitlement, we can reverse the process and use environmental cues to turn it off to create a more caring, civil society.
For my Summer Scholars project, I worked with Dr. Phyllis Anastasio of Saint Joseph’s Psychology Department and graduate student David Pagnotti. The ultimate goal of our research was to determine if those high in entitlement, which is defined as “a stable and pervasive sense that one deserves more and is entitled to more than others” (Campbell et al, 2004, p.31), react similarly to those high in narcissism to situations in which they experience feelings of rejection. Those high in narcissism have been found to act in response to rejection with anger and even aggression.

As a group, we examined the responses of individuals who varied in perceived self-entitlement to hypothetical situations of rejection and inclusion. We empirically measured entitlement by analyzing subjects’ scores on the Psychological Entitlement Scale (the higher one’s PES score, the more entitled they are). From there, we explored the responses of over 300 subjects to a survey that inquired why a variety of social situations might occur, some of which would leave them feeling rejected and some that would give them a sense of inclusion. My partners and I assessed the survey responses and coded them numerically based on numerous factors. These factors accounted for subjects’ viewpoints on who would most likely experience such situations, whether the situations would happen due to one’s character or on the state of events surrounding it, whether the situations would be influenced by one’s physical appearance, their short-term behavior, or their more long-standing personality traits, and whose responsibility the situation’s occurrence was. Once all of our data was evaluated and any discrepancies in interpretation within the group were resolved, we moved on to get a statistical analysis of our findings.

Utilizing SPSS statistics software, we were able to find a number of interesting correlations within our data. For one, there was a blatant difference in PES scores between those who credited personality or behavior in a situation that turned out well for them and those who instead credited physical appearance (the latter group having a much higher mean PES score, demonstrating that they were, on average, much more entitled). In situations that ended in feelings of rejection, a pattern of giving others the benefit of the doubt while blaming the self was consistent with those lowest in entitlement across several situations, emphasizing the complacent nature of those who do not score high in entitlement. This pattern was not found with those scoring higher in entitlement. These are just a few of the findings linked to this Summer Scholars project. The data we acquired and our subsequent evaluation allowed me both a number of very interesting findings as well as a new understanding of psychological research.
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 $\pi$-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.

Just in the past year, 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.
Oxygenation and Viscosity on Relaxation Times  
Eric Klein,’16  
Faculty Mentor: Paul Angiolillo  
Department of Physics  
Supported by the SJU Department of Physics

Nuclear magnetic resonance is a phenomenon that provides information on the substance that has been tested. Our research involved analyzing this phenomenon and running tests to determine how different parameters affected the substance. The first trial my partner and I had to overcome was learning how to operate the new machine. This new mastery allowed us to test how viscosity and oxygenation affected the relaxation times of our samples.

There are two types of values that can be obtained when looking at nuclear magnetic resonance. The spin-lattice relaxation time describes the amount of time it takes for the molecules of the substance to return to thermal equilibrium after being perturbed. The spin-spin relaxation time involves the amount of time it takes for the molecule to reach a percentage of alignment of its original plane after being initially disturbed. After testing samples of two artificial blood carriers, namely perflubron and perfluorodecalin, we determined that the spin-spin and spin-lattice relaxation times increased when the samples were deoxygenated. The effect was more dramatic for perflubron than it was for perfluorodecalin which can be attributed to the differences in molecular structure.

Our next set of experiments involved analyzing how viscosity affects relaxation times. This was done by obtaining bottles of silicone oil that had viscosities ranging from 100cSt to 5000cSt and running each one through the tests. After the tests were run, there was no conclusive pattern that could be found. The relaxation times showed neither a decreasing trend nor a parabolic path which was expected.
Stick-Slip Friction Insights on the Mesoscale
Lisa Mariani,’14

Faculty Mentor: Paul Angiolillo
Department of Physics

Supported by SJU Summer Scholars Program and the Howard Hughes Medical Institute

Stick-slip friction occurs from the nanoscale to the macroscale, and the underlying laws of stick-slip friction remain to be a conundrum. Stick-slip friction is important in many systems with moving parts, as well as the larger geological rock-on-rock or mineral interactions. Thus, the ability to better understand the behavior and possible predictability of stick-slip friction benefits many areas of science. The difficulty in describing stick-slip friction arises from the different regimes of adhesiveness, the effects of certain friction parameters, and the distinctions between length scales. In an attempt to bridge the gap between the nanoscale and the macroscale, a model system employing Velcro® has been adapted to investigate the stick-slip dynamics of adhesive, mesoscopic stick-slip friction. Velcro® is a hook and loop system that does not slide smoothly when in shear. The effects of varying the parameters of driving velocity, applied load, and apparent contact area are studied with respect to the friction dependencies upon them and their control of phase transitions within stick-slip friction. There are two friction components studied, the maximum static friction force and the average kinetic friction force. These are the force needed to begin motion and the force required to continue motion, respectively. The transition between the static and kinetic regimes is not understood, and within stick-slip friction, this is a transition that occurs repeatedly.

This summer, the experimental results have been analyzed and organized into a publication highlighting their significance and their relationship with nanoscale and macroscale experiments. The mesoscopic stick-slip system of Velcro® exhibits friction dependencies consistent with nanoscale measurements, including a linear dependency on apparent contact area and power law dependencies on the applied load. These dependencies are in contrast to the Amontons and Coulomb laws for dry, sliding friction. However, they conform well to the later Bowden and Tabor friction predictions. Interestingly, the power law exponent for the friction as a function of the applied load corresponds well with a previous adhesive nanoscale loading experiment by Restagno et al. The system has been determined to be adhesive, as the friction force does not explicitly go to zero newtons at zero applied load. A theoretical investigation into the shear strength of a single hook of Velcro® yielded a value that is similar to the experimentally extracted value. Thus, this multi asperity system can be viewed as a conglomerate of many single asperity systems. Furthermore, the prediction of phase transitions from chaotic to periodic stick-slip to smooth sliding, as controlled by apparent contact area, is demonstrated. These transition predictions follow power law profiles with respect to the increasing contact area. This trend is consistent with statistical mechanics predictions. These results evince that this system represents a mesoscopic view of the asperities studied in nanoscale friction experiments. Thus, there is coherence between friction forces of nanonewtons to those of newtons. Overall, the hook and loop system shows to be a good indicator of stick-slip friction and provides a link between nanoscale and mesoscale friction behavior.
Exploring the Nature of Mobile Charge Carriers in Cyanine Dyes and Zinc Arrays
Leslie Morrow,’15
Miles Radziwanowski,’15
Faculty Mentor: Paul J. Angiollilo
Department of Physics

Supported by the SJU Summer Scholars Program and the SJU Department of Physics

The nature of mobile charge carriers and their transport in organic conducting and semiconducting materials is still an area requiring deeper understanding. Unlike in classical metals, charge carriers are not represented well by bare charges but rather as polarons. Hole and electron polarons are to be chemically generated in a systematic series of meso-to-meso ethyne-bridged (porphinato)zinc arrays (PZnn). These doped states, by virtue of having unpaired spins, can be studied by electron paramagnetic resonance (EPR) spectroscopy. This is accomplished through the nuclear hyperfine interaction, which probes the interaction of the polaron spins with nuclei that possess nuclear spin such as $^{14}_N$, which has a nuclear spin of $S = 1$. Low temperature studies down to 4 K further reveal that the hole polaronic states maintain their ability to explore the extent of the molecule, which suggests these molecules might serve as motifs for molecular wires. This is perfect for spintronics, a new area of nanotechnology that uses the spin of an electron ($\frac{1}{2}$) to transport information through a device. The ability of an electron to do this is dependent on its spin lattice relaxation time, $T_1$. In organic conductors and semiconductors there are $T_1$ times on the order of microseconds to milliseconds, as opposed to picoseconds in typical conductors, which make these organic materials prime candidates for use in spintronic devices.

In order to accurately test samples, the EPR machinery needed to be calibrated. Peroxylamine disulfonate (PADS) is a well-known chemical in the field of EPR and can be used for simple calibrations by means of plotting its power saturation, $I_{pp} \propto \sqrt{P}$, where $I_{pp}$ is the peak to peak intensity and $P$ is the power. The sample of PADS was bubbled with nitrogen gas and a number of trials were run over a range of powers, namely 0.01 mW to 40 mW. We analyzed these EPR spectra and calculated the $I_{pp}$ to ensure that it corresponded with previous data obtained by Dr. Angiolillo.

While we are waiting on the PZnn from Duke, we are working with a series of similarly conjugated cyanine dyes that share characteristics with the PZnn, such as elongated ethyne bridges as shown in the figure to the right. We hope to continue to further our understanding of the nature of the mobile charge carriers in organic conducting and semiconducting materials as we delve deeper into the study of the cyanine dyes and PZnn.
Nuclear Magnetic Resonance Properties of Perfluoronated Fluids and Viscous Materials
Andrew Vitek,’16

Faculty Mentor: Paul Angiolillo
Department of Physics

Supported by the SJU Department of Physics

My partner Eric Klein and I have been working in the Physics department with Dr. Paul Angiolillo for the Summer Scholars program this summer. Our project involved using Nuclear Magnetic Resonance Spectroscopy on two different oxygen carriers (that are used as blood substitutes) to test what variables affect their relaxation times.

We received an NMR spectrometer which had to be assembled and properly tuned to the correct resonance frequency for each sample we were testing. Data was collected several times for each of the samples, which were provided with the machine, to understand how to create 90 and 180 degree pulses and manipulate them to calculate spin-lattice and spin-spin relaxation times. These values are also known as T1 and T2 relaxations times.

After receiving the oxygen carriers (Perfluorodecalin and Perflubron) in which we wanted to experiment on, we began preparing the samples and taking data. We used nitrogen to deoxygenate a few samples of Perfluorodecalin and Perflubron to see if the absence of oxygen would affect the T1 and T2 relaxations times.

After multiple data collections, we determined that the T1 values were larger in the absence of oxygen and that Perflubron was more largely affected by this than Perfluorodecalin. However, the T2 values did not react in the same manner as the T1 values and seemed to not be as affected. We expected the T1 relaxation times to be longer with deoxygenated samples and we believe that the reason that Perflubron was more greatly affected is due to the difference in structure of the two chemicals.

Our next step in our work was to see how viscosity affects the spin-lattice and spin-spin relaxation times. We began this experiment by searching for a fluid that was miscible in Perfluoronated compounds. Through our research, we found that Silicone Oil is soluble in both Perfluorodecalin and Perflubron. We then acquired 8 different viscosity values of Silicone Oil (238cST, 388cST, 463cST, 588cST, 613cST, 1000cST, 2000cST, and 5000cST) and began taking spin-lattice and spin-spin relaxation time data. The 613cST sample would not give a usable signal so we believed that the sample was not entirely pure and was faulty. Also, the 5000cST sample was viscous to the point that the relaxation times were too long to measure with the equipment we had on hand. Because of this, we removed these samples from our data collection and focused on the other 6 samples.

However, after data collection, it seemed as though our data was not holding true to theory. Theory says that viscosity and relaxation times are inversely proportional and our values were wavering high and low in no specific fashion while viscosity was increased. Therefore, our experiment was inconclusive in this regard and we will be looking more into this in the future.
Mary’s research has focused on the relationship between a child’s ability to respond thoughtfully to reading and intrinsic motivation to read. With the emergence of federal No Child Left Behind legislation, teachers in basic education are forced to respond to the pressures of high-stakes testing. Research suggests that they are resorting to extensive use of rote learning through skill and drill instruction.

Mary’s most recent publications, *A Study of Thoughtful Literacy and the Motivation to Read*” investigated the relationship between students’ value of reading and their performance on a reading measure assessing higher-level reading. Two previous investigations, *She’s my best reader: she just can’t comprehend”* and “*Why the states don’t measure up”* were published in the number one literacy journal devoted to research in elementary schools. Their scores on the National Assessment of Educational Progress (NAEP), a measure that makes extensive use of higher level thinking, suggest a very different story.

Mary’s future research will focus on the impact of rote learning as it impacts student motivation to read, and the ability to react thoughtfully to text. *The Critical Reading Inventory*, an assessment measure she has co-authored, will be used as a means of showing the relationship between criterion-related measures of thoughtful literacy and norm-referenced measures.
How prepared are students to critically think about the new Common Core?

Tiffany Feret, ’14

Faculty Member: Mary DeKonty Applegate
Department of Teacher Education

Supported by the SJU Summer Scholars Program.

During my review of research at the start of the Summer Scholars program, I studied the components of the Common Core reading standards for 9th and 10th grade. I interviewed and talked to 9 teachers about how they incorporate these new standards with their lesson plans. I was surprised that 6 of the 9 teachers whom I spoke with did not rely on the Common Core standards and put them into their lesson plans simply because they had to. 5 of the 9 teachers told me the standards were too broad and felt that they were still teaching to a test. 7 of the 9 teachers disliked the Common Core standards.

After I interviewed them, I worked one-on-one with 15 students. The first thing I did was to administer the Motivation to Read Profile (Gambrell et al, 1996) to see how motivated students were about reading. I obtained two scores, a score for the student’s self-concept as a reader and a score reflecting the value that the student placed on reading. I then used the Critical Reading Inventory (Applegate, Quinn, Applegate, 2008) to measure students’ ability to respond to critical reading questions. Each student was asked to silently read a story at his or her grade level and, after reading the story, was asked to retell and respond to the story. I recorded their retelling and asked a set of comprehension questions which included 4 text-based questions, 3 higher-level inference and 3 critical response items.

After analyzing the responses from each student, I planned three instructional sessions for each student. During the first session, I provided a strong pre-reading instructional lesson which focused the student’s attention on the underlying theme of the story. After this pre-reading instruction, the student again read the passage silently. This was followed by a retelling and reaction to the story and 10 comprehension questions. This instructional activity was repeated for two additional lessons. The purpose of this instructional lesson was to guide student’s attention to reading as a meaning-making process in which a student reads purposefully. I was attempting to investigate the impact of this instruction on both their ability to reading critically and to investigate its impact on the student’s scores on the Motivation to Read Profile.

The Motivation to Read Profiles revealed that the students’ pre-testing mean score for the Self Concept as a Reader was 71% and their mean score for the Value of Reading was 53%. These scores suggest that while they did not value reading, they did perceive themselves to be good readers.

10 of the 15 students showed improvement from the pre-test to story two. However, while the scores were higher, they did not reflect the gains for which I had hoped. Before I used my lesson plans, the students did not participate without prompting from me. Once we looked at the text closer, the students asked more questions and had a deeper understanding of what they read. I had originally expected and hoped that the students would be ready to demonstrate the type of critical thinking required in the Common Core. Instead, believe that while some of these students will be ready for the new standards and assessments that are to come, others will not be prepared. However, since most students did improve their scores, achievement levels can be raised as the years go on because students will be able to adjust and have more practice with the new way of teaching.
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.

Mechanisms to respond to the environment are very important for adaptation to different environmental conditions. Not all bacteria have the same “tools” (proteins and, of course, the genes that encode them) that allow them to survive or thrive under specific conditions, and it is very interesting to investigate which types of bacteria live in different environments or microenvironments. Some students in my lab explore the structure of bacterial communities in locations such as compost piles, slow sand filters and Winogradsky columns.

I also collaborate with the Institute of Catholic Bioethics at SJU to design, test and implement an affordable water filter for people who do not have access to clean drinking water.
**Succinate Mediated Carbon Catabolite Repression in Sinorhizobium meliloti**
Muhammad Arif, ’15

Faculty Mentor: Dr. Catalina Arango
Department of Biology

Supported by the Howard Hughes Medical Institute, and a Gift from Nick Nicolaides, ‘87

*Sinorhizobium meliloti* is a gram-negative plant symbiont that induces formation of root nodules in plants of the legume family, which it later inhabits. This bacterium exchanges nitrogen it fixes for organic carbon with its host. When succinate, an energetic carbon source, is present in the environment together with certain other substrates, they are not utilized simultaneously. Instead, a phenomenon called carbon catabolite repression (CCR) is exhibited, where succinate is utilized first. Specifically, the presence of succinate inhibits expression of genes encoded in the *melA-agp* operon, needed for utilization of alpha-galactosides (raffinose and melibiose).

The phosphotransferase system (PTS) has been shown to regulate CCR in model organisms such as *E. coli* and *B. subtilis*. *S. meliloti* has an incomplete set of PTS proteins that include Enzyme I, Hpr, Hpr-K, and two types of Enzyme IIA: EIIAntr, and Enzyme EIIAminx. These proteins are involved in regulation of CCR but the mechanism in *S. meliloti* is unknown.

We are using various *S. meliloti* mutants that either lack the PTS proteins or have forms of the proteins that cannot be phosphorylated to investigate the direct or indirect interaction of the PTS proteins with regulatory proteins that affect the *melA-agp* operon. Each of the mutant strains was inserted with a high copy plasmid that contains the *melA* promoter region fused to GFP. We hypothesize that the extra copies of regulatory sequences will sequester transcriptional regulator proteins, resulting in an altered expression pattern of the *melA-agp*. Thus, if the missing protein in a mutant is involved with transcriptional regulator activity, the change in pattern in the mutant will differ from that in the wild type.

Preliminary results show that deletion of HPr results in a change in pattern that is similar to that in the wild type. This is, they show evidence of sequestration of regulatory proteins. In contrast, HPr and EIIAmin mutants that cannot be phosphorylated, as well as an EIIAminX deletion mutant, show no evidence of sequestration of regulatory proteins when carrying multiple copies of the promoter, indicating that a specific form of these proteins may directly or indirectly control the transcriptional regulators.

Additionally, we want to identify the sequences within the promoter region that may be important for induction and regulation of the *melA-agp* operon. For this, plasmids with shortened versions of the promoter region are being constructed and their regulation pattern investigated.
Unsafe drinking water is defined as inconsumable water containing biological or chemical pollutants that often cause illness and disease in developing nations. Pathogenic bacteria and arsenic are two common contaminants in water that cause avoidable illnesses. Slow sand filters are a proven and simple technology that relies on straining and attachment to a previously formed biofilm to remove microorganisms. Water hyacinths have been shown to absorb arsenic from water at high rates, and the water hyacinths can potentially be used to reduce arsenic concentration from water. We previously designed and tested an inexpensive slow sand filter to remove bacterial contamination. During the last year, the filter design was modified to incorporate *Eichhornia crassipes* (water hyacinths) that could remove both bacteria and arsenic from water. New filters use either live lilies or dried plant material. These two plant-slow sand filters and two different versions of the traditional slow sand filters were tested to evaluate the effect of plant material in bacterial removal. All filters were tested by treating 64 to 112 L of *Escherichia coli*-spiked sterile water and measuring the efficiency of removal. Other parameters monitored decrease in water flow rate, which signals clogging of the filter, and frequency of maintenance of the filter.

Non-plant filters removed between over 90% of *E. coli* once the filter had matured. The dry-plant filter removed an average of 98% of *E. coli*, while the efficiency of the live plant filter reached 90% but quickly decreased to 60%. Water flow in non-plant filters decreased up to 30% during the testing period. The live plant filter reached less than 10% of the initial flow at the end of the trial. Maintenance was required every week or two in the live plant filter and did not improve filtering efficiency, as opposed to one maintenance event for the other filters. These results show that the performance of the filter is seriously compromised by the presence of live plants, suggesting that they provide organic matter that favors the growth of microorganisms throughout the filter bed and making it not a viable option for dual arsenic-bacterial removal. A dry-plant/slow sand filter has good potential.

We are investigating the extent of bacterial colonization in the filter beds, and whether the composition of the bacterial community differs between filters. The project will now concentrate in establishing operational parameters of the non-plant slow sand filter using artificially contaminated water that better simulates real-life conditions. Parameters that will be determined include lifespan, time frame of maturation, and the optimal renewal procedure of the biolayer.
I am the laboratory coordinator for the general education program natural sciences laboratory-based classes for students who are not majoring in science. Since my arrival in Fall 2011, I have started several research projects on science pedagogy, with an emphasis on microbiology education. Not only can microbiology be found in almost all topics of biology, but bacteria are useful laboratory tools! They are easily grown and can be manipulated in ways that allows scientists to ask and answer their questions. My pedagogical research is divided into two main categories;

(i) **Assessment and development of curricula for microbiology classes.** Prior to my arrival at SJU, I developed an online case study that allows students to investigate a hypothetical bacterial outbreak. I am currently working with microbiology and epidemiology students both here at SJU and Cornell in assessing the educational value of this case study. In addition, my students and I have published curricula materials to Microbelibrary, a peer-reviewed database free for microbiology instructors to find curricula materials that can be used in their classes.

(ii) **Publishing and assessing laboratory exercises specifically designed for students who are not majoring in science.** Experiments that are performed in a teaching laboratory should not only have a student discover through observations and questions key scientific principles, but should also focus on showing the student the nature of science and how science works. Currently, Dr. Catalina Arango and I have prepared a semester-long laboratory experiment that will be performed collaboratively between science-majors and non-majors. This project focuses on the identification of bacteria found in Winogradsky Columns, miniature ecosystems that can made at home by placing a bottle full of soil and water in front of light for several weeks. The columns become enriched with photosynthetic bacteria, resulting in different soil colors in the column! Following the development of this activity, the students’ results will be collected for a systematic project in identifying bacteria found in Winogradsky columns.
Identification of Winogradsky Column Bacteria by 16S rRNA Gene Sequencing
Mackenzie Silvestri,’16

Faculty Mentors: Catalina Arango and Brian Forster
Department of Biology

Supported by the SJU Summer Scholars Program and the Department of Biology

Winogradsky columns are a simple way to house a diverse bacterial population. The column is filled with soil, usually taken from a body of water, and supplied with carbon and sulfur sources. After being allowed to incubate in sunlight for several weeks, the column contains both an oxygen and sulfide gradient. Three Winogradsky columns were constructed for this project. The first column containing added calcium carbonate with no added sulfur source, the second containing added calcium carbonate and calcium sulfate, and the third containing added corn starch (a different carbon source) and added calcium sulfate.

The objective of the experiment is to identify the bacterial populations in each column at different depths. A traditional method of identifying phototrophic bacteria is to prepare absorption spectra from the chlorophyll produced by the bacteria. The bacteria within each column can be further identified through 16S rRNA gene sequencing. Soil samples undergo a series of steps, usually completed with kits, to reach the ultimate goal of sequencing. Soil samples harvested from columns constructed in the fall and spring semesters are currently undergoing the various steps necessary for sequencing.

Future work will consist of analyzing the data to assess the variety of bacterial species present within each column at different depths.
A chance encounter with a “Moonie” (member of the Unification Church) at the start of my Ph.D. program in sociology at UC Berkeley led to my long-term teaching and research interest in “cults.” The story of my three week encounter is probably the single most remembered aspect of my undergraduate teaching on cults. I observed that in this group, while there was a male lecturer, most of the small group leaders were women, which was unusual at the time. I concluded that women, socialized to be nurturant, were best equipped to help new recruits accept a radically different life plan. This experience developed a continuing interest in gender roles and sexual patterns in cults.

My first book, *Insane Therapy: Portrait of a Psychotherapy Cult* (1998), described a psychotherapy group which evolved into a cult. The issues of gender, sex, and family came up as I interviewed, as a “cult of masculinity” had developed in the group. The quality unique to being a female, the ability to reproduce, was denigrated, and childbearing was actively discouraged. Gender roles were encouraged, but central to the feminine role was women’s appearance, such that women were put on strict weight control and exercise programs to maintain unrealistic norms of appearance.

Gender, sex, and family are central to my current teaching and research interests. I teach an Honors course entitled “Cults and Culture: Sex, Gender and Family in Cults/New Religious Movements” every spring semester. I am at work on a second book, tentatively titled *Outside the Mainstream: Ex-cult Members Make Sense of Gender, Sex, and Family Experiences in Cults*, on this topic.

Thus Melanie Wright’s Summer 2013 Scholar proposal to delve deeper and explore the role of gender and sexuality in cults overlapped my research interests. We met weekly and discussed the excellently detailed notes Melanie took on the full range of works on gender and sex, from the few overviews written by sociologists, to coverage of selected cults, e.g., *Children of God* and the Unification Church, by experts and by former members of cults who had written memoirs. One of our conclusions was that while gender roles and sexual practices vary in different groups, in general women are more likely to be second-class citizens in such groups. Another conclusion is that celibacy and promiscuity can result in the same pattern of greater devotion to the leader and the group than to an individual partner or family. We are hoping to work on a conference paper to be submitted to the Eastern Sociological Society’s annual meeting in spring 2014.
Gender and Sexuality in Cults:  
A Study of the Role Gender and Sexuality Play in Various Cultic Groups  
Melanie Wright,’14

Faculty Mentor: Marybeth Ayella  
Department of Sociology  
Supported by the SJU Summer Scholars Program

Throughout the summer, Dr. Marybeth Ayella and I examined specific cults to study how a person’s gender can impact his or her experience in the group. Depending on whether on the sex of the individual, he or she could have a completely different life in the cult they join. Although some groups, such as Jonestown and Rajneeshpuram, have male leaders, females hold all the secondary power positions. The leaders of these two groups, Jim Jones and Rajneesh, kept females close and entrusted women with their most important tasks. Conversely, another type of cult is male-led and only allows males in authority positions. This type of cult is evident in The International Society for Krishna Consciousness and The Unification Church. Women’s main utility in The Unification Church was seen to come from bearing children and waiting for their husband to come home from work.

The group, Children of God, led by David Berg, gave men and women equal opportunities to be in charge of the different communes. Berg created a new method he called, Flirty Fishing, to garner financial aid and to recruit new members. Women were to sleep with men outside of the COG as a way to bring God into their hearts. The men in the community were given the job of deciding which random man the women would sleep with. Although women were made to believe this was all for God, many of them were negatively impacted by the Flirty Fishing method.

Female cult leaders are limited in number, but The Church Universal and Triumphant and Siddha Yoga are both headed by women. Both of the women took over only after males were in charge. Elizabeth Clare Prophet of the Church Universal and Triumphant tended to favor men by giving them all the important tasks. Despite her male favoritism, she trained her daughter to take over her role in the church. In Siddha Yoga, Gurumayi only allowed a group of women known as darshan secretaries to perform the most important tasks. Men could hold different positions in the group, but they were not entrusted with the same valuable information and jobs that the women in Siddha Yoga were.

Dr. Ayella and I also examined how sexuality plays a role in cults. We found that some cult leaders enforce strict celibacy rules, while others encourage sexual promiscuity among all members in the group. Some leaders, such as Jim Jones of the People’s Temple, switch back and forth between the practice of celibacy and sexual freedom. No matter what a leader enforces, he or she is still controlling the actions of the members by telling them what is right and what is wrong.
As a behavioral neuroendocrinologist, I am interested in examining the neural and hormonal mechanisms of animal social behavior. I have studied a number of different behaviors including aggression, scent-marking and parental behavior. My current program of research centers on understanding the impact of parental care on offspring development.

For many species, the postnatal period, which consists primarily of feeding and thermoregulation, is a critical phase in development. In rats, care by foster mothers influences the development of maternal behavior and anxiety in adult offspring. This work suggests that the environment (rather than genetics) is important for the expression of these behaviors. Further, work with both humans and non-human primates indicate that maternal behavior may be passed from mother to daughter to granddaughter. 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 California mice, increased retrievals (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. The monogamous and territorial California mouse (*Peromyscus californicus*), that we work with in my lab, is a model system for exploration of paternal investment on offspring development because males provide high levels of care that are necessary for offspring survival.

**Current Research Highlights.** Study 1. My previous work suggests that the steroid hormone testosterone (T) may be a mechanism underlying neural changes that drive the differences in adult behavior that we observe in male offspring, as retrievals increase T in sons. We are currently exploring whether paternal retrievals have similar effects on daughters. Study 2. Recently (article in prep), I have shown that paternal behavior is passed from father to son through non-genetic mechanisms. We will explore whether perturbations in the father’s environment will (a) alter his parental behavior and (b) that of his offspring as well as possible neural mechanisms driving patrilineal transmission. Study 3. We will explore whether retrievals themselves (as provided by father or mother) are responsible for the increased aggression in male offspring that has been observed, or whether it is something unique about the father-son interaction.

*Dr. Becker received a B.A. in psychology and a B.M. in voice performance from Lawrence University. She received her Ph.D. in psychology at the University of Wisconsin-Madison.*
Environmental effects on paternal behavior across generations in California Mice (*Peromyscus californicus*)
Thomas Bernardo, ’14

Faculty Mentor: Elizabeth A. Becker
Department of Psychology

Supported by the SJU Summer Scholars Program

A wealth of research has implicated a significant role of early parental care on the development of offspring. Mothers have been the focus of most research because paternal care is rare among mammals. Research indicates that mothers influence stress responsiveness and maternal behavior in offspring. Recent work with bi-parental species, however, has contributed to our understanding of the role of fathers on offspring development. Paternal behavior in *Peromyscus californicus*, for example, influences testosterone levels, aggression and future paternal behavior in offspring.

The environment in which a parent raises its offspring may be an important factor in their caregiving, as previous research indicates exposure to a stressful environment decreases maternal care. In *P. californicus*, fathers huddle and groom offspring early in development, and later in development, they retrieve their offspring. Removal of the father in the wild significantly decreases survival. Therefore, we posit that retrieval behavior may remove offspring from dangers outside of the nest, such as risk of predation.

Paternal behavior is passed from father to son through father-son interactions. Because a stressful environment can significantly impact level of parenting and because paternal behavior in *P. californicus* is necessary for survival, we hypothesize that fathers will increase their paternal attentiveness in response to a threat to their offspring.

The goal of the current study is to investigate the effects of predator odor on paternal behavior in *P. californicus*. We will test the central hypothesis that fathers exposed to a predator odor, will provide high levels of care (retrievals) as compared to fathers exposed to no or a non-predator odor. The aims of the study are: to establish a relationship between the environment and parental behavior (retrievals) as exhibited by fathers towards pups; and to establish a relationship between the early postnatal father-pup interactions and the expression of paternal behavior in different environmental contexts as adults.

Testing is ongoing and will conclude in the summer of 2014.
Tetyana Berezovski  
Department of Mathematics  
Saint Joseph’s University  

Ph.D. Simon Fraser University  

**Research Interest:** Mathematics  
Teacher Education, primarily Mathematical Knowledge for Teaching, Pedagogical Content Knowledge, and issues of Technology in mathematics teaching and learning.

My line of research is related to advancing and improving the mathematical knowledge of teachers through various professional avenues, such as professional development, coursework, collaborations, summer institutes, and teacher support initiatives. My research aims to understand how prospective and practicing teachers learn mathematics, and how mathematics educators can enhance teacher learning. Consequently, I am interested in how mathematics can be taught, and how to prepare prospective and practicing mathematics teachers to become highly competent and effective in their profession.

Witnessing an increasing influence of technology on our lives, led me to believe that incorporating technological tools into education might change our perspectives on the ways we teach and learn. Thus, my research program associated with technology-related issues in education is primarily based on my belief that generational shifts bring new avenues and exciting opportunities for educational research. With shifts in technology, some of our knowledge becomes obsolete - creating the need for new more suitable knowledge (that may not be familiar to us). To continue the research, we need to gain a better understanding of what the up-coming generation of students needs to know (or knows already), how they learn and process new information, and how does technology affect their thinking, learning, and cognitive interactions. Perhaps, understanding these phenomena would allow a finer definition of cyber learning, and consequently develop new models of teaching, namely “cyber teaching”, specifically in mathematics.
The Effectiveness of a Geometry Course designed for Secondary Mathematics Educators
Sarah Bell,’13

Faculty Mentor: Tetyana Berezovski
Department of Mathematics

Supported by the SJU Summer Scholars Program

In the summer of 2011, Saint Joseph's University offered a Summer Institute for practicing mathematics teachers in the School District of Philadelphia. As a part of this institute, teachers were enrolled in *Geometry for Teachers: From Problem Solving to Proofs*. It was a research-designed course focused on the improvement of Mathematical Knowledge for Teaching (MKT) in geometry, designed by Dr. Berezovski. As a part of the Summer Scholars Program, I did a statistical analysis on the assessment tool given utilized in this course. The assessment tool was used to analyze the change and retention of MKT, and administered on three separate occasions. The test consisted of multiple-choice and proof-based questions.

Two groups of teachers participated in our study. The treatment group contained the participants enrolled in the course with Dr. Berezovski, and the control group, which included teachers with similar demographics who did not take the course. Both groups were asked to take a pre-test before the course, a post-test after the course, and a post-post-test a year after the course was completed.

To start off the summer I did a literature review on similar studies done in the field of mathematics education. I also had to familiarize myself with the statistics needed with the help of Dr. Lurie of the Department of Actuarial Science. I then organized and coded the collected data. The responses from both groups were coded. I also separated the scores of the exam by multiple choice questions and open-ended questions. After the data was coded I was able to run the results through SPSS, statistical software, to perform an independent variable *t*-test. This test compared the mean scores of the treatment group vs. the control group. The test results provided information on whether or not there was a significant change in score for the participants that completed the course, ultimately verifying that the course was effective. I found that there was a significant change in scores for the proof section of the exam. That is, the teachers that participated in the course gained a significant amount of knowledge in geometry and improved their proof writing skills.

After performing the overall *t*-test I was also interested in looking at the demographics of the participants. I decided to separate the participants by their number of years of experience teaching and also whether or not they achieved a degree in mathematics as a graduate or undergraduate student. I ran this data through an independent *t*-test and found similar results as my first overall test. From this I concluded that although demographics had a slight effect on the results, the course content was equally accessible to the participants. I look forward to continuing to investigate the results in the fall of 2013 with Dr. Berezovski and hopefully writing a scholarly article that can be submitted to RUME and MAA conferences.
Educational assessment is generally assumed to relate primarily or solely to academic or cognitive outcomes; this is in spite of the fact that most schools (and certainly Jesuit ones) explicitly include moral, social, and character goals in their mission statements.

Because measuring affective educational outcomes carries a number of obstacles and “yeah, buts” with it, the fact is that most educational leaders and teachers don’t spend much energy in determining whether their efforts at character formation and moral development are effective, nor in planning how they might change programming and pedagogy to effect desired affective learning outcomes.

William Popham, a leader in the field of educational assessment, insists that we “measure what we treasure.” He further argues that assessment, when done well, improves instruction. It stands to reason that more intentional efforts to measure our success in “teaching matters of the heart”—both during the teaching process and when the dust has settled—is an essential and very practical element of the Ignatian magis to which we are committed.

I worked with Annie Mrazik this summer on the problem of assessing transformational learning as it occurs in service immersion programs. How does one change one’s heart, and how can immersion programs facilitate such transformation?

Annie served as “eyes and ears” for a pilot assessment project by participating in the Romero Center’s Urban Challenge as a program intern, getting an intimate firsthand look at the transformation process as it occurred within a series of weeklong poverty-awareness immersion experiences in Camden, NJ. Her extensive field notes, in conjunction with weekly meetings with myself and the program’s director, provided the larger project with valuable insights into the transformational learning process as well as with concrete “next steps” in developing a means of assessing its affective learning outcomes.
In the past two decades, students in high school and college have noticeably increased their participation in cultural immersion programs, both domestic and foreign. In response to such demand, ministries and organizations such as the Romero Center of Camden, New Jersey, have been fostered into existence. Founded in 1998, the Romero Center is an urban retreat center designed to call people to live out the Gospel value to serve the poor. It hosts a variety of programs and services to cultivate development in the surrounding community and in the hearts of the students who participate in the Center’s service immersion programs; thousands of people have come through these programs and have experienced a piece of Camden’s social reality. The question driving my research project is this: all souvenir t-shirts and wristbands aside, what do the participants take with them that “lasts” when the experience is over? In other words, what impact does the experience in Camden have on them; and furthermore, what particular aspects of their experience throughout the week bring them to this change?

Serving as an intern at the Romero Center for the months of June and July as a part of its Urban Challenge program, I lived in an intentional community with four other interns, assisting the Romero Center with all aspects of immersion programming. We worked closely with seven different groups over seven weeks. I was able to facilitate nightly reflections with a small group of four to ten participants every week. The questions posed during these reflections challenged them to think beyond the surface experiences of their day and to consider how these events touched their hearts and changed their mindsets.

I kept an extensive field journal, in which I was able to record what students shared during evening reflections, as well as my own lessons learned and inner transformations. Weekly meetings with Jeff Petrosky (the Program Director) and Dr. Bernt allowed me to explore patterns in the sorts of experiences that strongly affected the participants and to speculate about how those experiences might effect a transformation in them. Although participants came from as far away as Florida and Missouri and from as close as Lower Merion Township and Philadelphia, all were struck by the joy they found in Camden and by the common ground they shared with its residents. Noting these aspects of humanity in the residents of Camden catalyzes some sort of change in their mindsets about poverty and social justice. My own mindset changed and developed throughout these seven weeks as well; living in Camden made the poverty and injustice there a very personal matter, because my new friends and neighbors were in the midst of it.

My observations during the reflections this summer allowed me to understand how the participants made “meaning” of their experiences. Our weekly discussions of my journal have contributed to first steps in a process that will serve to develop the Romero Center’s effort to further improve an already-wonderful and transformative program for youth.
For several years now, my primary research program has been to investigate an ethics of liberal-democratic citizenship in light of the fact of enduring religious and philosophical pluralism. At the center of the philosophical literature on this topic are a number of arguments for and against proposed moral requirements of citizenship and deliberation. Along these lines, I have attempted to defend an interpretation of the “idea of public reason,” initially developed by American political philosopher John Rawls (1921-2002). Some of the main questions addressed in this area of my work are as follows:

- **What kind of justifications do citizens and government officials owe one another for their exercise of coercive state power?** What does it mean to have a sufficient and accessible justifying reason that another might reasonably accept? Are justifying reasons in support of coercion to be held to the same epistemic and normative standards as proposed defeater reasons? How do we choose from among an optimal eligible set of potential laws and policies when no decision procedure can itself be conclusively publicly justified?

- **To what extent may government officials and/or ordinary citizens rely on religious doctrine, perfectionist values or substantive ethical conceptions of the good in publicly discussing, advocating or voting for matters of coercive law and policy?** Do officials and/or citizens violate any moral requirements of citizenship when they rely solely on such grounds in their political activity?

- **If there are (non-legal) normative requirements to exercise restraint with respect to religious and other comprehensive doctrine in political deliberation and decision-making, what is the moral status of requirements of this sort?** Are such requirements duties, virtues or supererogatory ideals? How much weight should they carry, especially when they appear to conflict with other obligations or expectations?

A second set of research interests began with a course on “Toleration and Multiculturalism” that I developed at Saint Joseph’s and taught each fall from 2006 to 2011. The work associated with this course contributed directly to papers published on the following topics: (1) race and ideal theory in political philosophy, (2) the status of minorities within minority groups (so-called “internal minorities”), and (3) immigration policy and civic-political identity.
With an increasing amount of cultural and ethnic groups within the United States, issues surrounding questions of group rights and recognition also increase. For many decades, members of these groups have been marginalized in the midst of the dominant, majority groups and ignored in mainstream political philosophy. Recently, though, discussions on this issue have focused on granting cultural and ethnic groups special rights so that they can enjoy many of their various traditions freely in society. Granting these special rights is a goal of liberal multiculturalism, which aims to reconcile cultural diversity and pluralism with traditional liberal commitments to freedom and equality. Specifically, proposals for language rights for certain minority groups have generated an interesting set of questions geared towards the justification of such rights. Promoting bilingual education is one a way to equalize the instrumental value of language by facilitating societal access, social mobility, and democratic participation. Bilingual education also responds to non-instrumental considerations of language such as identity formation and cultural preservation.

Bilingual education, used in its contemporary sense, refers to children of immigrant families who are thought to fall behind if they do not receive part of their education in their mother tongue. During this process, they are also learning in English, which immerses them slowly into the dominant culture. This kind of policy has led to various forms of backlash, sometimes based on the ethics of assimilation. Therefore, this research project has focused on bilingual education in a broader sense that extends to all children regardless of family background. Drawing upon official linguistic policies from other states such as Wales and Quebec, we are left with the question as to how and why the United States should adopt similar but also different language policies due to the current situation of rising immigrants, especially from Spanish-speaking countries.

Encouraging this sort of policy raises another set of questions. For instance, reflecting on various arguments surrounding the territoriality principle vs. the personality principle, we are able to ask who should be responsible for deciding the educational policies of a school district? Should it be a local, regional, or an even larger federal responsibility? Who should fund these sorts of programs? In addition, after detailing the definition of liberal multiculturalism, would imposing a bilingual education on all students be illiberal? The research has aimed to answer these questions in a way that supports bilingual education by engaging various political philosophers like John Rawls, Will Kymlicka, Alan Patten, Brian Barry, Charles Taylor, and sociologist and linguist Stephen May, as well as many others.
John M. Braverman, S.J.
Department of Biology
Saint Joseph's University
Ph.D. University of California, Davis

**Research Interests:**
Evolutionary genetics in flies and plants

Two different individual organisms from the same species often differ in their DNA. I want to know why. So the basic scientific question unifying my research on diverse organisms is: “What explains their genetic variation?” The answer may be different in different organisms. For example, organisms which fly tend to spread genetic variants across geographical regions, reducing the “structure” of the populations. Organisms which live in very small populations and limited ranges, like plants specialized to live on certain kinds of soils, are expected to show a very high level of genetic differences among geographic populations. Several other variables come into play, such as, the gene or genetic region in question.

With that in mind, my Summer Scholars investigated genetic variation in several species. To see if fruit fly genetic variation is indeed as structured as predicted for a flying insect, we first surveyed the species present in the area. That led to the selection of *Drosophila simulans* for a study of genetic variation at the finest scale. In light of the prediction of low genetic structure, we chose genetic regions with very high mutation rate called microsatellites. Indeed, some preliminary hints at structuring were uncovered.

*D. simulans* is not native to North America but has been here for at least one hundred years. To contrast, a new arrival is *D. suzukii*. We studied genetic variation in this species as well. Our findings include a radical shift in the size of an intron, which is a non-coding portion of a gene.

Finally, the study of a plant called the lyre-leaved rock cress (*Arabidopsis lyrata*) began with a survey of several local nature preserves. We hoped to locate new populations, as predicted by one of their preferred soil types. The study moved on to consider the level of variation within and among the populations. The results revealed a number of important genetic variants, some of which may be involved in local adaptation. In addition to our scientific findings, I appreciated the intellectual and personal development in a group of students working on different but interrelated projects. We exchanged insights about the genetics, lab techniques, computer software, and field collection. The Summer Scholars Program again proved extremely valuable to three SJU students and me.
Drosophila Biodiversity in the Philadelphia Area
Rodrigo Castro,’16

Faculty Mentor: John Braverman, S.J.
Department of Biology

Supported by the SJU Summers Scholars Program

During my research for the Department of Biology at Saint Joseph’s University I studied the biodiversity of the *Drosophila* population in the local area. Biodiversity is essentially the variety of life. Biodiversity is important because it often indicates ecological health.

My research dealt with the *Drosophila* or fruit fly population of the local area. I set up traps in the Maguire Campus and outside the Science Center of Saint Joseph’s University. The traps consisted of a plastic water bottle that contained bait made from rotting bananas, red wine, and yeast. The traps were checked everyday and the flies captured were identified, counted and stored in ethanol. The counts of the flies were saved in a Microsoft Excel file. There were many different species of *Drosophila* that were collected including: *D. melanogaster, D. simulans, D. affinis, D. robusta, D. busckii, D. immigrans, D. tripuncata*, and two invasive species, *D. suzukii, and D. indianus.* The information from the Excel file was then used to estimate quantitatively the biodiversity of local *Drosophila.*

There are two factors that are key in determining biodiversity, richness and evenness. Richness is the number of species per sample is a measure of richness. The more species present in a sample, the “richer” the sample. Evenness is a measure of the relative abundance of the different species making up the richness of an area. There is several of determining Biodiversity of a population; they are referred to as biodiversity indexes. The particular index that I focused on during my research was Simpsons Index, $D$. Simpson’s Index consists of the sum of $n$ multiplied by $(n-1)$, where $n$ is the total number of organisms of a particular species. This value is divided by $N$ and multiplied by $(N-1)$. $N$ is the total number of individuals of all species.

$$D = \frac{\sum n(n-1)}{N(N-1)}$$

By subtracting the value of $D$ from one, a biodiversity value is calculated that ranges from zero to one. Zero means a low biodiversity and one indicates a high biodiversity.
Analysis of Genetic Variation in *Drosophila simulans* and *suzukii* within the Vermilion Gene and Microsatellites
Matthew DiMeglio,’15

Faculty Mentor: John Braverman, SJ
Department of Biology

Supported by the SJU Barbelin Scholars Program and the Howard Hughes Medical Institute

*Drosophila* is a genus of fruit flies, which commonly linger around and reproduce within rotting fruit such as blueberries. The most notable species of fruit fly is *Drosophila melanogaster*, which has been studied since the early 20th century. All current studies on different species of *Drosophila* utilize this species as a reference for comparison. My research has been to quantify the amount of variation among multiple species of *Drosophila* to provide a greater understanding within the population structure, which could hopefully lead to inferences about the evolutionary selective forces acting upon these populations. We focused on *D. simulans* in our microsatellite study due to its close relation to *D. melanogaster*, and it was available in our sampling of local populations at SJU. In addition, *D. suzukii* was chosen for study because of its agricultural significance as an invasive pest that lays eggs in ripe fruit rather than rotting fruit. This species recently emigrated from Japan to the United States and has caused the destruction of many crops, especially blueberries.

The primary method to acquire the data for analysis was through Polymerase Chain Reaction (PCR). This was a reaction that consisted of a small volume of a polymerase enzyme, DNA, forward and reverse primers, a buffer, dNTPs, and deionized water. The reaction was placed within a thermocycler, which heats and cools the reaction to specifically determined temperatures based on the primers and enzyme efficacy to allow for the DNA to be denatured, the primers to anneal to the specific locus of interest in the genomic DNA of a particular species of *Drosophila*, and extend the new DNA fragment across the length of the specific locus. This process increases the concentration of a specific region of DNA that we would like to analyze exponentially. Optimizing this process for multiple microsatellites in *D. simulans* and for the vermilion gene required much time and effort. Experimentation and critical thinking was required to adjust the many variables of PCR.

In the case of analyzing the vermilion gene in *suzukii*, we did not know what to expect since we used primers that were designed specifically for *D. simulans* in the hope that PCR would yield a product in *suzukii*. What we found was very interesting. Not only did a product amplify, but also the product was much larger in *D. suzukii* than in *D. simulans*. DNA sequencing revealed that there is a 350 base pair intron insertion within the *D. suzukii* vermilion gene. We used the National Center for Biotechnology Information (NCBI) databases to see if this inserted sequence is located in another portion of the *D. suzukii* genome, but found that this is a unique sequence. This finding was definitely the most exciting portion of my Summer Scholars research experience, because it led to many new questions. In the future, I hope to conduct a cross-species study to find out exactly how this intron evolved. This will hopefully lead to better understanding about how evolutionary forces affect the structure of genes.
Genetic Variation Within and Among Different Populations of *Arabidopsis lyrata*
Katherine Molloy, ’15

Faculty Mentor: John Braverman, S.J.
Department of Biology

Supported by the Howard Hughes Medical Institute Grant and a Gift from Nick Nicolaides, ‘87

The object of my research is to study genetic variation in different populations of *Arabidopsis lyrata*. Commonly known as “lyre-leaved rock-cress,” *A. lyrata* is able to grow on nutrient-poor soils, such as well as serpentine soil, which has high concentrations of heavy metal and low calcium to magnesium ratios. By looking into genetic variation in different populations, we hope to get a better picture of how genetic variation is distributed within and among natural populations and the genetic basis of adaptation.

We first located places where *A. lyrata* grows. We already have studied one such population in Cecil County, Maryland. Using Internet and geological data, we targeted other locales in southeastern Pennsylvania. That led to discovery of new populations. After obtaining permission, we collected leaves of *A. lyrata*.

The next step is to extract DNA. We used several methods to try and obtain the highest yield of DNA from the samples. Using Polymerase Chain Reaction (PCR), we made copies of several loci. Then we had the loci sequenced and compared them using Geneius Pro, a computer program. We analyzed polymorphisms, which are single base pair differences among DNA sequences. The protein coding regions were translated to see if the changes affected the amino acid sequence.

We measured genetic variation at three genetic loci. Two of these genes are protein-coding candidates for local adaptation. The *Taberlet* locus is a non-protein coding region from the plant chloroplast genome. Because *Taberlet* is non-coding, the variation there gives a baseline level of variation.

Each of the three loci has multiple polymorphisms. At the *Taberlet* locus, the variants observed are rare. In the two coding regions, the variants are in relatively high frequencies. Some of the polymorphisms change the amino acid sequence of the protein, making them good candidates to be adaptive.
My research interests have shifted over the course of my career. Initially, I did research in the field of literature and science, which explores the interrelations between these two fields. In particular, I focused on the discourse between both fields from mid-19th century German realism until the Turn of the Century. At present, I have been working on contemporary German crime fiction. My specific focus in this instance is the inclusion of Nazi/World War II themes within post-unification (after 1990) German crime fiction. Such inclusions would have been unthinkable in the immediate decades following World War II. In addition, I have been investigating how this development relates to the German memory discourse, which has emerged in the 1990s. The memory discourse looks at the broad spectrum of German experiences during the 1930’s and 1940’s, essentially the Nazi period, and incorporates German Nazi and wartime experiences, not publically discussed in the past, such as the suffering of Germans during the Allied aerial bombings and the expulsion from the eastern territories. Another recent post-unification phenomenon I have been investigating is the portrayal of immediate post-WWII culture, particularly the late 1940’s, in contemporary German crime fiction.

My research interests bear little direct connections to the work my summer scholar, Alison Thomson, is pursuing this summer, namely an investigation of German business culture after World War II. This is more of a teaching interest of mine, as I have taught Business German in the past and have included business-related issues in other courses I have taught.
German Business Culture in the post-World War II Era: Developments and Trends
Allison Thomson,’15

Faculty Mentor: Thomas Buckley
Department of Modern and Classical Languages

Supported by the SJU Summer Scholars Program

Inter cultural communication is becoming increasingly important as countries around the world become more connected. International business is a growing sector, and it is difficult for companies of any size to avoid dealing with other countries on a regular basis. One has to recognize that cultures differ among countries and these cultural differences influence how countries do business.

Germany has transformed itself in the post-WWII era from a country ruined by war to one of the most economically powerful countries within the European Union. The culture, politics, and economy have all affected this transformation. In my project, I not only wanted to analyze these transformations by themselves but also how they have impacted German business culture. I analyzed German business culture and compared it to American business culture. Geert Hofstede’s Five Dimensions of Culture was the initial model with which I began my research in comparing German and American business cultures.

Geert Hofstede is known as one of the top researchers in the field of international management. He created the famous “Five Dimensions of Culture” model that allows business people to learn about other countries’ business cultures at a quick glance. It ranks countries in five areas: Power Distance, Individualism/Collectivism, Masculinity/Femininity, Uncertainty Avoidance, and Long Term Orientation. Germany and America have mostly similar scores in these dimensions, but when one looks at the specifics of each culture and traces these specifics to the score in each dimension, it is easy to see how these two business cultures are different.

In addition to using Hofstede’s model, I was able to find a number of sources in German and English that allowed me to discover the specifics of German and American business cultures. One article that I found highlighted the contrasting histories of Germany and America and traced them to each country’s business culture. I used this article to attempt to trace other aspects in business culture to instances in history. For example, Germans have a strong tendency to plan out the details of business ventures and consider each possible outcome of a situation before making a decision. This leads to a lengthy planning process. This need for security and low risk tolerance is linked to Germany’s war seeded history. America’s more recent past is not as unstable as Germany’s. This could be one of the reasons why Americans are less likely to think out every possibility of a situation because risk is seen as almost a necessity for a high return. Short term profits and returns predominately guide the focus of American businesses. Deep-seated cultural differences are not the only things that differ between American and German business cultures. There are typical business “do’s and don’ts” that vary between the two cultures.
Janée N. Burkhalter  
Department of Marketing  
Haub School of Business  
Saint Joseph’s University  
Ph.D., Marketing, Georgia State University

**Research Interests:** New media, marketing communications, niche markets, celebrities, responsible business practices & business education

My focal research melds my concentration on niche markets with my interest in marketing communications and investigates how the embedding of brands in music videos and social media may influence the consumption behaviors of musical subcultures. The *Journal of Marketing Communications* has published some of my first work in this area by year’s end. I believe this field is ripe for inquiry because scholars tend to focus on music as a background element to marketing communications as opposed to looking at music as the marketing vehicle itself. Currently, I am working on several projects in this area including a few which employ the use of psychophysiological measures such as EEG, GSR and eye-tracking mechanisms.

Prior to joining academia, I worked as a marketing manager and marketing consultant in the financial services field where I focused on niche markets of customers including affluent consumers and Fortune 500 businesses.
Analyzing Unethical Advertisements and Applying Crisis Management Principles to Retain Brand Image
Grace Gunnels,’14

Faculty Mentor: Janée Burkhalter
Department of Marketing

Supported by SJU Summer Scholars Program

Last year as a Summer Scholar, my goal for my Summer Scholars project was to examine the many different aspects of ethics in marketing to fully explore why it is important to behave ethically, how to behave ethically, and how a company can recuperate from an unethical decision. To achieve this goal, I created a website that could be visited by students entering the workforce who need to learn and understand the importance of ethics as well as business people who are already in the workforce and may want to learn more about ethics. One major part of the website that I created was a section on unethical advertising. I selected three unethical advertisements, analyzed them, and created a teaching note complete with student worksheets that an instructor could use as a way to teach a course on unethical advertising practices.

For this year’s project, I decided to continue along with my focus of business ethics and take a deeper dive into the world of unethical advertisements. Companies use advertisements to make customers and prospects aware of the features and benefits of their products. By advertising regularly, a company can reinforce their positive brand image so that their product becomes first choice when the consumer next makes a purchase. Most companies try their best to release advertisements that reflect the information that customers feel is important in an effective and ethical manner. However, when companies are not cautious about the advertisements that they release, they may create an advertisement that is not well perceived by their audience and is very detrimental to their reputation.

To complete my research, I selected three unethical advertisements and fully analyzed each advertisement by researching the company and looking at the following components of the advertisement: signs, symbols, figures, plot, themes, language used, and techniques. I then created a survey that was sent out to marketing students to see how the advertisements were perceived in terms of what the advertisement says about the product, what does not seem to fit together, what impressions the students took away from the advertisements, and how the advertisement effected their desire to buy the product being advertised. Then, I interviewed a Public Relations Manager that was able to provide insight into the process of crisis management after an unethical advertisement has been released in order to restore the company’s brand image.

This research will help marketing professionals better understand the negative effects that unethical advertisements can have on the positive brand image that their company has worked so hard to create.
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 these groups to achieve a specific function. For example, cytochrome c oxidase (CcO) and myoglobin (Mb) (X-ray crystallographic structures shown on the left side) have very different biological roles despite containing similar redox cofactors. The main cofactors in these heme proteins are heme $a$ and heme $b$, highlighted in magenta. CcO is an enzyme that utilizes the reduction of oxygen to water to pump protons for the eventual production of ATP, the energy currency in cells. It is an electron transfer (ET) protein that contains multiple redox centers, whose main protagonists are two heme $a$ cofactors. A topic of much interest is the elucidation of how the two hemes $a$ are involved in the proton pumping mechanism of CcO. Heme $b$ (found in Mb, hemoglobin, heme peroxidases) can serve in roles such as oxygen storage and transport, electron transfer, oxygenase, catalase, peroxidase, and gas sensing. It is obvious by the structures of the surrounding media of the hemes in the figure, that there are differences in the heme-protein interactions between CcO and Mb and thus these interactions are key to their respective functions. 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. One way of studying specific interactions to the heme is by using heme model compounds dissolved in aprotic solvents. In this regards, during this summer, Mary Malloy and Alaina Stockhausen investigated the electrochemical properties of heme $a$ and heme $b$ in aprotic solvents.

Another approach in understanding protein-cofactor interactions is to use fluoride binding in heme proteins. Research studies performed in other labs have used fluoride ion as a probe of the heme cavity of proteins. Last summer we used this approach to study the heme cavity structure of Mb. For this summer, Victoria Angelucci and Megan Forman investigated the electrochemical properties of heme-bound fluoride complexes of horseradish peroxidase.
Determination of the Reduction Potential of Heme-Bound Fluoride Complexes of Horseradish Peroxidase as a Function of pH
Megan Forman, ’14
Victoria Angelucci, ’14

Faculty Mentor: Dr. Jose Cerda, Department of Chemistry

Supported by SJU Summer Scholars Program and McNulty Scholars Program

This summer we worked with Dr. Cerda on fluoride binding in heme proteins, specifically, horseradish peroxidase. Our goal was to measure the reduction potential ($E_m$) with and without heme-bound fluoride in horseradish peroxidase (HRP) and compare its pH profiles to that of myoglobin (Mb). Our results show how these two heme proteins, which have different biological roles, have also different electrochemical properties in the presence of fluoride. In our previous study, we investigated the effects of pH on fluoride binding in heme proteins. We showed that the pH profile for fluoride binding in HRP is different than that of Mb due to the differences between the heme cavity structures of these proteins.

For this study, we measured the midpoint potentials of horseradish peroxidase by using UV-vis spectrophotometric spectroscopy. With this data we were able to establish a comparison between HRP and Mb. The pH profiles of the solution containing just protein (Mb, HRP) or the protein-fluoride complex (Mb-F, HRP-F) are shown on the right. The pH profiles of the electrochemical reduction potential of horseradish peroxidase are different than that of Mb. Myoglobin, just like hemoglobin, is a heme protein with the ability to bind to oxygen, since its role is oxygen storage (that of hemoglobin is to transport oxygen). On the other hand, horseradish peroxidase catalyzes the reduction of hydrogen peroxide to water and couple this reaction to the oxidation of a substrate. The spatial arrangement of the amino acid residues that surround the heme cofactor in horseradish peroxidase and myoglobin cause these two heme proteins to have different functions. Hemoglobin and myoglobin contain a distal histidine that is involved in oxygen binding, whereas horseradish peroxidase contains a distal histidine that is instead key in the peroxidase reaction. The different roles of the distal histidines have different effects on the heme-bound fluoride complexes of HRP-F and Mb-F, as seen in the comparison between the red traces.
Heme Peripheral Groups Interactions in Extremely Low Dialectric Media and their Contributions to the Heme Redox Potential

Mary Malloy, ’14
Alaina Stockhausen, ’15

Faculty Mentor: Jose Cerda Ph.D
Department of Chemistry

Supported by a Gift from Anne Marie and Jay Borneman, ’80 and SJU Summer Scholars Program

Heme a, a naturally occurring cofactor in the protein cytochrome c oxidase (CcO), is a critical component in creating a proton gradient in our cells to produce ATP—the body’s main source of energy. Our research this summer focused on testing heme a’s peripheral groups and their interactions using three derivative hemes. Heme b was tested for interactions to the propionate groups, diacetyl heme (DAH) was tested for interactions with the formyl groups, and dimethyl ester heme (PPIX-DME) was tested as a control for all experiments. Heme a exists in the body containing both peripheral groups—two propionates and a formyl group (Figure 1). What sets our data apart from previous research is that we were able to quantify the interactions to the peripheral groups using cyclic voltammetry (CV) during addition of DBU, which causes deprotonation of the heme propionates.

The objective was to measure the heme redox potentials in various low-dielectric conditions upon deprotonation of the heme propionates. The lower the polarity of the solvent, the closer the conditions match the naturally-occurring environment of heme a. The measured redox changes (ΔE1/2) are reported in Table 1. With the use of ultra-microelectrodes, we were able to successfully measure the heme redox potential without DMSO and electrolyte, which represents the lowest polar conditions. Without electrolyte, the heme redox potential reached ≈100mV for both deprotonated propionates of heme a and heme b. This large redox change is caused by the strong interaction between the charged propionates and the heme iron.

Our results show how this redox-linked ionization is magnified in low-dielectric media. In conclusion, the heme derivatives helped reproduce data seen with the interactions of heme a. Our research shows how the redox-linked ionization can be utilized by heme a in the cytochrome c oxidase to pump protons for ATP production in the body. For future research, we would further study the interactions to the formyl group and its effects on the heme redox potential.

Table 1. Heme potentials after DBU additions
My research focuses on the Mongolian Buryats who are the largest group of indigenous people in Siberia. Although few Americans may have ever even heard of the Buryats, they actually offer an excellent opportunity to better understand Imperial Russia, the Soviet Union, and the Russian Federation.

I am especially concerned with the effects of periods of massive social and economic change. I explore how ordinary Buryats experienced such historical moments 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 forced the nomadic Buryats to settle onto collective farms, the rise in social mobility in the post-WWII years, the collapse of the Soviet Union, the economic devastation of the 1990s, and Vladimir Putin’s policies to diminish regional control across the Russian Federation. The Buryat people who experienced these drastic changes have sometimes challenged the state’s authority, but have always had to adapt, negotiate, and find ways to live through the sea tides of state political and economic policies.

What is exciting about this stream of research is that it allows me to investigate a wide range of themes. My work speaks to issues of human rights, social justice, gender, empire, colonialism, religion, education, modernization, media, identity, nationalism, social mobility, political and cultural institutions, and more. This is also particularly useful for teaching because my courses often stretch across many centuries and cover a large range of topics.

Part of my research this summer has focused on a project about how Buryat and Russian women have experienced economic change from the late Soviet period to the early 2000s. The project draws from historical research, participant observation, informal and formal interviews, and a survey conducted among women in Siberia in 2006. It examines how women have sought to improve their lives over the last four decades by developing various strategies such as gaining more education, building informal networks of exchange, moving to cities, and, for Buryats, Russian language acquisition. This project also includes the work of the summer scholar, Ashley Hobson, who has recorded and processed the 2006 survey and conducted her own research and analysis on questions about democracy and women’s attitudes toward local and central government in the Russian Federation.
How Are Women Surviving?
Ashley Hobson,’14

Faculty Mentor: Melissa Chakars
Department of History

Supported by the SJU Summer Scholars Program

In 2006, a survey was conducted in the Russian Republic of Buryatia. The survey asked 87 women of both Russian and Buryat decent, a series of 59 questions. They ranged from biographical information such as age and ethnicity to more in depth questions about politics and the economy. The primary purpose of the survey was to examine how women have been surviving in the Republic of Buryatia since the fall of the Soviet Union in 1991. Have they had to seek additional sources of income? Have they seen the value of their money increase or decrease? What are their concerns for the future? In an article published by Angela Stent titled, Women in the Post-Soviet World: The Politics of Identity and Ethnicity, she asserts that women are actually worse off now, than they were prior to the collapse because of the demise of the social safety net. By examining the responses to the survey, it can be concluded that women in Buryatia do not have complete trust and faith in their government and their lives began to change once the Soviet Union collapsed. Due to increases in crime, rises in alcoholism, changes in education, and health care, women have seen their state change drastically.

In order to understand why women have lost faith in their government and are struggling to survive, the data had to be organized and placed into tables and graphs. Most of the summer was spent trying to find the most effective way to make the raw data readable. It was decided to place the data into excel and to make a series of spreadsheets. The respondents were labeled R1-R87 and divided into groups of 10-15. While recording the responses, it became apparent that certain questions were generating similar responses. For example, 47% of respondents do not approve of how the government treats women and 84% of respondents do not trust their government, either completely or partially. When examined by ethnicity, 82% of Buryat women and 88% of Ethnically Russian women do not have partial or any trust in their government.

As a Political Science and Sociology double major, the lack of trust in government and the dissatisfaction with the government’s treatment of women fueled me to research further. Presently in Russia, only 13.6% of their Parliament or Duma are women. In the United States, that percentage is only slightly higher at 17.7% (Inter-parliamentary Union, 2012). Lack of representation for a large percentage of the population creates unfairness and explains why 47% of women in Buryatia are unsatisfied with how their leaders are treating women. The collapse of the Soviet Union did not increase the freedoms for women, rather it forced them to regress to more traditional roles. Are women faring better since the collapse? The research says that they are not, especially politically.
Research Interests: My research this summer focused on implementing the Mercy Health Promoter Model designed by the fellows and staff of the Institute of Catholic Bioethics for the Nigerian community in Philadelphia. As of March 2010, 11.2 million undocumented immigrants were living in the United States, virtually unchanged from a year earlier according to the new estimates from the Pew Research Center. Estimates show that there are at least 50,000 undocumented African immigrants living in West Philadelphia, constituting eight percent of the total immigrant population. The increase in foreign-born peoples and their need for health care is a complicated issue facing many cities, health systems and hospitals. Over the course of the past few years Mercy Hospital of Philadelphia has treated increasing numbers of foreign-born African patients. The majority have been presenting in the late stages of disease, which has made treatment more complex and costly.

To meet the needs of this growing population, the Mercy Hospital Task Force on African Immigration designed a program that centers on the Third World concept of “Health Promoters.” This program is intended to serve as one possible proactive solution for hospitals to cost-effectively manage the care of this growing percentage of foreign-born individuals in the population. This notion of a “Health Promoter” program in Philadelphia is unique as one of those rare occasions when a Third World concept is being utilized in a first world environment. It is also unique in that it could serve as a paradigm for other hospitals in the United States to meet the growing need of health care for the undocumented population.

The implementation of the Mercy Health Promoter Model is a joint venture between the Institute of Catholic Bioethics, the designer of this model, and the Mercy Health System of Philadelphia. This pilot program began in January 2013 and targeted the Nigerian community of Philadelphia. The Nigerian community was selected because it is well-organized and has a stable basis at St. Cyprian’s parish in West Philadelphia. We have been approached by the French West African community and will begin serving this community as of September 2013. We spent the summer educating four new health promoters for the French speaking African community. 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 the Catholic Health Association of the United States and they are very interested in monitoring the implementation, success and evaluation of this model.

I am also researching the medical, legal and ethical implication of force-feeding the detainees at Guantanamo Bay Prison in Cuba. Is this a violation of international human rights law?
Unsafe drinking water is defined as inconsumable water containing biological or chemical pollutants that often cause illness and disease in developing nations. Pathogenic bacteria and arsenic are two common contaminants in water that cause avoidable illnesses. Slow-sand filters are a proven and simple technology that relies on straining and attachment to a previously formed biofilm to remove microorganisms. Water hyacinths have been shown to absorb arsenic from water at high rates, and the water hyacinths can potentially be used to reduce arsenic concentration from water.

My research this summer focused specifically on the chemical aspect of the removal of arsenic, while in the previous year it was focused around the removal of harmful bacteria. Two potential solutions to remove arsenic consist of iron nails and *Eichhornia crassipes*, or water hyacinths. Both would require a modification to the design of the filter that was used when testing for the removal of bacteria. Before the addition of the *Eichhornia crassipes* can take place, a control needed to be run. This control was set up where one sample was taken per day at the same time for twelve days. This system was used to see if time played an important role in the removal of arsenic. These twelve samples were then tested for concentration levels of arsenic using the ICP. This set up a standard for how much arsenic the filter will remove on its own and how time plays a part in the removal.

The *Eichhornia crassipe* and iron nails have yet to be introduced because of time restraints but this project is ongoing, and I will be personally testing the filters throughout the 2013-2014 academic year and the 2014-2015 academic year.

Although both Dr. Catalina Arango and Dr. Jean Smolen are the science faculty assisting on the project, the project is conducted through the SJU Institute of Catholic Bioethics. Therefore, the Institute must purchase all materials used for the testing of the filters. The supplies used while testing were paid for with the money from the Gustafson grant. These supplies include purchasing standards for the ICP, beakers, volumetric flasks, stirring rods/bars, carboys, and water hyacinths.
The increase of foreign-born documented and undocumented African patients seen by Mercy Hospital seems to reflect a foreign-born population “boom” in Philadelphia over the past decade. Estimates show that there are at least 50,000 undocumented African immigrants living in West Philadelphia, constituting eight percent of the total immigrant population. Thirty-seven percent of African immigrants arrived between 1990 and 1999, and 45 percent have arrived after the year 2000. The recent arrival of many in this population has important implications for individuals’ ability to access health, social, and legal services. Consequently, the health needs of African immigrants in Philadelphia are becoming an increasingly important consideration for public health agencies and health care providers.

To meet the needs of this growing population, the Mercy Hospital Task Force on African Immigration designed a program that centers on the Third World concept of “Health Promoters.” This program is intended to serve as one possible proactive solution for hospitals to cost-effectively manage the care of this growing percentage of foreign-born individuals in the population. This notion of a “Health Promoter” program in Philadelphia is unique as one of those rare occasions when a Third World concept is being utilized in a first world environment. It is also unique in that it could serve as a paradigm for other hospitals in the United States to meet the growing need of health care for the undocumented population.

My role in the project includes setting up health screenings for the Nigerian and Togolese communities at St. Cyprian’s Church in Philadelphia. Patient data is monitored (BMI, blood glucose, blood pressure etc.) and recorded into an excel file to chart the trends in patient health. The data enables us to pinpoint specific health concerns in these communities and gauges the effectiveness of the program. Patients receive cards to set up appointments at Mercy Philadelphia Hospital for further treatment. They are encouraged to return to the Health Promoter so we can ensure patient compliance after their follow up appointments.

By creating a community-based program that provides health care services with already established organizations in the area, the Mercy Health Promoter reduces the cost of health care for uninsured or underinsured individuals.
Steve Cope
Department of Art
Saint Joseph’s University

MFA Boston University

Research Interests: Painting

Inside the process of painting I am looking to assimilate and contribute to my heritage, stand on the foundation laid by painters of recent account and proceed in the development of the visual language.

I search my physical world for a potent or mysterious image that I can lock into paint. In 1990 while on the top floor of a Boston skyscraper, I saw at a great distance, a blimp, hovering silently over the harbor. It was an image I took to immediately- the blimp, as a slow and stealthy observer with a unique vantage point became a metaphor for my work as a painter. Soon wandering blimps themselves began appearing in my work, and I found I was painting them quite obsessively, flying into different landscapes. Ultimately, the blimp itself disappeared, transformed into a simple sphere. To me the spheres are a kind of universal subject matter. With their many different connotations, these forms are open in meaning and do not imply anything too specific. Some people see molecules: other people see beach balls. I’m interested in the relationships inside the painting and between the painting and viewer. These circles and spheres are ripe for interpretation, allowing the viewer to bring his or her associations to the experience with the painting.

What I do is look around and find the images that seem pertinent to us, images that we personally connect to. If I am lucky and follow these images, and though they remain for me a personal discovery, imbued with content special to me alone, they will sometimes transform into larger ideas that can be understood as part of common human experience, accessible beyond the particular. The blimp was an image I connected to, among it’s other qualities it was solitary, a lonely image. Perhaps people could connect with that, as if we all experience being alone in the universe. To me that is interesting, to make images that touch people, that contribute to our understanding of the experience of life in our times.
Explorations in Drawing: Duality
Sequoia Collier-Hezel,’15
Faculty Mentor: Steve Cope
Department of Art
Supported by the SJU Summer Scholars Program

What interests me in drawing is the relationship between light and dark. Charcoal provides shades of black and an eraser reveals a white page, but it is the charcoal marks in relation to the light of the page that creates an image. With charcoal alone we have only darkness, but by working with the opposites of light and dark the artist is able to create the illusion of space and form. It is the tension between light and dark that reveals an image, but I learned this summer that creating tension through different styles and even by adding color creates and image that people want to look at.

As I started my project I was leery of choosing a single direction to pursue. There are so many techniques and styles of drawing and I was dying to explore them all, but above all I wanted to use this opportunity to increase my proficiency and skill. At first I was slightly overwhelmed by the myriad of ways to realize a form and I defaulted to drawing with charcoal and focusing on technique. I experimented with subject matter, but my drawings where in the same vein as what I had been doing in class.

After taking a break from the studio I came back with my head clear and my will determined to venture into different genres of drawing. My first experiment was to start on a graphic novel, but my characters and illustration refused to stay on the pages of a book. I found myself incorporating my illustrations into my technique driven charcoal drawings. A charcoal drawing relies on the tension between light and dark marks to create an image, but by integrating illustrative characters into realistic works I could add tension between the realistic and the cartoonish styles. Yet I felt like my drawings needed even more conflict to capture onlookers, so I employed the use of color. Since my project revolved around drawing I was hesitant use paints, instead I began to investigate the properties of pastels. With soft pastels I found I could get my cartoonish characters to pop and strongly contrast the black and white charcoal drawing. I quickly realized that the duality between the black and white drawings and colorful illustrations was the direction I wanted to take my art, but I refused to abandon my desire to experiment.

Though I was quite content working with the tension between different styles and color schemes, I continued to experiment. I found my old drawings to be a source inspiration and fodder for experimentation. I cut up some of my old pictures and added words or illustrations to others. I also tried out different materials. I created smaller pencil drawings and used ink, pen, and marker in my illustrations. The theme of duality seemed to persist throughout all my work, but thematically I also drew upon pop culture and images of Americana.

This summer was much more than an exploration of different drawing materials and techniques; it was a transformative experience for myself and my art. I learned about time management and self-driven work, I learned about taking advice and criticism, and I learned about making art, and all the while I enjoyed doing it. I am so thankful for this opportunity and I know the experience as well as the skills I developed will stay with me forever. Though I might not have gone in the direction I expected I am happy that what started as an investigation into different drawing styles became an exploration of the tension and duality, using style as the point of contention.
I am currently interested in working on a number of separate but related projects in philosophy of mind, philosophy of religion, metaphysics, and epistemology. The first is getting a better handle on the nature of pain and pleasure. Specific issues subsumed under this project include analogies and disanalogies between pains and pleasures, the closeness of the relationship between pains and various desires/aversions/dispositions, the justification of introspective beliefs about pains and pleasures, and the explanation of why pain is (typically) morally bad and pleasure morally good.

The second project is exploring strategies for providing answers to the problem of evil. I am currently focusing on two separate lines of inquiry. The first (closely related to parts of the above project) is an attempt to investigate the badness of animal pain. Is animal pain really as morally bad as is often supposed? Or is it rather the case that animal pain lacks certain of the key experiential elements that make human pains so bad in normal cases? The second involves exploring the application of strategies and techniques developed in economic contexts to deal with the goodness and badness of human free actions, in an effort to understand why God might create a world set up like ours.

The third project, largely separate from the other two, is a project on the nature of human intelligence—of developing conceptual categorizations and terminology which will help to clarify empirical debates about what “smartness” consists in.
A Philosophical Exploration of Personhood in Split-Brain Patients
Dylan Zdanavage,’14

Faculty Mentor: Joseph Corabi
Department of Philosophy

Supported by the SJU Summer Scholars Program

Topics in philosophy of mind include the nature of thought, consciousness, and personhood. Modern advances in neuropsychology and neurobiology have led to intriguing cases that raise some serious questions within this subset of philosophy. One such case is found in split-brain patients. A commissurotomy is a surgical procedure performed on epileptic patients that severs the corpus callosum and other parts of the brain, effectively splitting the brain into the right and left hemispheres. The main purpose of a commissurotomy is to diminish symptoms of chronic epilepsy, but after undergoing this procedure patients are known to exhibit peculiar behavior under experimental conditions. For instance, a patient flashed an image in his left visual field (which is governed by the non-verbal right hemisphere), will not be able to say out loud what image he had seen. He could, however, write with his left hand the name of the object in the image.

Based on data from his famous experiments in the 1960s, R.W. Sperry posited the view that in split-brain patients there exists two coconscious selves with separate wills, memories, etc. Since these groundbreaking studies were done, many philosophers have advanced competing theories on the topic. The original view proposed by Sperry has been supported by philosophers such as Thomas Nagel, and modified based on further evidence. Other theories propose a switch-model of consciousness, in which attention switches between the two hemispheres, happening so quickly that it appears as though the person has 2 coconscious selves. Others have even proposed that a split-brain patient is still just one person with one consciousness.

In addition to looking at philosophical papers on split-brain patients, I also read several psychological articles on the topic, drawing deeper conclusions from the empirical data. This is a crucial step in philosophical inquiry, and it is a step that can be overlooked by some psychologists and neuroscientists.
Carmen Faccini  
Department of Modern and Classical Languages  
Saint Joseph’s University  
Ph.D University of Illinois at Urbana-Champaign

**Research Interests:** Literary and film (re)construction of and in response to social and political issues in modern Latin America, such as dictatorships, exile, and political prison. I am also interested in educational development in and cultural production of Latin American modern revolutions.

In relation with the previously mentioned research interests, I teach courses in a cultural studies framework—such as Dictatorships in the Southern Cone, Culture in Revolution and an Introduction to Hispanics Literatures—which explore the historical, political and social subtexts of the works analyzed.

Joseph Cerrone considered the theoretical framework and the orientation given in my courses and research as an appropriate context in which to develop his project entitled “A House of Mirrors: Latin American Reality Found in Macondo.” While the most traditional literary approaches to the novel *One Hundred Years of Solitude*, by Colombian writer Gabriel García Márquez, have to do with its inclusion in the Magical Realism ‘modo,’ Joseph approached it from more innovative perspectives. Joseph is interested in the implications of García Márquez’s work in relation to the development of Colombian identity and, furthermore, with the historical and political discourses which he finds that the novel reconstructs and contest at the same time. The result of his research paper sheds light not only in this field of study but also in the development of my own courses and research.
As one of the most prolific and renowned authors of the twentieth century, Gabriel García Márquez has enormously impacted both his native Colombia and the world. García Márquez’s unique perspective and poetic style have made his works prime examples of the magical realism genre and masterpieces of Latin American literature. Through my Summer Scholars Project, I explored the overarching message of García Márquez’s works and the impact he has had on his native continent. This goal required first investigating the magical realism genre, in order to better understand how it is used to express the unique reality present in Latin America. Next, a study of García Márquez’s landmark work, *One Hundred Years of Solitude*, examined his use of magical realism and his commentary on the role of tradition, family, social justice and solitude in Latin American history. Lastly, an assessment of the author’s popularity and importance in modern Latin America illustrated the lasting impact of his work. Conducting my research in Spanish allowed me to experience the original depth and beauty of his works and gain an appreciation for the natural style and message of this masterpiece.

In order to understand the magical realism genre, I studied several foundational works and critical commentaries that define this unique literary style. Found only in Latin American literature of the twentieth century, magical realism requires the author to illustrate the magical nature of ordinary life in Latin America, demonstrating the inherent enchantment of the continent. This style is different from fantasy, in which the supernatural interrupts the normal world, because for magical realists the very nature of their world is magical. Considered by many as the magnum opus of this genre, *One Hundred Years of Solitude* recounts the lives of seven generations of the Buendía family in the mythical village of Macondo. The development of individual characters, the repetition of history and the gradual destruction of the village illustrate García Márquez’s view on the negative impact of colonialism and imperialism on Latin America. Numerous characters, motifs and events reflect true aspects of Colombian history, such as the tyranny of the banana company, which parallels the injustice perpetuated by the United Fruit Company in the early twentieth century. Through this literary work and his activism in the wake of its success, García Márquez offers a message of condemnation of social injustice, remorse for the perpetual presence of solitude of Latin America and hope for the continent’s future.

More than mere artistic expressions, the writings of García Márquez touch at the very soul of Latin America by reflecting on both the joys and sorrows of its past. Despite being the topic of study for countless scholars, García Márquez continues to provide a never-ending source of knowledge and new insight into the literature, culture, and identity of Latin America.
Joseph J. Feeney, S.J.
Department of English
Saint Joseph’s University
Ph.D. University of Pennsylvania

Research Interests:
Poetry of Gerard Manley Hopkins
Biography of Gerard Manley Hopkins

In my early years, I did research and published on the American Black novelist Jessie Fauset, on the American novelists Charles Brockden Brown, Nathaniel Hawthorne, Mark Twain, Mary Gordon, Andre Dubus, and Tom McHale, on the English novelist Iris Murdoch, and on the English and Irish playwrights Tom Stoppard, David Hare, Brian Friel, and Martin McDonagh. Then in 1977, I published my first article on Gerard Manley Hopkins, and I’ve been going strong on him ever since.

In 1998 I discovered in London an unknown poem of Hopkins, “Consule Jones,” and I’ve done research on him in London, Dublin, Rome, Austin (TX), and Spokane (WA). Through the years I’ve published on his poetry and his life in, for example, TLS: The Times Literary Supplement (London), The Month (London), Studies (Dublin), Stimmen der Zeit (Munich), Hopkins Research (Tokyo), The Hopkins Quarterly, Thought, America, and in books and other journals. I’ve also been co-editor of The Hopkins Quarterly since 1994, co-editor of the book Hopkins Variations (2002), and author of The Playfulness of Gerard Manley Hopkins (2008). This last book is my most significant insight and best work.

Currently, I’m writing on Hopkins as an early environmentalist, on Hopkins’ understanding of “home,” and on Hopkins and classical music. In June, I also recorded fifteen 25-minute lectures on Hopkins, to be released in boxes of five CDs or DVDs by “Now You Know Media” of Rockville, MD. All that, I guess, keeps me out of trouble. I really love it, too.
What We Lost: A Modernist Examination of Contemporary College Youth Concerns
Robert Cusella,’14
Faculty Mentor: Joseph Feeney, S.J.
Department of English
Supported by the Summer Scholars Program

Literature, in particular fiction, in its simplest form is about expressing the human experience. Through the actions of characters, a reader is thrust forth into the imagination of a writer and bound to take a journey – some journeys grand in scope, while others stay close to simplicity; yet no matter where the journey leads in a story, by the end a reader has experienced (hopefully) moving emotions that touch upon the foundation of being human and being flawed. This realization came to me during the Fall 2012 semester in Fr. Feeney’s “Modernism and Postmodernism” English seminar that explored the two rebellious movements in literature. Through the study of Virginia Woolf’s Mrs. Dalloway, I was moved by how a tiny book, taking place in one day, could pack so much feeling. Written in narrative consciousness, the thoughts of a multitude of characters converge in an examination of changing societal issues such as a woman’s role in the world, the aftermath of a world war and PTSD, and homosexuality.

Taken away by the beauty of Woolf’s prose and stark insight, I decided to throw my voice into the mix of literature and write a novella that brought the essence of Mrs. Dalloway into the twenty-first century, but kept the modernist writing style. Creating a meaningful examination of the issues and challenges that face college students today, What We Lost follows Oliver Dalloway, Emilia Smith, and the connected people in their lives on the eve of their college graduation. As the day moves forward, the characters find themselves going backwards, retracing the moments that have brought them to the present and facing an uncertain future. This project has allowed me deep access into the personal, intimate, and challenging task of writing. Creating realistic characters and penning strong prose opened up a deep respect for the writing process. In essence, my project has allowed me to explore not only the challenges of young adulthood through fiction, but also understand myself as a creative writer.
Breakfast with the Millers
Sean Rempel, '14

Faculty Mentor: Joseph Feeney, S.J.
Department of English

Supported by the Summer Scholars Program
and the Department of English

William Faulkner's *The Sound and the Fury* is structured in four parts. Each section is told from a different character's perspective within the Compson family in 1920s Mississippi. One of the most intriguing aspects of this literary style is that the various points of view provide different interpretations of many of the same events. Faulkner's work forces the reader to encounter characters both internally and externally. None of the characters in the story have the same outlook on each other or themselves. Thus, after reading and studying *The Sound and the Fury* in Father Feeney's *Modernism and Post-Modernism* course in the Fall of 2012, I was inspired to create *Breakfast with the Millers*.

*Breakfast with the Millers* is a series of four short stories that are told from different characters' perspectives within the Miller family. The five members of the Miller family live in present-day Carol Stream, IL, a poor suburban area just outside of Chicago. My preliminary research included gathering information about the geography, school systems, and average income of the citizens of Carol Stream. Then, I created the characters of Jake, Derek, Evan, Lindsay, and Evelyn Miller. The father, Derek, and his son, Jake, are struggling to raise eleven-month-old Evan and nine-year-old Lindsay, after the death of Derek's wife, the mother of the family. Derek's mother-in-law, Evelyn, has not spoken a word since her daughter's death, but she provides unique insight into the other characters in her story. By seeing the other characters internally within their own stories and then externally from the other stories, the reader is provided with a complete picture of each character.

Father Feeney and I worked to adapt my writing style to create more captivating prose. First, Fr. Feeney instructed me on how to keep the reader engaged by replacing passive verbs with active ones. I was taught about the "show, don't tell" method of fiction writing. For instance, instead of directly informing the reader of the Miller family's unfortunate financial situation, I show the reader that their clothes are from inexpensive retail stores and that their house is in poor condition. The first half of the summer was devoted to stripping myself of my bad habits and learning how to write actively. After numerous rewrites and significant improvements, twenty of the sixty pages are completed. By November 31st, I will have completed a series of four short stories that provide an insightful examination of personal and social interactions and that have significantly improved my ability as a fiction writer.
Research in my laboratory normally centers on the larvae of black flies, the ubiquitous bane of campers and outdoors enthusiasts throughout most of North America. In particular, we focus on their dispersal (one-way movement in the environment) and how flowing water interacts with their behavior to determine their distribution.

This summer, however, we (myself, Dr. Scott McRobert and Kristina Orbe) decided to answer a similar question using a different model organism. Fruit flies are an equally ubiquitous group of flies whose genetics, behavior and sensory abilities have been well characterized. Building on last summer’s work to develop a non-toxic marking technique that could be used to track flies in the natural environment without influencing their behavior, we are developing baits to specifically attract (and hopefully control) an invasive species, Drosophila suzukii, which preferentially damages fruits such as blueberries and raspberries on the vine.

In a second project, we are also working on a group of photosynthetic single-celled organisms called diatoms. Just as ubiquitous as fruit flies, diatoms are the basis of many aquatic food chains and an difficult group to organize taxonomically. Focusing on one cosmopolitan species, Achnanthidium minutissimum, we are trying to determine if this is indeed one species or rather a group of closely related species. Our approach is multi-disciplinary using both genetics, morphological analysis and physiological experimentation to determine how closely related are strains from different locations and ecosystem types (stream vs lake). This project is collaboration with the Academy of Natural Sciences of Drexel University. My lab is leading the efforts to investigate the diatoms’ physiology, specifically how flow (presence, absence and magnitude) influences their growth rates.

Our findings will help us understand not only the phylogenetics of this important species, but also help to identify the types (or combinations) of information that can, or cannot be useful in these types of studies.
The Effect of Water Flow on the Multiplication Rate of *Achnanthidium minutissimum*
Merissa Misiura,’15

Faculty Mentor: Jonathan Fingerut
Department of Biology

Supported by the SJU Summer Scholars Program and the Howard Hughes Medical Institute

Diatoms are photosynthetic, single-celled organisms that have an exoskeleton made of silica and live in either aquatic or semi-aquatic environments. The number of diatom species could vary from 20,000 to 2 million, due to difficulties in defining a diatom species. There are two morphologically different groups of diatoms; centric (radial symmetry) and pennate (bilateral symmetry). Movement of diatoms is dependent on the presence of a structure known as a raphe. The species we are most interested in, *Achnanthidium minutissimum*, is very common and abundant in aquatic environments. *A. minutissimum* is found in both lakes and streams, we would like to see if there is a different growth response to water flow between these strains. We hypothesized that the stream strains, that are the least genetically divergent, would respond more similarly than strains from a lake. To determine if there is a difference between strains, we studied their genetics, morphology and physiology. My role in this experiment was to observe the physiological aspect, which was the growth rate of *A. minutissimum*.

This aspect of our study was to investigate the effect of water flow on the multiplication rate of *Achnanthidium minutissimum*. Three strains, two from streams and one from a lake, of *A. minutissimum* were used. A flume was created in the lab, which allowed different levels of regulated flow through tubes containing the diatoms at three different flow conditions; fast (30-60 cm s⁻¹), slow (7-25 cm s⁻¹), and no flow. Pictures were taken of the diatoms attached to the walls of their clear tubes at the beginning and end of each one-week experimental trial to determine their density. This allowed for observation of the effect of water flow on the multiplication rate of this particular species of freshwater diatoms. Each of the strains was tested in three replicate trials over the course of nine weeks.

Thus far in our experiment, we have concluded that strains with the closest genetic relationship surprisingly have the most divergent morphology. The results from our experiment did not correspond with our hypothesis. The results show that all three strains have similar multiplication rates. These results may give insight to whether or not these three strains belong to different species. For future work, we plan on further exploring this species by observing the effect of different environmental factors, such as fluctuations in light and nutrient levels, on its movement and quorum behavior.
Identifying and Examining the Range of Attractive Baits in the Trapping of *Drosophila simulans*
Kristina Orbe,’14

Faculty Mentor: Dr. Jonathan Fingerut
Department of Biology

Supported by SJU Summer Scholars Program and the Howard Hughes Medical Institute

Within recent years, the growing population of the pest species *Drosophila suzukii* has become an increasing concern for farmers across the United States. Native to Japan, *D. suzukii*, also called the “Spotted Wing Drosophila”, first appeared in the United States in 2009 in cherry orchards in California. In the summer of 2011, *D. suzukii* was detected in Southeast Pennsylvania and Maryland. Unlike all other species of Drosophila that feed and oviposit on overripe or rotting fruit, the Spotted Wing Drosophila lay their eggs in ripening fruit causing considerable damage to crops, specifically soft-skinned fruits such as raspberries, strawberries, cherries, and blueberries.

This summer various baiting experiments were performed as part of a long term project to develop a trap that specifically targets *D. suzukii*. For these preliminary experiments while the protocol was being developed and fly cultures grown, *Drosophila simulans* were used as an analogue to *D. suzukii*. The first baiting factor examined was which odorant was most attractive to *D. simulans*. The second baiting factor investigated was the impact of distance between odourant choices on the effectiveness of the baits. Four different baits were tested: raspberries, blueberries, blueberries that had been fermented with Baker’s yeast for 24 hours, and a solution of apple cider vinegar (2% acetic acid) and grape wine (7% ethanol) in a 2:3 ratio. A few drops of dish soap were added to the vinegar/wine mixture to break the surface tension of water to ensure that the flies would drown when they landed on the surface of the vinegar/wine solution. 10 g of each fruit and 10mL of the vinegar/wine solution was placed in 50mL beakers. The four baits were placed in either a 1 ft\(^3\) or a 64 ft\(^3\) insect cage made of PVC covered with insect netting. 100 flies were introduced into the cages. After the flies were exposed to the baits for three hours, the number of flies on each bait was counted.

A 2-way ANOVA showed that there was no significant difference between large and small cages. This shows that the strength of these baits were equally effective within the range 1 ft\(^3\) and 64 ft\(^3\). However, fermented blueberries were significantly (p < 0.5) more attractive to *D. simulans* than the other baits. In the future, we will continue to run these bait preference tests with *D. suzukii*. It will be interesting to see if these same results are replicated with *D. suzukii* considering that these flies target ripening fruit as opposed to rotting. Once a strong, attractive bait is identified, different traps will be developed and used in field tests to test their effectiveness in capturing *D. suzukii*.
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 (σ) bond and a pi (π) bond as shown in Figures 1a-d. Maximum overlap between the p-orbitals of the σ 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, ϑ, 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[4.3.0.0₂,₄.0₃,₈.0₅,₇]non-4-ene (2) (Figure 1f).

During the summer of 2013, my research group continued the investigation of the synthesis and study of pentacyclo[4.3.0.0₂,₄.0₃,₈.0₅,₇]non-4-ene (2) and direct synthetic precursors. We have previously shown that alkyl lithium induced dehalogenation of 4,5-diiodopentacyclo[4.3.0.0₂,₄.0₃,₈.0₅,₇]nonane (3) leads to pyramidalized alkene 2. Because pentacyclo[4.3.0.0₂,₄.0₃,₈.0₅,₇]non-4-ene (2) reacts with the alkyl lithiums, we investigated synthetic routes toward 4-iodo-5-(trimethylsilyl)-pentacyclo[4.3.0.0₂,₄.0₃,₈.0₅,₇]nonane (4), a potential precursor to 2 that utilizes fluoride ion and not alkyl lithiums. We also investigated new synthetic routes to diiodide 3 and related polycyclic alkyl iodides using N-iodosuccinimide (NIS) and 1,3-diiodo-5,5-dimethylhydantoin (DIH).
The synthesis of Pentacyclo [4.3.0.0²,4.0³,8.0⁵,7]non-4-ene

Eric Eisenhauer,’14
Elena Montoto,’14

Faculty Mentor: Mark Forman
Department of Chemistry

Supported by SJU Summer Scholars, McNulty Fellows Program, and the ACS-Petroleum Research Fund

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[4.3.0.0²,4.0³,8.0⁵,7]non-4-ene.

Alkenes are a class of organic molecules that contain carbon-carbon double bonds. The carbon-carbon double bond of an alkene ideally has bond angles of 120°, and any deviations from this ideal angle cause enhanced reactivity and unique properties of the alkene. One of the main types of distortions in alkenes is referred to as pyramidalization. This results from a syn-folding of the substituent groups as seen in Figure A.

This past summer we worked towards modifying the synthesis of pentacyclo [4.3.0.0²,4.0³,8.0⁵,7]non-4-ene. We focused our efforts on iododecarboxylation chemistry. The first reaction we improved involved creating iodo-ester product from an acid ester (Figure B). We started with our acid-ester product, which was reacted with DIH using chlorobenzene as our solvent instead of DCE as was done previously. This reaction was done using microwave technology, resulting in better yields in comparison to DCE reactions. We also reacted our diacid product with DIH (Figure C). This was also done in the microwave with similar reaction conditions. Using nuclear magnetic resonance (NMR) and gas chromatography/mass spectroscopy (GCMS) we have evidence that the diiodide product was formed, which is the main precursor to our target molecule (Figure D). We are going to continue working on improving both of these reactions to optimize yields and reduce the time needed to form our target molecule.
The Synthesis of Pentacyclo [4.3.0.0^{2,4} .0^{3,8} .0^{5,7}] non-4-ene
Casey Adams,’15
April Savarese,’15
Faculty Mentor: Mark Forman
Department of Chemistry
Supported by the SJU Summer Scholars Program, and the ACS-Petroleum Research Fund

The Forman research group focuses on the synthesis and study of non-natural products that possess unique properties and enhanced reactivity due to forced deviations from their ideal geometries. The target molecule for our synthesis is pentacyclo[4.3.0.0^{2,4} .0^{3,8} .0^{5,7}] non-4-ene due to its unique bond strain on the carbon-carbon double bond. Ideally, carbon-carbon double bonds have bond angles of 120°. However, some alkenes deviate from this ideal geometry causing higher energies and increased reactivity. These highly reactive alkenes possess bond angles either greater than or less than the ideal 120° due to strain among their carbon-carbon double bonds.

Among the various sources of strain that alkenes can experience, pentacyclo [4.3.0.0^{2,4} .0^{3,8} .0^{5,7}] non-4- experiences a type of syn-folding, or pyramidalization. This source of strain causes the substituent groups to bend towards each other, creating a tetrahedral geometry rather than the ideal trigonal planar geometry. Therefore, our compound is rendered highly reactive with a lifespan in the order of seconds due to this strain. The short lifespan and high reactivity of this molecule causes difficulty in the synthesis of this compound and is the focus of our research.

One of the main goals during our summer research was to synthesize the precursors to pentacyclo[4.3.0.0^{2,4} .0^{3,8} .0^{5,7}] non-4-ene. Significant quantities of these compounds are needed for our research efforts. A primary precursor to our proposed methodology is closed diacid. The synthesis of this molecule is a three-step process as shown in the diagram below. First, a Diels-Alder reaction was performed to synthesize a diester. Next, the diester was hydrolyzed in a hydrolysis reaction which yields an open diacid. The open diacid is then subject to ultraviolet light which includes photochemical cycloaddition to bring us to the closed diacid. This photo-chem reaction is very challenging since it produces very low yields and is very time consuming. All these reactions were repeated numerous times with careful attention to detail so that we synthesized as much closed diacid as possible.

As the summer ended, we had synthesized enough closed diacid to further our research goals for the next school year. We plan to use the closed diacid in our future efforts to synthesize and isolate our target molecule.
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. Since the industrial revolution, humans have relied 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 that can overcome the stability of carbon dioxide. These complexes might catalyze the conversion of carbon dioxide to carbon monoxide, formic acid, acrylic acid, or dialkyl carbonates. To this end, my students and I have synthesized a variety of compounds containing the transition metals tungsten and molybdenum that can coordinate carbon dioxide and activate it towards such reactions. Gaining a better understanding of how such metal complexes interact with carbon dioxide is paramount to developing new catalysts for carbon dioxide utilization.
Synthesis and Reactivity of Molybdenum Carbon Dioxide Complexes
Robert Carden, ’14

Faculty Mentor: Dr. Peter Graham
Department of Chemistry

Supported by a Gift from Anne Marie and Jay Borneman, ’80

In today’s society there is a very heavy dependence on carbon-containing fuel. Many of the starting materials used in chemical industry also rely on fossil fuels as a source of carbon. The main goal of my research has been to investigate molybdenum complexes that might enable carbon dioxide to be incorporated into other small molecules. If such catalytic processes are discovered carbon dioxide can be better utilized by chemists as a carbon-containing building block to make useful chemical products.

My project has involved improving the synthesis of and examining the reactivity of molybdenum carbon dioxide complexes. This summer, I have examined the reactivity of the previously synthesized compound, TpMo(NO)(1-methylimidazole)(η²-CO₂) (1). My focus was on the reactivity with various electrophiles, nucleophiles and reducing agents. The most successful reactions were those involving reducing agents, which yielded the complex, TpMo(NO)(1-methylimidazole)(CO) (2). Because of the success of the reduction of the Mo-CO₂ complex, I also began to examine the possibility of oxidizing the Mo-CO complex to form the Mo-CO₂ complex. In addition to the ligand substitution, I have found that it is possible to oxidize the Mo-CO complex with both cumene hydroperoxide and molecular oxygen (O₂) to form the Mo-CO₂ complex. Both processes have led to higher synthetic yields of the Mo-CO₂ complex.

In the future, my goal is to explore the reactivity of such complexes with ethylene, hopefully leading to a coupling of the ethylene and CO₂ to lead to the formation of a higher grade product from the CO₂. Additionally, I have begun to explore the possibility of synthesizing tungsten carbon dioxide complexes by similar methods.

**Figure 1.** Oxidation and reduction chemistry of 1 and 2, respectively.
The Synthesis of CO₂ Complexes of Molybdenum
James Ohane,’14

Faculty Mentor: Peter Graham
Department of Chemistry

Supported by a Gift from Anne Marie and Jay Borneman, ’80 and the SJU Department of Chemistry

CO₂ is an abundant compound that is produced through the use of fossil fuels, deforestations, across many different types of industries and human activities. Since CO₂ is the most abundant among greenhouse gases, a way of reducing CO₂ emissions is needed. One way of mitigating CO₂ is to develop new chemical processes that consume CO₂ to give useful products. The challenge in dealing with CO₂ is that it is very stable. However, the use of a transition metal can help overcome this stability. The purpose of this project is to couple a molybdenum metal complex with carbon dioxide as a first step toward making CO₂ a viable carbon feedstock.

Last summer, I successfully synthesized a molybdenum-CO₂ complex, but the procedure involved many steps and harsh reagents. This summer’s project was to create new molybdenum-CO₂ complexes using a simplified method. The new procedure involves a high temperature reflux, followed by an oxidation reaction. Oxidation with cumene peroxide yields the molybdenum–CO₂ complex. Recently, it was discovered that the oxidation step could be done simply by heating under an atmosphere of oxygen to yield a clean molybdenum-CO₂ complex. This summer a new molybdenum-CO₂ complex was synthesized and shown in the figure below.
The Synthesis and Reactivity of Molybdenum η²-CO₂ Complexes
Mike Pogash,’15
Faculty Mentor: Peter Graham
Department of Chemistry

Supported by the SJU Summer Scholars Program

The carbon starting materials used to make many chemical products seen in everyday life, such as paint, plastics, and pharmaceutical drugs are almost exclusively obtained from crude oil and natural gas. However, these carbon sources are becoming increasingly expensive and an alternative carbon source is needed. One possibility is carbon dioxide, which has many benefits including abundance, cost, and safety. However, due to carbon dioxide’s thermal and kinetic stability, it is difficult to make use of the compound. This stability can however be overcome by coordinating carbon dioxide to a metal. Coordination to a metal can be difficult and requires specially tailored metal complexes.

Over the summer, I have worked on synthesizing and isolating new molybdenum-carbon dioxide complexes. A number of different ligands have been tested in the attempt to find which will allow coordination of the carbon dioxide to form stable complexes. One of the four molybdenum-CO₂ complexes that I have successfully isolated features the ligand trimethylphosphine and is depicted in Figure 1.

Figure 1
Ann E. Green  
Department of English  
Saint Joseph’s University  
Ph.D., State University of New York, Albany  

**Research Interests:** Race, class, gender, writing, service-learning and social justice, of late, medical and environmental writing.

I write. I teach writing, and I write about the teaching of writing. Most of my work centers on the role that the subject position of the writer takes in any piece of narrative. I often question: How do race, class, gender, sexuality, and disability change the way a writer presents a self in language? How does language determine what we can and can't say? How can we use writing as a tool for social change? What happens in the teaching of writing when we consider the subject position of the writer?

In the last fifteen years, my scholarship has focused largely on the service-learning classroom. If we’re engaged in the “faith that does justice,” what does it mean to send predominantly white middle class students into communities of predominantly people of color to “serve”? How can service learning work as a force for social justice and social change if it replicates societal hierarchies and inequities? What happens in a writing classroom where race, class, gender, and sexuality are addressed and how can they be addressed effectively?

By using critical race theory, theories of white racial identity development, and analyses of social class, I consider what pedagogies can create space for social change. Through this scholarship, I propose ways that systemic inequalities can be addressed and changed through innovative pedagogies, and ways that Saint Joseph’s can truly engage in its mission of “the faith that does justice.”

More recently, this scholarship has turned toward issues of environmental racism and classism, particularly surrounding social class and fracking in Pennsylvania, and the implications of medical writing for the humanities. In addition, I have been exploring writing for more general audiences, including *The Huffington Post* and *The Chronicle of Higher Education*, in order to reach broader audiences and engage more deeply in social change work.

Felicia Carter and Chanelle Greene’s projects engage in social change work in new ways for Saint Joseph’s. While SJU has, over the years, attempted to address racism and racist incidents through various outreach events and classes, Ms. Carter and Ms. Greene’s research is the first time, to my knowledge, that students have taken the initiative to educate other students. I have great hope for their success.
Often, the phrase "colorblind era" is used to describe the current social climate within America. Americans have moved past race, and to be colorblind is seen as a progressive ideology. However, colorblind ideology does not eliminate racial biases among people; it only hides them. Paradoxically, colorblind ideology only reinforces unconscious racial biases by ignoring unconscious racial biases. Colorblind ideology underemphasizes race and forces people to disregard any discussion of it. Therefore, enacting this ideology prevents racial.

Throughout my research, I examined how the enactment of colorblind-ism impacts discussions of racism within college campuses. Currently, many college settings encourage the use of colorblind ideology. Within this methodology, people diminish the differences among races to create an artificial sense of racial tolerance. Yet, by rejecting racial differences, the institutional advantages white people receive are ignored while the biases against people of color are also ignored. Therefore, this ideology only reinforces institutional racial prejudice by maintaining white privilege. When people start to acknowledge the racial privileges allotted to white people then there is room for true racial discussion. An essential component of ending racism is having open and honest discussions of racial differences. College campuses cannot enact colorblind ideology to handle issues of race. My research (1.) draws parallels between colorblind ideology and white privilege; (2.) examines how colorblind ideology manifests in colleges campuses; and (3.) develops strategies to combat colorblind ideology on campuses in order to create honest discussions around race.

Although we live in a post civil rights society, issues of race and power are still relevant. By using colorblind ideology to diminish racial differences, institutions cannot address racial inequality.
The Examination of Critical Race Theory for Skill Development and Respectful Dialogue
Chanelle Greene,’14

Faculty Mentor: Ann Green
Department of English

Supported by the SJU Summer Scholars Program and the Office of Institutional Diversity

Critical Race Theory (CRT) draws on civil rights scholarship and acknowledges that racism exists in every facet of American society. Whereas overt racism was perpetuated by de jure segregation less than 60 years ago, today “post-racial” America has adopted a new racial ideology known as colorblindness. The grounds for colorblindness suggest that it’s healthy to ignore racial and individual realities. However, adopting this ideology will not combat racism. “Post-racial” America is plagued with structural and subtle racism.

As a Jesuit institution, Saint Joseph’s University calls its’ students to build an inclusive community that recognizes and respects the differences in each other. We imagine an equitable society where each member seeks self-determination. Therefore, a discussion on social justice issues such as race allows for an even stronger campus community. Before we are able to tackle the injustices of the greater society, there has to be a study on smaller social groups to identify the issues that sustain inequalities. Racial micro aggressions, the daily experience of subtle acts of racism, some of them unintentional, leave students of color feeling excluded on predominately white college campuses. In 2012, SJU maintained a largely white population (85.3% White, 2.9% Black, 4.7% Hispanic/Latino, and 2.2% Asian).

To close the gap race discussions must go beyond sameness. That’s why this summer I have used this opportunity to concentrate on connecting critical race theory to everyday practices on campus. It’s easy to talk about how human each of us are, but recognizing the intersectionality of race, class, and gender in American society is more valuable. Race talks must acknowledge that there is a problem and recognize that our differences make us similar. My project is interdisciplinary and will result in a methodology for teaching capacity building and racial awareness to other students. Thus far, I have investigated the following questions: What does it mean to matter? How can students guarantee that their peers’ fate is the campus’s concern? And how can social groups on campus model multiculturalism? Mattering and multiculturalism is vital to building solidarity. Therefore, if it can be ensured that every student on campus feels valued then I am confident that Saint Joseph's University will be one step closer to being the greatest Jesuit institution the United States has ever seen.
Kristi Grimes  
Department of Modern and Classical Languages  
Ph.D The University of Chicago  

Research Interests: Italian literature and art of the Middle Ages and Renaissance; interdisciplinary relations between literary and visual traditions; the history of humanism.

My scholarly publications focus upon Italian art and literature of the Trecento and Quattrocento and, in particular, the emergence of humanist culture. My research is interdisciplinary, combining two areas of literary study (Latin and Italian vernacular) and drawing on art history. My scholarship is closely connected to my teaching, particularly in the interdisciplinary upper-division courses that I have invented. The idea for Evan Di Martino’s project stemmed from coursework in “ITA 445 The Medici Court: Poetry, Patronage and the Art of Power.” In the context of this course we studied the artists and literati that gathered at the Medici court, including Brunelleschi, Botticelli and Michelangelo. Here on campus, we examined the sculptural cast of Michelangelo’s Bacchus and Faun, which reflects the artist’s sophisticated conception of Bacchus, instilled at the court of Lorenzo de’Medici, and derived from intense study of classical literature and Greco-Roman artworks. Evan was interested in learning more about the impact of humanist and Neo-Platonist philosophies upon Michelangelo’s intellectual formation. The challenging detective work involved in conducting archival research offered Evan the excitement of discovering the past while gaining insight into the present. Ultimately Evan’s project connects Saint Joseph’s history (the Renaissance, humanist roots of the Jesuits) to today (through the delivery of his research in the form of a QR code). In doing so he has made a unique contribution to the intellectual life on our campus.
The Cast of Michelangelo’s *Bacchus and Faun*: Humanist and Jesuit Context
Evan DiMartino,’14

Faculty Mentor: Kristi Grimes
Department of Modern and Classical Languages

Supported by the SJU Summer Scholars Program

The subject of my project is a plaster cast replica of Michelangelo’s *Bacchus and Faun*, on permanent loan from the Metropolitan Museum of Art and displayed in the North Lounge of the Campion Student Center. My project has three goals: 1) To examine the historical significance of Michelangelo’s original (completed in 1497), particularly its humanist roots at the court of the Medici; 2) To explore the rise and subsequent decline of plaster casts in 19th and 20th century American museums; and 3) To situate the cast in its current home by viewing it in the light of the Jesuit, humanist tradition of Saint Joseph’s University. To share my research with the campus community, I created a scannable QR code to be displayed beside the cast. The code will allow viewers to use their smartphones to access a website displaying my research in both English and Italian.

I began by studying the history of Michelangelo’s *Bacchus and Faun* using scholarly resources in English as well as Italian. After completing Dr. Grimes’ course on the Medici Court in Spring 2013, I was interested in learning more about Lorenzo de’ Medici and the humanists’ impact on Michelangelo. The group of intellectuals that gathered at the Medici Court prized classical literature, celebrated the capabilities of humankind, and placed a new emphasis on the centrality of man to God’s universe. Referencing analyses by art historians revealed that Michelangelo’s depiction of Bacchus, the Roman god of wine, reflects the impact of humanism and Neo-Platonist philosophies upon his artistic formation, as well as the oft-cited revival of classical antiquity during the Renaissance.

The second component of my project focuses on the plaster cast of *Bacchus and Faun* in the university art collection. Thanks to the assistance and resources of Mr. Carmen Croce, Director of the Saint Joseph’s University Press, I traced the crucial role of plaster casts in the development of early American museums, including the Metropolitan Museum of Art. In the early 20th century, casts were among the most prized and important pieces in the Met’s collection and were useful educational tools for art students and the general public. However, increasing financial capabilities of American museums in acquiring original works and changing tastes of their leaders caused the popularity of these pieces to wane dramatically. After decades of storage in warehouses that damaged its casts, the Met began to disperse its collection by loaning it to universities, including Saint Joseph’s University, where several pieces are in the process of being restored and displayed. By conducting archival research with the Digital Media Department of the Metropolitan Museum of Art, I acquired a 1921 photo of the *Bacchus and Faun* cast on display and, using a museum publication from 1891, I discovered that the cast was created at the École des Beaux-Arts in Paris. My research reveals that as a university founded by the Society of Jesus, an order established during the Renaissance and with humanist roots, Saint Joseph’s University is an ideal home for these casts, particularly *Bacchus and Faun*. 
Eileen D. Grogan  
Department of Biology  
Saint Joseph’s University  
Ph.D. College of William and Mary

**Research Interests:** biology, ecology, and evolution of early vertebrates, especially chondrichthyan fishes

I am co-principal investigator of the Bear Gulch Project, a multifaceted analysis of the fossil, environmental, and geologic record of the 323 million years old, tropical marine Bear Gulch Bay of Montana, USA. Forty-five years of field observations and excavations of the 8 x 14 kilometer Bear Gulch Limestone deposit have resulted in a unique and large database of life in this Paleozoic Bay and the prevailing environmental and ecological conditions at that time. The level of detail in this database is tied to the fact that this is a Lagerstätten deposit, one world-renowned for the high quality of organism preservation (including pigment patterns of the skin, organs, and vasculature) and for its biotic diversity. Thus, the Bear Gulch Limestone provides a rare, virtual window to observe and study Paleozoic life in a tropical marine bay. Our current collection of 5,800 fossil fish, principally reposited at the Carnegie Museum of Natural History, provides a treasure trove of data and diversity for those interested in evolution and early vertebrate life. This is especially so for the paleoichthyologist specializing in chondrichthyans (sharks and related cartilaginous fishes) since 59.5% of the Bear Gulch fish species diversity is chondrichthyan-based. This starkly contrasts with today’s waters where chondrichthyans contribute approximately 3.4% to overall diversity.

The mainstream of my research program represents an integrative (evolutionary and developmental biology) approach to studying the origin and relationships of fossil and extant chondrichthyan fishes. Emphasis is placed on vertebrate form and function, the ontogenetic and phylogenetic development of the cranium, diversity and evolution of the jawed condition, and development and mineralization of skeletal tissues. Many of these studies are derived from fishes new to science. Thus my work also involves the formal scientific description of Bear Gulch fishes (chondrichthyan and osteichthyan) and extends to phylogenetic studies of relationships and diversity in these fish groups and to the ecomorphological and community structure analyses of these Paleozoic fishes.

Students in my lab may be engaged in research projects ranging from embryological and histological studies of the skeleton to the reconstruction of an extant organism, functional analyses of morphological variants, the scientific description of new taxa, or evaluating the geological, ecological and environmental conditions of the Bear Gulch Bay. Summer Scholars in my lab engage in both lab and field experiences.
Within the limestone of the Bear Gulch in central Montana’s Heath Formation, an entire 323 million year old tropical marine bay is preserved. For approximately 1,000 years in the Upper Mississippian of the Carboniferous period, the marine waters of the sheltered bay, which was 12 degrees north of the equator in the supercontinent Pangaea, provided the environment for a diverse and flourishing ecosystem. Monsoonal conditions stirred up sediment in the bay, which upon settling would quickly bury and suffocate organisms and minimize decay or scavenging. Consequently, the Bear Gulch contains some of the most well-preserved fish specimens in the world and is significant in the study of early fishes. Since 1968, the field crews of Drs. Richard Lund and Eileen D. Grogan have recovered 5,887 specimens and more than 150 species of osteichthyan (bony fish) and chondrichthyan (sharks, chimaerids and related fishes) have been identified. Data collection and analysis aim to answer evolutionary questions about these ancient fish (their form and function, origins, relationships to one another and to modern forms, and their ecology).

This summer I spent seven weeks analyzing the various fossils found in the Bear Gulch, reading corresponding literature and creating an educational power-point to share with volunteers and the field excavation crew that I joined for three weeks in Montana. While in the field, I maintained a log book of what I learned each day regarding excavation techniques, geology, the types and conditions of recovered fossils, and data preserved in the layers of rock that provide information on environmental and ecological conditions at the time of sediment deposition. I learned how to use a Brunton compass, which measures the characteristics of the tidal flow seen in the horizontal groves in the layers of rock. I also learned about the methods of curation in the field and how recovered fossils are prepared for safe transport to the lab for follow-up study. The field logs for each year of the expedition provide a record for details of each specimen, when and where it was collected and details of the day of recovery. Of the specimens found, branchiopods, shrimp and cephalopods were the most abundant. The numbers of these invertebrates coupled with the knowledge that this was a shallow area of the bay suggest that this was a popular feeding ground for a variety of fish species, especially paleoniscoids, which were a majority of the fish collected. Some of these are related to a putative taxon, code-named “Prolatus”, that I have been studying for the past year. Subtle differences in the morphology show that specimens currently assigned to “Prolatus” may represent 3 or 4 variations within the group. Further analysis is required to resolve whether there are multiple species within this unit. If these variants can be mapped to different regions within the bay, this may provide some evidence for speciation in closely related forms. I hope to continue studying these in the lab this next year.
Yu Gu  
Department of Physics  
Saint Joseph’s University  
Ph. D Cornell University  

**Research Interest:** Laser materials processing and microchip fabrication

Dr. Gu graduated from Cornell University in 2005 and joined MIT as a graduate student the same year. Her research focused on using short-pulsed lasers in integrated optical device fabrication. During her PhD study, she spent several semesters as an overseas scholar in the Physics Department of Milan Politecnical Institute at Milan, Italy. Following obtaining her doctoral degree in 2011, she continued at MIT with a one-year teaching post-doctoral assignment. She joined Saint Joseph's University in 2012.

Dr. Gu's research is focused on the miniaturization of traditional chemical and biochemical functionalities, a technology coined as "Lab On Chip". She is particularly interested in fabrication of devices which combine lightguides and novel fluids to achieve next-generation functionalities.
The miniaturization of the traditional lab with chemical and biochemical functionalities is called Lab-On-Chip (LOC). It has many advantages such as portability, small sample size, multiplexing, and simpler automation. In recent years, microfluidic and microoptical elements have been combined together, leading to the term optofluidics, which has great impact on these LOC devices. This optofluidic technology enables reconfigure light sources, act as guides, and act as switches within the LOC device.

We have shown through creating a LOC device that embodies a multiplex geometry, through the use of three multimode fibers in parallel and a perpendicular microfluidic channel. A ferrofluidic plug inside of this microfluidic channel acts as a switch, which can be actuated within the channel by a rare earth magnet. A ferrofluid is a stable colloidal suspensions with nanometer sized, single-domain magnetic particles.

Using a chemical called Polydimethyldisiloxane (PDMS), a novel optofluidic device is created with a multiplex geometry. Three lasers are used to couple light into each of the three fibers at varying wavelength (405 nm, 532 nm, and 625 nm). The ferrofluidic plug is placed in the microfluidic channel with index matching oil, and is actuated to turn each laser signal “on” and “off”. Figure 1 depicts the LOC geometry in the “on” state, where all light flows without interruption. Figure 2 depicts the “off” state for the first fiber, where the ferrofluidic plug blocks the input light signal from the laser resulting in no output signal.

A high contrast ratio is measured by comparing the “on” and the “off” state of each fiber, proving the effectiveness of the ferrofluidic plug for blocking the light signals. This research has succeeded in creating a successful switch that could be used for sensing, digital processing, or digital storage.

Figure 1. The “on” state with horizontal fibers and vertical microfluidic channel with ferrofluidic plug

Figure 2. The “off” state of the first horizontal fiber (light blocked by the ferrofluid plug), others are “on”
During summer of 2013 two students worked in my laboratory, and one student volunteered for a part of the summer. Martin Iwanicki’14 studied dynamics of colloidal particles in dense suspensions with various strengths of inter-particle attraction. Ryan Stull’15 and Sebastian Hurtado-Parra’15, who in the second part of the summer was part of REU program at University of Chicago, 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. Martin 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. Now, we plan to continue 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. Next, we plan to conduct systematic studies of magnetic beads moving with various speeds through colloidal suspensions of various concentrations.
Particle Dynamics in Dense Colloidal Suspensions with Short-Range Attraction
Martin Iwanicki, ’14

Faculty Mentor: Piotr Habdas
Department of Physics

Supported by the Howard Hughes Medical Institute, and the SJU Summer Scholars Program

While it is one of the most common materials used in daily life, the nature of glass is still ambiguous and considered a mystery. The ambiguity in the nature of glass lies within glass possessing both solid and liquid properties. Macroscopically, glass appears to be a solid; however, it lacks the internal long-range order that common solids have, such as table salt, and has more liquid-like properties on the microscopic scale. Understanding the solid and liquid properties of glass drives the purpose of our study. Instead of directly studying molecular glass, we utilize a model system of colloidal suspensions. Colloidal suspensions, where particles are suspended within a liquid, share many features that molecular glass exhibits, such as having a glass transition.

In order to simulate a molecular glass, the colloidal particles used in our experiment were poly-methylmethacrylate (PMMA) particles of diameter, $d = 2.2 \mu m$. They were suspended within a decalin/cyclohexylbromide mixture, which matched the density and the index of refraction of the particles. PMMA particles, when by themselves, repel each other when they come into contact. This system is known as a repulsive glass. In order to create attraction between the colloidal particles, we introduce a second species of particles (polystyrene) which is about a tenth of the size of the PMMA particles. The addition of these particles makes the PMMA particles “stick” to each other, creating a system known as an attractive glass. Thus far, we have created a series of repulsive glass samples at different volume fractions, which is the fraction of the total volume taken up by the PMMA particles, and another series of attractive glass samples with differing amounts of polystyrene but at the same volume fraction.

By using microscopy, we collect images of our particles. From these images, we track the positions of the particles over a certain time using the computer programming language IDL, which allows us to do our analysis. Figure 1 shows the mean square displacement, which quantifies the motion of the particles, of the particles from the series of attractive glass samples.

![Figure 1: Mean square displacement of samples with attraction between the particles.](image)

We will continue to analyze our data in many other ways.
Microrheology of Dillute Colloidal Suspensions
Ryan T. Stull, ’15
Sebastian Hurtado Parra,’15
Faculty Mentor: Piotr Habdas
Department of Physics
Supported by SJU Summer Scholars Program and Howard Hughes Medical Institute

Background: Rheology is the study of the flow and deformation of matter. Until the 1990’s rheology was only performed by taking measurements via a rheometer, a device which applies a constant or oscillatory strain to a sample fluid, and measures the resulting resistant forces. Thenceforth a new way doing rheology began to become more practiced, microrheology. In microrheology small tracer particles are introduced into the fluid in question, and then their motion is followed via a microscope camera. There are several theories which allow for the prediction of various rheological properties of fluids based on the motion of these tracer particles. In 2012 Zia and Brady [1] developed a new theory which allows for the prediction of the stress tensor of a fluid only by measuring the mean and mean squared displacements of the tracer particles.

Research: The goal of our research was to test this theory in a dilute colloidal suspension. Early on in our research we noticed the particle tracking algorithm used was unsatisfactory as it deviated from the position of the particle quite frequently and with great magnitude. Our early efforts focused on developing a new particle tracking algorithm, which once fully developed was much more accurate than the one previously used. Subsequently we had limited success in acquiring data as the sample was being heated by our light source and it began to flow, making it impossible to accurately track the motion of the particle. It took a long time to eliminate other possibilities which could cause the flow, such as poor density matching of colloidal particles and solvent, too high concentration of tacking (magnetic) particles, and not having waited long enough after preparing the sample. In the end we determined an infrared filter would likely be needed to shield the sample from infrared radiation which would cause the sample to heat up.

Conclusion: Our work is ongoing and we will be continuing into the 2013-2014 academic year in hopes to fix our experimental problems and acquire data that will ultimately support or refute this new theory.

Emily Hage
Art Department
Saint Joseph’s University
Ph.D. University of Pennsylvania

Research Interests: Modern and contemporary American and European art; print media, museum studies, relationships between text and image, art and national, religious, and racial identity, social justice, teaching writing

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, 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, as the two have the potential to convey particularly pointed and poignant messages. 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 circulation and grappling with religious issues, which are particularly challenging in today’s political climate. Locally, I am involved in supporting artists in Philadelphia, whose work speaks to issues of social justice and contributes significantly to the increasingly globalized art world of the twenty-first century.
Social Justice In Art  
Kathryn Carter,’15  
Faculty Mentor: Emily Hage  
Department of Fine Arts  

Supported by the SJU Summer Scholars Program

Social justice is a theme that has captivated artists for hundreds of years and it is art created about this subject that is often a catalyst for positive social change. My project focuses on this theme in art created specifically by artists working and living in Philadelphia. This is an important theme at St. Joe’s because of both our location and underlying purposes of the university. Our campus is located in the middle of two very different socio-economic spheres and because of this, issues of social justice confront us in our everyday lives. The term social justice was coined by a Jesuit priest Luigi Taparelli in 1840 based on the teachings of St. Thomas Aquinas, making this theme an important one in Jesuit education. The mission statement of our university explicitly endorses “the continuous pursuit of truth, human rights, and the common good”, values explored by these artists.

Over the course of the summer, I conducted research on the topic of social justice as it relates to art. I looked at works containing various themes of social justice that has been created in previous centuries to build a foundation on which the works being created in present day stand. Focusing on eight artists currently living in and creating work about Philadelphia for my paper, I explored their various mediums, such as painting, sculpture, and photography, and the specific themes they each concentrate on. I found unique attributes and styles of each individual artist, but also greater themes and techniques that allow them to fit nicely as a group. With this research, I wrote a comprehensive paper detailing the theme of social justice as it related to art in Philadelphia.

My mentor, Dr. Emily Hage, and I visited artists’ studios over the course of the summer, talking with them about their work and process in general, and more specifically their works relating directly to Philadelphia and social justice. I took photographs, video, and sound during these visits and compiled them into a video about social justice and how each artist believes his or her work relates to this theme. Seeing the works in person and being able to talk with artists face to face provided tangible material for not only the video, but my paper as well.

This project also relates to an exhibition I am working on with Dr. Hage that will take place next February on campus. The show will be held in the University Gallery in Merion Hall and will consist of the artists whose studios we visited. This is a great opportunity for the St. Joe’s community to see and learn about issues that affect our city and because of the location of the gallery, is accessible to those who might normally have gone to see the work.
H-town Art: A Study of Art and Artists in Houston, Texas
Madeleine Keogh,’15

Faculty Mentor: Emily Hage
Department of Art History

Supported by the SJU Barbelin Scholars

Houston, Texas is the fourth largest city in the United States and a major art hub, supporting more than 500 organization dedicated to the arts. While Houston has always had galleries and museums supporting the art community, the city has recently been receiving a large amount of positive publicity concerning its quality of living and rising art scene. In 2012, Forbes named Houston the “coolest” city in America, and many news sources have followed the trend of praising Houston as a great place to live, especially for fresh graduates and upcoming artists. Houston has one of the fastest growing economies in the country and its economic success in the energy industry has helped spur the cultivation of art and culture.

While Houston has been sited to be a great place to live and work, no research strives to figure out the influence of such a unique town on the art and artists that reside in the metropolis. Almost all of the artists I interviewed used Houston’s diversity or urban scene for inspiration in their work. Many artists also stated they would choose Houston again if they could live and work anywhere in the world, due to the quality of art resources. Houston contains multiple organizations, such as Lawndale Art Center and Houston Alliance for the Arts, which provide ample opportunities for new artists to get their work viewed and promoted. The friendliness of the art community was another major influence for the success of Houston artists; the character of the city promotes an “anyone can make it” attitude, with neighbors helping each other become profitable in their field. A third key component to the city is its economic success. The booming nature of its economy leads citizens to allocate more money to the art world, helping artists make more sales and receive grants for art projects.

And while citizens are now aware of the large art community present in Houston, it can be hard to find the hidden gems amid the large and confusing sprawl of the city. The art scene constantly grows, but the artists and works can be overlooked or hard to find in this complex and busy city. My research and public blog served to help expose the diverse artists and exhibitions Houston supports.
The Reverend Daniel R. J. Joyce of the Society of Jesus is a 1988 graduate of Saint Joseph’s University, having majored in Philosophy with minors in Political Science and Faith-Justice Studies. He completed graduate studies in Philosophy and Theology receiving his M.Div from The Weston Jesuit School of Theology. Dan served as a Mercy Corps volunteer at Saint Catherine’s Indian School in Santa Fe, New Mexico and as an affiliate of the Jesuit Volunteers International for two years in Belize, Central America. In Belize he was as a Lecturer in Philosophy and History at Saint John’s Junior College.

For many years Dan has been involved in working with communities on economic and educational issues. He has worked as a community organizer for Guadalupe Family Services in Camden, New Jersey; As a Vice President of Wheeling Jesuit University, Wheeling West Virginia and as The Assistant to the Executive Director of Mission at Saint Joseph’s University, Philadelphia. Dan worked with a coalition of faith-based organizations to resolve the economic troubles of in the depressed region of northern West Virginia and founded The Hopewell Fund that has generated $5 million dollars in capital to support the growth of business clusters and living wage jobs in eastern Appalachia.
Over the course of the summer I have been working closely with West Catholic Preparatory High School, a co-educational Catholic high school in the Archdiocese of Philadelphia, to develop a business enrichment program that focuses on students’ developing a basic understanding of leadership and ethics. Recently West Catholic Preparatory High School has gone under major renovations to refine and reposition itself as a viable option for people of the greater Philadelphia area seeking to provide their children with high-quality Catholic education. Before this project began, a personal finance/business law class and a basic accounting class were the students’ only choice in terms of seeking business education at the high school. A “need” existed at West Catholic Preparatory High School and I found myself in a unique position to be able to meet this need.

I began researching other high schools that have gone under various forms of transformation including the Cristo Rey Jesuit High School in Chicago and this model provided insight for the importance of creating a program that enhances students’ trajectory in the future while sustaining the values of their communities. I enlisted the Ignation Pedagogy and the Lasallian Pedagogical Framework of Transformative Learning to develop the structure of the lesson plans and the sequential classroom materials.

The program will run for seven weeks on Saturday mornings for 90 minutes. Saint Joseph’s University and West Catholic Preparatory students will gather to discuss, uncover, and explore various aspects of business including personal leadership, business ethics, marketing, and business in the community. Each week a new topic will be introduced and eventually students will build upon each topic to create a final project.

Objectives for the program include students developing a greater knowledge & ability for public speaking, further exploring their own understanding of ethics, increasing their ability to apply ethics in their own life, expanding upon previous presentation skills, and having the opportunity to advance research skills. The ultimate goal is for students to gain a greater sense of propose and ownership of their surroundings while providing a foundation of analytical skills that will translate into the business world.
Youth homeless is a pervasive social problem all around the globe. According to UNICEF’s State of the World’s Children Report (2012), tens of millions of children are living and/or working on the streets in global urban environments. UNICEF further notes, “while abuse, conflict or neglect can happen in any family home, children whose poverty and marginalization leave them with few choices often see the street as the best available option for escape” (32).

My own study of youth homelessness at the international level indicates a need for increased direct service providers. Non-governmental organization’s intervention aimed at primary (at-risk children, for example those living in poverty), secondary (children working in the streets with some connection to ‘home’) and tertiary (children living and working in the streets) prevention is integral to addressing the various challenges experienced by children of and in the streets. As the rate of children living and/or working on the streets continues to increase, this need will continue to expand.

Additionally, there are both international and state social policy models that can dramatically assist with the multifaceted needs of this vulnerable population when adopted and enforced so coverage expands systematically. For example, Brazil’s Estatui Da Crianca E Do Adolescente, their major national child welfare law, was a progressive legislative document in a country plagued by crimes against children. Furthermore, my own experience working with Chavos de la Calle Programa Talitá Kum Project in Mexico City demonstrates and reinforces the need of improved expansion and enforcement in a country whose human rights law for children is limited.

Closer to home, the National Center on Family Homeless estimates that 1.6 million children in under 18 years experience homelessness every year in the United States (2010). Implications for children and youth who experience homelessness include poor physical health, addiction, decreased educational attainment, and increased exposure to violence and extreme poverty. Therefore, homelessness can have a tremendous impact in youth’s social participation as well as life course trajectory.

Julia Collins’ (Sociology Major) research this summer focuses on the experiences of gay homeless youth in the United States, a subgroup of the already marginalized homeless youth population. Through interviews with direct service providers and advocates, Julia’s research provides an analysis of the needs, efficiency and delivery of services to homeless LGTBQ youth. Her research findings will be shared with direct service providers and raise awareness of this important social problem.
A Life Marginalized: The Evaluation and Analysis of Homeless Homosexual Teens and Society’s Influence on Their Survival
Julia Collins,’15

Faculty Mentor: Ann Marie Jursca Keffer
Department of Sociology

Supported by the SJU Summer Scholars Program

In the U.S. alone, nearly 2 million youths endure a period of homelessness annually, 5,000 of which die as a result. Youths represent a diverse portion of this ever-growing homeless population for a variety of reasons. Gay, lesbian, bisexual, and transgender (LGBT) homeless adolescents are forced to overcome the difficulty of surviving on the streets, while also enduring the stigma of being a part of a sexual minority group. While it is difficult to record an accurate number, it is estimated that nearly 40 percent of all homeless teens identify as gay or lesbian. Moreover, about 30 percent of homeless people using housing-related services are members of the LGBT community.

Because I am interested in the doubly marginalized population of gay homeless youth, I spent this summer interviewing staff at agencies that serve both heterosexual and homosexual homeless youth. I asked staff members questions related to the foster care system, the level of promoted acceptance, mental illness prevalence, family engagement, general protocols, and discrimination within each organization.

I found that within most organizations, mental disorders are overwhelmingly prevalent, as the majority of youth have some type of a disorder. In addition, organizations have improved their relations with the transgender population by implementing a policy that allows youth who have gone through a transformation to live on their desired gender’s floor. Moreover, most organizations provide services that allow gay homeless youth to find acceptance both internally, within themselves, and externally, within the community, which proves to be tremendously useful in their strides towards stability and permanency.
Research in my laboratory centers on questions concerning cell motility. Our current areas of investigation focus mainly on understanding mechanisms of actin-dependent organelle motility and how actin-dependent organelle motility is regulated. As a model system, we use retinal pigment epithelial (RPE) cells from fish. These cells are found at the back of vertebrate eyes, and contain numerous pigment granules that in fish, undergo mass migrations in response to light. RPE cells can be isolated from the eyes of fish, dissociated, and cultured as single cells. Aggregation and dispersion of pigment granules within RPE is dependent on the actin cytoskeleton, and can be chemically triggered in isolated cells, allowing investigation of the mechanisms involved in motility.

Questions we are addressing include:

- Do actin dynamics, including actin retrograde flow, play a role in pigment granule motility?
- The signaling molecule, cAMP, stimulates pigment granule aggregation in vitro. What are the targets of PKA?
- What type of myosin motors are in RPE that could effect pigment granule motility, and what is their distribution?

A new area of investigation involves an enzyme found in RPE cells that is essential for vision. This enzyme, RPE65, is an isomerase that regenerates the prosthetic group called retinal. Retinal associates with the protein opsin, found in photoreceptors, and when in the \textit{cis}-form, allows the photoreceptors to detect light. After light hits the retinal it is converted to the \textit{trans} form, dissociates from opsin, enters the RPE cells, and in a series of enzymatic steps undergoes isomerization to regenerate the \textit{cis} form, which then re-associates with opsin in photoreceptors. Recent studies have shown that an actin-dependent myosin motor, myosin VIIa, is responsible for the redistribution of this enzyme in mammalian RPE cells in light-and dark-adapted eyes. Myosin VIIa has also been shown to play a role in light-dependent motility of pigment granules. We are investigating whether this enzyme similarly undergoes light-dependent translocation in fish RPE and the mechanisms of its redistribution. RPE65 has been identified in smooth endoplasmic reticulum in mammalian cells. We are also studying whether smooth ER containing RPE65 undergoes light- and dark dependent redistribution in fish RPE.
The Localization and Distribution of Enzyme RPE65 in Teleost Retinal Pigment Epithelial (RPE) Cells
Megan O’Donnell, ’15

Faculty Mentor: Christina King Smith
Department of Biology

Supported by the Summer Scholars Program and Howard Hughes Medical Institute

The retinal pigment epithelium (RPE) is a layer of cells located near the back of the vertebrate eye and is densely packed with pigment granules. Because fish do not have dilatable pupils, light flux is controlled by pigment granules that disperse throughout the RPE cell’s elongated apical projections in the light and aggregate back to the cell body in the dark, traveling up to 100 µm. RPE cells isolated from fish eyes and cultured as single cells can be chemically triggered to aggregate or disperse pigment granules using cAMP or dopamine, respectively.

Not only does RPE play a role in controlling light flux, it also contains an isomerase, RPE65 that regenerates the all-trans retinal associated with the visual pigment, rhodopsin, back into its cis-form necessary for photoreceptors to detect light. A recent study showed that in mammalian eyes, RPE65 localizes at the apical side in the dark and redistributes to the basal side in the light, and this movement requires the actin-dependent myosin motor, myosin VIIa. MYO7a also plays a role in the light-dependent movement of pigment granules. Because pigment granule motility and RPE65 distribution rely on similar actin-dependent mechanisms, we are addressing these questions:
• Can RPE65 be labeled with an antibody in fish tissue?
• In isolated RPE cells, does RPE65 distribution change when chemical triggers are applied to move pigment granules?

Previous data using immunoblotting shows that an antibody against RPE65 cross-reacts with fish RPE at the expected molecular weight of 65 kD. Preliminary cell staining results suggest that RPE65 is found in both the RPE apical projections and the cell body, and its distribution stays the same when granules are triggered to move using cAMP or dopamine.

Figure 1. The visual cycle in the RPE and retina layer.
Ron Klimberg
Department of Decision and System Sciences
Ph.D. Johns Hopkins University

Research Interests: Development and application of quantitative models.

My continuing underlying theme of my research has been directed toward the development and deployment of quantitative tools to solve complex problems such that the results add value. This requires the development of better tools and models. Additionally, it also requires drawing upon research and technological developments of several disciplines. With my diverse background, I have been able to accomplish this in my research by employing both traditional and innovative techniques/models and furthermore, I have been able to bring my experiences into the classroom. My major research interests are, in general, in the area of multiple criteria decision making (MCDM), and in particular:

- multiple objective linear programming (MOLP)
- data envelopment analysis (DEA)
- data visualization
- statistical analysis and forecasting; and
- modeling in general.

The University departmental course planning and scheduling is the process of determining what courses to offer, determining how many sections are needed, assigning a faculty member to instruct each section, scheduling each section to a timeslot to avoid conflicts, while trying to satisfy faculty desires. Development of such a model with its multiple criteria structure naturally fits into my research. Although, not initially planned an essential input parameter to such a model is the expected number of sections to offer. As we quickly discovered the development of a forecasting tool to predict the number of sections was more critical and became the focus of the research project.
A Multiobjective Approach to Course Scheduling and Forecasting Enrollment
Alyssa Beck,’15

Faculty Mentor: Ronald Klimberg
Department of Business Intelligence

Supported by the SJU Summer Scholars Program

The original goal of this Summer Scholars Project was to research and build a linear programming model in order to help department chairs assign professors to courses. After some initial research, Dr. Klimberg and I met with Dr. George Sillup, department chair of Pharmaceutical Marketing, and Dr. Richard Herschel, department chair of DSS/Business Intelligence. While discussing what knowledge would be helpful when developing a schedule for each semester, Dr. Herschel explained that it would be much easier if he had an idea of the approximate number of students that would take specific courses each semester. This knowledge would be especially helpful when scheduling courses that have multiple sections. If a department chair had an estimate of how many students were taking a particular course, he or she would know how many sections to offer and would avoid canceling or adding a section, thus avoiding the need to change around the entire course schedule for that department.

After talking with Dr. Herschel, the main focus of the research shifted to developing an effective forecasting model that would test several variables and how much those variables affected course enrollment. The first step to developing a forecasting model consisted of gathering enrollment data for the three “business core” courses (Business Statistics, Introduction to Information Technology, and Business Analytics) in the DSS/Business Intelligence department beginning from the Fall 2004 semester through the Spring 2013 semester. After running the data through the model multiple times, we were able to determine that only the enrollment data from Fall 2010 through Spring 2013 had the most influence on forecasting enrollment in future semesters. Several variables were tested, including the semester, the GEP curriculum that was introduced in the 2010-2011 academic year, and enrollment in the Haub School by class year. We first ran all three classes through the model, and then ran them separately. By running the enrollment data through the model separately, we were able to determine the different variables that affected the enrollment of each of the three courses. The variables that affected enrollment in each of the three courses depended upon the characteristics of that particular course.

Once we were able to determine the combination of variables for each course, we were able to develop three models (one for each DSS course in the Haub School core set of courses) that could forecast enrollment with an error of plus or minus one section. In other words, the enrollment prediction would only be off by 30 students or less. This level of accuracy allows the department chair to avoid adding or eliminating a section of that particular course, making the scheduling process less complicated. Now that we have developed effective models for forecasting in the DSS department, we hope to work on developing forecasting models for the seven additional courses that compose the core requirements of the Haub School.
My fields of research are combinatorics and graph theory. In very general terms, combinatorics deals with enumeration of the number of ways to perform a mathematical task (such as choosing a delegation of three people to represent a group of 15 people), and graph theory is concerned with diagrams you make by connecting dots with lines. Since these areas are relatively accessible to undergraduates, they are often sources of undergrad-level research problems, but not all the projects I have directed have been purely combinatorial, because the choice of topic is in large part driven by the student’s needs and interests. I have directed projects each of the last five summers.

In ’06, I directed two summer scholar projects: The role of invariance in mathematics (which, among other things, investigated the use of an invariant in a number of combinatorial problems) and Generalized Möbius Inversion (which is abstract combinatorics). In Summer ’07, I directed a project in another area of combinatorics, Pólya-de Bruijn Theory, which deals with enumeration questions in which not all the ways of performing a task count as different. (For example, consider painting the faces of a cube using $k$ colors. Rotating the cube will make some colorings coincide with others.) I directed a project centered on probability theory’08, on stochastic processes and the Black-Scholes formula in ’09, on problem solving in ’10, on coding theory and public-key encryption in ’12, and on Financial Mathematics in ’13. For more details on these projects, please see the one-page summaries prepared by the students.
Financial Mathematics
Lisa Chen,’14
Timothy Collins,’16
Lyndsey Sample,’14
Faculty Mentor: Paul Klingsberg
Department of Mathematics

Supported by the Summer Scholars Program and Department of Mathematics

For our summer project, we studied some of the mathematics that has been developed to assign fair values to different types of financial investments. With the financial crisis of 2009 still present in our minds, the potential benefits of our studies was particularly clear to us. We spent some time reviewing some basic probability theory (sample spaces, independence, random variables, the Wiener Process (for Brownian motion). The two types of investment we considered in depth are:

- **Call options**: the right to *buy* a share of stock at a future time $t_1$ for a price $K$ specified now
- **Put options**: the right to *sell* a share of stock at a future time $t_1$ for a price $K$ specified now

Each of these investments takes one of two forms: A *European* call or put option may be exercised only at time $t_1$, while an *American* call or put option may be exercised at any time up to and including time $t_1$.

The central tool for pricing call/put options (as well as many other investments) is to stipulate that fair prices should preclude the existence of arbitrage—that is, of any investment strategy that will guarantee a profit regardless of what happens. This simple criterion goes remarkably far. An immediate consequence is the *Law of One Price*: if two investments will necessarily have the same value at some future time, then their present cost must also be the same.

Deeper applications of the arbitrage-free pricing hinge on the so-called *Arbitrage Theorem*, which proves, roughly, that in the absence of arbitrage, there is a way of assigning probabilities to future events that force all investments to have zero expected gain, after gains due to interest alone are discounted. (These probabilities are called *risk-neutral* probabilities.)

A high point of the summer was the derivation of the *Black-Scholes Formula*. Under the reasonable assumption that a stock’s price $S_t$ has a distribution of the form $S_0 e^{X_t}$, where $\{X_t\}$ is a Brownian motion process, the Arbitrage Theorem

- implies a relationship between the two parameters of the process $\{X_t\}$ (which make the associated probabilities risk-neutral); and
- determines the unique fair price of either European or American call options, in terms of the prevailing interest rate $r$, the “strike price” $K$, the exercise time $t_1$, the parameter(s) of $\{X_t\}$, and the current stock price $S_0$.

The Black-Scholes Formula assumes that the stock in question does not pay dividends. We learned how to the formula should be modified under the assumption that the stock pays dividends according to one of several different dividend schemes.

We also investigated the pricing of put options. It turns out that the Arbitrage Theorem gives a way apply the Black-Scholes formula to the problem of pricing European put options but not American put options. The techniques we learned afford a way to price American put options, but the results of this analysis cannot be summarized in a simple formula.

Throughout the summer, we sought and sometimes found ways to extend the techniques and formulas to a wider array of investments than those treated in the text.
As an historical theologian, I study the development of Christian thought and practice, particularly from ~100 CE (the period just after the texts of the New Testament were written) up to ~1600 CE. But I do not study history for history’s sake. I am fascinated by the human will to thrive, that impulse within the human spirit that seeks a meaningful life, and which often finds extraordinarily creative ways to attain this end even in circumstances that would seem to make this impossible. Therefore, my interest in historical theology is driven by a desire to understand how specific individual and communal expressions of Christian thought and practice are shaped by the historical context (time, place, social structure, etc.) in which they arose. Individuals in every place and time seek to thrive. How is this idea or that practice an expression of that urge in this time and place? What makes this strange (to us) idea or practice make sense? There are two practical payouts in this study – the first is that since I know that authentic expressions of Christianity yesterday differ from those experienced in the Christian community today, I am willing to be flexible in my understanding of the forms and expressions Christianity can take. Studying the tradition has also helped me find the threads of continuity within the tradition that often form, for me, a more meaningful foundation for faith than much of what is preached in the Christian community today.

The research task currently awaiting my attention is a book project which discusses the chronological development of Christian spiritual practices. For instance, some of the earliest followers of Jesus Christ called themselves simply followers of “the way.” They sought to walk the path that Jesus had set before them with his teaching and example, and the earliest Christian “gospels” were collections of Jesus’ sayings. As persecution of followers of Jesus became more prominent, the ideal of martyrdom moved to the center of Christian identity and practice, and attention turned from following Jesus’ own teaching to the significance of his suffering, death, and resurrection. Christians were encouraged to enter into the mystery of Christ through suffering and sacrifice, the Christian martyr became the locus of the presence of Christ in the Christian community, and the Eucharist became the center of Christian worship. Likewise, as persecution ebbed, the martyr ideal gave way to the monastic ideal, and so on.

Overlaying this chronological assessment is an examination of the way in which gender matters – that is, the ways in which some of the same spiritual ideals are, due to cultural constraints, lived out quite differently by women than by men. If I assume that women in all times and places are seeking to thrive, then the seemingly strange practice of child abandonment by women deemed holy must make sense within the ideals (both religious and social) of its time. It also signals the ways in which gender ideology remains embedded within traditional religious ideals.
“Whence the Reformation?: Response to Corruption or Theological Development?
Patrick Shank,’15

Faculty Mentor: Shawn Krahmer
Department of Theology and Religious Studies

Supported by the SJU Summer Scholars Program

The year 1517 is generally considered the beginning of the Protestant Reformation. Martin Luther is generally considered its “Father,” because 1517 was the year that Martin Luther published his Ninety-Five Theses criticizing the practice of indulgences within the Church. These theses protesting corruption in the Church resulted in Luther’s excommunication, in part because to critique church practice was also to call into question Church authority. It is therefore commonly thought that the origins of the Protestant Reformation lie in the critique of Church corruptions and the challenge this posed to the authority of the clergy.

My research, however, indicates that the focus behind Luther’s reforming efforts was not the issue of Church authority and Church corruption, but rather the result of his reading of the bible in the original Greek and Hebrew, which led to the formulation of the theological ideas of sola fide and sola scriptura. Through his Biblical study, preaching, and teaching, Luther had come to believe (prior to 1517) that man was saved sola fide, or by faith alone. Luther developed this idea from a rereading of Romans 1:17, “the righteous by faith will live,” in which the “righteousness of God” was viewed as passive instead of active. This removed from consideration the idea that God was an unforgiving judge and led Luther to reject good works as a means of salvation and declare that through faith, the commandments were fulfilled and one is made righteous before God.

It was this theological insight that led Luther to question the selling of indulgences, because some of the theology being preached on indulgences was counter to his new beliefs, and even – so it seemed to Luther – to Church doctrine. This sequence is important because it shows that the idea of sola fide came first, then concern over church corruption. Questioning Church authority was the last concern of Luther who in his Disputation Against Scholastic Theology, wrote that he “said nothing that is not in agreement with the Catholic Church and the teachers of the Church.”¹ It was not until his debate with Eck in 1519 that Luther was forced to finally break from the Church and denounce its authority.

Ironically, Luther’s rejection of Church authority may have been more important in the spread of his ideas than his theological insights because the German people were tired of being taxed by Rome. This along with the growing sense of nationalism caused both the common man and rulers to side with the German Luther over the distant Roman Church. Luther’s rejection of scholasticism also helped him gain support from the humanists, because this rejection was in line with their desire to return to the analysis of the bible not the texts of Aristotle.

¹ Martin Luther, “Disputation Against Scholastic Theology”, Selected Writings of Martin Luther vol.1, p. 42
Joseph Larkin  
Accounting Department  
Saint Joseph’s University  
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Research Interests: Managerial  
Accounting applications, Ethical  
Decision Making in Accounting and  
Career Planning and Work-Life  
Balances in Accounting  

Making ethical decisions and, simply, doing the right thing are two of the most important things that we, as faculty, can instill upon our students. As Evan notes in his summary, the accounting profession is perceived to be very ethically-minded. Of course, several financial reporting scandals have received significant media attention. That withstanding, it is essential that the users of financial statements can rely on a fair, objective presentation of the financial position and results of operations of organizations.

Evan’s research focuses upon how our students perceive and react to ethical challenges in a business world context. He surveyed several hundred students and has found some very interesting results. He is still working on the statistical analyses of the data. It has been a pleasure working with Evan. To see his zest for academic research is encouraging. Hopefully, his findings will raise awareness of the importance of "doing the right thing."
Corporate social responsibility or rather the lack thereof has complicated the very foundations of the business world in recent decades. Numerous corporate scandals and financial failures have raised important questions about the ethical behavior of business decisions makers. The accounting profession is regarded as a highly ethical system. The profession’s reputation has suffered tremendously in recent years and so too has the public’s confidence in accountants. Researchers conclude that ethical behavior in the accounting profession is rooted in higher education. Therefore, ethical emphasis on this level is rapidly becoming more relevant. This was the genesis of this project.

It commenced in the spring of my freshman year with the assistance of Dr. Larkin. The goal of the study was to identify how business students react to ethically sensitive decisions. Data were gathered via a two-part survey methodology. The first part gathered demographic data, including gender, age, major and GPA. Part two presented eight ethical scenarios and elicited their responses to ethically sensitive decisions. The instrument was administered to multiple managerial accounting sections. Prior to the administration of the instrument, it was pretested by several graduate students and accounting faculty. Their suggestions were incorporated into the final version.

During the summer of 2013, data were analyzed from the 288 responses collected during the spring 2013 semester. The preliminary findings distinguish trends and statistical differences among many of the research variables. This suggests that there is a correlation between gender, age, major, GPA and how students perceive ethically sensitive decisions. Conclusive results in this area of research are crucial to understanding the future ethical behaviors of business professionals. Ultimately, this paper reflects my preliminary findings and further analyses will be completed.
We have a great opportunity as Food Marketers to influence consumers. From where & how they shop to what, where, & how they eat, and finally, to how they dispose of their food/packaging.

Prior to teaching, I spent 22 years as a Sales and Marketing Executive with Tastykake. We took pride in the fact that we used real ingredients like Milk, Butter, Eggs, Sugar and Cocoa to make our products. None of the products would be considered healthy today.

In addition to teaching, I also consult for food companies and help with target marketing segmentation, strategic/marketing planning, market sizing, consumer research, direct marketing & E-commerce.

This Summer I am working with Tyler Hill to identify how younger consumers (specifically those in Generation Y) view snacking/health.

All of the Food Marketing classes I teach use marketing theory as a base, but are heavily focused on the practical application. This research will be a big part of my classes in the coming year.
I, along with 80 millions others in the United States, am part of a group referred to as Generation Y—those born between the early 1980s and the early 2000s. This generation, also called the Millennials or the Echo Boomers, was raised with technology at its fingertips and is well-versed in various types of electronic communication. Thanks to a background defined by constant access to information and communication, Generation Y requires instant gratification. The generation also desires being individualistic and unique, wanting anything but to be seen as the same as one another. These traits prove to be troublesome to marketers, as Generation Y require specific targeting in order for a product to appeal to them.

With its massive size, Generation Y is a strong force in the economy. These individuals have over $200 billion at their disposal, and they do not spend it carelessly. Generation Y can be very reluctant to purchase goods, and many products and services advance quickly along the product life cycle from in-demand to obsolete. This generation can be virtually unpredictable to marketers trying to sell their products. Despite these marketing obstacles, companies still target parts of Generation Y due to its sheer size and spending power.

Due to Generation Y’s power and appeal to convenience, the traditional supermarket’s appeal has declined. Places like Acme and Giant, among others, are facing a huge problem as they do not have the same volume of consumers they once did. Rather than shopping at supermarkets for food, Generation Y has turned to convenience stores to fulfill their short-term needs. These individuals prefer places like Target and Wal-Mart to shop for groceries, as these retailers provide lower prices than supermarkets. The trips to the grocery store to stock up for a week at a time are over, as Millennials take shorter, more frequent trips to buy their food. Additionally, Generation Y tends to dine at restaurants more frequently than past generations. These changes are forcing supermarkets to adapt. More grocery stores offer “dollar aisles,” parts of the store that sell discount products. Prepared foods and other quick meals are on the rise as well as Millennials demand no-wait meal options. Because they cannot sell their products quickly enough, Supermarkets are also downsizing and carrying less inventory.

Over time, we will be able to more accurately predict the health of the supermarket. This next decade is vital to the future of the supermarket as it tries to stay relevant and find its place in the life of Generation Y.
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.

My lab is focused on how RNA-processing proteins may interact with telomeres and thereby help maintain them. Recent studies in mammalian cells have characterized how hnRNP A1, important for preparing RNA for protein synthesis and for the assembly of ribosomes, is able to interact with telomeric DNA sequences as well as telomerase. We are using baker's yeast as a model system to study Npl3, the yeast homolog of hnRNP A1. 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, my students and I were generating yeast strains to see whether Npl3 is necessary to prevent TERRA transcription. We specifically aimed to produce cells with npl3 deletion and have a marker gene inserted in the telomeric region. If Npl3 keeps transcription silent, mutant cells that do not have Npl3 would be able to express the marker gene product. We also identified two candidate genes whose protein products interact with Npl3; one works to regulate transcription activation (Hst1) and the other in transcript degradation (Rat1). Understanding how Hst1 and Rat1 works with Npl3 will also help us decipher where and how Npl3 contributes to maintaining the telomeres.
Npl3 May Interact With Hst1 and Rat1 at Telomeres to Regulate TERRA Levels
Shannon Spencer,’14

Faculty Mentor: Julia Lee-Soety
Department of Biology

Supported by the National Institute on Aging/National Institute of Health

Telomeres are repeat DNA sequences at the ends of linear chromosomes that prevent degradation of genetic material. Since DNA polymerase is unable to fully replicate the telomere region, nucleotides are lost with each round of cellular division signaling cell cycle arrest referred to as senescence. Telomerase is an enzyme with a RNA template (TLC1) that helps compensate for DNA polymerase’s limitation by re-extending telomeres. Inappropriate expression of telomerase causes telomeres to continuously re-lengthen, contributing to the formation of cancerous cells. Telomere maintenance involves a dynamic equilibrium between telomere shortening and re-lengthening. Until recently, telomeres were considered transcriptionally silent but new data has shown that when telomeric DNA is unwound from histones it is transcribed into non-coding RNA transcripts called TERRA. TERRA may accumulate in the nucleus and interfere with cellular processes like telomere maintenance.

Saccharomyces cerevisiae (Baker’s yeast) is an ideal model for study because it resembles human somatic cells and contains the protein Npl3. Npl3 is important for the gene expression process in yeast and is structurally comparable to hnRNP A1, a protein shown to be important for telomere maintenance in human cells. When Npl3 is deleted from tlc1 mutants, accelerated senescence and elevated TERRA expression is observed indicating that Npl3 may play a role in telomere and TERRA regulation. Npl3 interacts with many other proteins in order to accomplish its gene expression functions. We want to determine if and how Npl3 works with other proteins at the telomere region. I used the S. Cerevisiae Genome Database to identify which of 1326 known proteins that interact with Npl3 in gene expression processes also have roles at telomeres. Our lab selected histone modifier Hst1 and exonuclease Rat1 as proteins for further study.

Hst1 helps regulates DNA structures by modifying histone proteins, allowing DNA to wind more tightly. Previous research shows that cells with mutated Hst1 exhibit shortened telomeres. We hypothesize that Hst1 inhibits transcription by compacting the DNA and therefore preventing telomere shortening and TERRA production. We want to determine whether Hst1 and Npl3 are working together at telomeres to maintain chromatin stability and prevent TERRA expression. Exonuclease Rat1 degrades nucleotidic transcripts. Cells lacking telomerase with mutated Rat1 also exhibit shortened telomeres and increased TERRA expression. We want to determine if Rat1 and Npl3 are working at telomeres to prevent the accumulation of TERRA. We will compare the senescence rates of tlc1 npl3 double mutants to tlc1 npl3 hst1 and tlc1npl3 rat1-1 triple mutants. If Npl3 is working with Hst1 and/or Rat1 via the same pathways, then we expect the rates of the double and triple mutants to be similar since the additional protein deletion should not have an additive effect on senescence. Telomere length and TERRA levels will be determined from DNA samples. We expect the Hst1 and Rat1 triple mutants to exhibit increased TERRA expression since these cells will have open telomeric DNA or lack exonuclease activity, respectively.
Studying the Role of the Protein Npl3 in the Telomere Position Effect
David J. Temme,’16

Faculty Mentor: Julia Lee-Soety
Department of Biology

Supported by the National Institute on Aging/National Institute of Health

Telomeres, the ends of eukaryotic chromosomes, protect the chromosome from deterioration and joining with other ends. Since the ends of chromosomes shorten with each round of replication, the telomeres act as a buffer to ensure all vital genetic information is kept. The progressive shortening of the telomeres may eventually cause the cell to age and die. Some cells, however, have enzymes like telomerase that maintain telomere lengths. For this reason, telomeres may be directly related to the natural processes of aging. They may also be important in cancer biology because if cell aging is never triggered, the cell will not be able to control replication and will become immortal and cancerous.

Telomeres can also affect the expression of genes located near the telomeres (subtelomeric genes) in a gene-silencing mechanism called the telomere position effect (TPE). TPE occurs when a gene near the telomeric region is shut off. This is because the compaction of DNA that protects the chromosome ends is extended to nearby genes.

Our project is focused on further understanding the role of the protein Npl3 in the TPE mechanism by testing whether the absence of the NPL3 gene affects the expression of subtelomeric genes. This can be done in a number of ways. First, we could design specific DNA primers, a short nucleotide sequence used as the starting point of DNA replication, to knock out the NPL3 gene and test for the incorporation of a replacement gene by PCR. However, we decided to mate 2 haploid cells, cells that have 1 copy of each chromosome. Of these two cells, one would have an npl3 mutation and one would have a marker gene near the telomeric region. Mating these haploids produces cells with 2 copies of each chromosome- diploids. These diploid cells were then sporulated to produce daughter haploid cells through meiosis. We are aiming to produce haploids with both the npl3 mutation and the marker gene. We used the URA3 gene as our marker gene because its expression catalyzes uracil production, which, in the presence of 5-fluoroorotic acid (5-FOA), is converted into a toxic chemical that kills the cells. We then can plate our cells on SC-URA medium because only cells that have the URA3 gene will be able to grow, this is done to make sure our cells have the inserted URA3 gene. We will then plate our cells on medium with 5-FOA to determine if the URA3 gene near the telomeres is being expressed in the absence of Npl3. If the protein Npl3 plays a role in silencing subtelomeric genes, we would expect to find that npl3 mutants will not grow in the presence of 5-FOA because the URA3 gene should be expressed, causing uracil and then the toxic chemical to be produced.
This year's Summer Scholars Project, working with Mercedes Yanora, has heightened my interest in two rapidly exploding areas of historical research: gender, and identity. Her research on prostitutes (female only, for the purposes of this study), has revealed significant differences between official pronouncements regarding prostitution, and popular perceptions of the prostitutes themselves. Recognizing that she does not at present have the linguistic skills needed to read various records of people’s interactions with prostitutes, she very wisely chose to focus her current research on graphic representations of these legal but marginalized components of medieval and Renaissance society.

The second area, that of identity, is far broader in scope and extends her research into some outcomes that might surprise modern readers. Recognizing that prostitutes faced grim futures once they had aged out of the profession, wealthy patrons would sometimes endow specific convents as havens for those who left the profession voluntarily. As Ms. Yanora’s research shows, these institutions could become wealthy and powerful, influencing both ecclesiastical and secular authorities. It was thus possible for some of the least powerful members of society to become some of the more powerful, by choosing the path of repentance various institutions across Europe offered.

Prostitutes usually faced several impediments to social acceptance, beyond the stigma of their profession; most municipalities made a point of recruiting them from outside the civic ambit, in part to protect the reputation and honor of their native women. Most were poor, and therefore lacked a dowry, which made them virtually unmarriageable. The fact that some did eventually marry and others become nuns in important convents shows that we still have a great deal to learn about the ways in which residents of a town or city treated questions of identity, and how fluid and flexible some of their categories might have been.

In her continuing work on this topic in 2013-2014, Ms. Yanora will further explore these issues, and write what promises to be an innovative and provocative honors thesis that explores new ways of analyzing the world’s second-oldest profession.
Constructing Venetian and Florentine Prostitution From the Bottom-Up
Mercedes Yanora,’14

Faculty Mentor: Alison Williams Lewin
Department of History

Supported by the SJU Summer Scholars Program, and a Gift from Randall Miller

In 1358 and 1403, Venice and Florence respectively legalized prostitution within prescribed areas of their cities. They justified doing so for both religious and secular reasons: to protect their cities' honorable women from young men’s insatiable lust and to dissuade males from engaging in sodomy. Though viewing the prostitute as immoral, secular and religious authorities perceived the prostitute as a necessary and legal component of society as was the lesser of two evils.

Modern historiography often approaches prostitution from a top-down perspective. Noted historians like Richard Trexler, Ruth Karras, John Brackett, Gene Brucker, Guido Ruggiero, Trevor Dean, Monica Chojnacka, and Dennis Romano explore prostitution as seen through the eyes of secular and religious authorities. My aim, however, is to construct Venetian and Florentine prostitution from the bottom-up, to explore general popular perception of the prostitute. Court cases, rental agreements, medical records, illustrations, narratives, literature, and records documenting civic festivals show that no one concrete perception of the prostitute prevailed among the general population; rather, perceptions and interactions varied from situation to situation. So while many of Florence’s illustrious families rented their property to prostitutes, elsewhere parishioners might unite to expel prostitutes from their parish. Similarly, while in Venice prostitutes were banned from respectable areas, archival evidence presents court cases in which prostitutes provided critical testimony.

My study of medieval perceptions of prostitution will contribute to the modern historiography of gender during the Middle Ages. A fuller understanding of prostitution will emerge only from examining the general populations’ relationship with the prostitute.
Currently, my lab is studying two membrane proteins: fibroblast growth factor receptor 3 (FGFR3) and mucin 1 (MUC1). FGFR3 is a single-pass membrane protein that regulates cell growth, differentiation and motility. In the plasma membrane, FGFR3 interacts with another FGFR3 to form a dimer. Extracellular signals (ligands) bind to FGFR3 to stabilize the dimer, resulting in the transduction of the signals across the membrane into the nucleus. Overexpression and mutations in FGFR3 have been associated with skeletal and cranial disorders, and several forms of cancer. MUC1 is also a single-pass membrane protein, and is over-expressed in 75\% of all human solid tumors, including 90\% of breast carcinomas. In cancer cells, dimerization of MUC1 is necessary for forming complexes with other proteins and targeting to the nucleus, where MUC1 can interact with effector proteins regulating gene expression.

My research focuses on understanding the physical and chemical principles governing the dimerization of membrane proteins. Understanding how membrane proteins, such as FGFR3 and MUC1, form dimers are essential for developing novel therapeutic strategies to block their oncogenic effects.
Determination of Structural Differences Between the Wild-type and G380R Mutant of FGFR3
Joseph Collins,’16

Faculty Mentor: Dr. Edwin Li
Department of Biology

Supported by the SJU Summer Scholars Program and the Howard Hughes Medical Institute

Receptor tyrosine kinases (RTKs) are single-pass membrane proteins that are categorized as enzyme-linked receptors. RTKs have three distinct regions: an extracellular ligand-binding domain, a transmembrane domain (TMD), and a cytosolic kinase domain. RTKs are maintained in a monomer-dimer equilibrium. Ligands bind to the extracellular domain, which strengthens the dimers, allowing the kinase domains to cross-phosphorylate and initiate a signaling cascade inside the cell. The family of fibroblast growth factor receptors (FGFRs) is a part of the RTK group. This family consists of FGFR 1-4, all of which are involved in several aspects of cellular life such as cell growth, differentiation, migration and chemotaxis, angiogenesis, and survival.

The ToxR assay measures enzymatic activity as a reporter of the amount of dimerization that occurs between the TMDs of chimeric proteins. The chimeric protein consists of a maltose binding site, the cytosolic ToxR transcription factor, and the desired TMD. Previously, the ToxR assay was used to show that there is a structural difference between the TMD dimer of wild-type (WT) FGFR3 and the A391E mutant.

Currently, I am determining whether or not the dimer of the G380R TMD mutant is structurally different from that of WT FGFR3 TMD. The G380R mutation is linked to achondroplasia, a disorder that causes short stature by interfering with cartilage growth plate maturation of long bones. Following the same steps as the previous study using the A391E mutant, I am using the ToxR assay and mutagenesis to compare levels of dimerization. I am comparing the relative changes in dimerization induced by specific mutations (A374I, S378I and G382I) in the WT and G380R TMDs. These results will show whether or not the G380R mutation induces a structural change of the dimer.
Using the AraTM Assay to Measure the Dimerization of MUC1 Transmembrane Domain with the Juxtamembrane CQC Motif

Christopher Moll,’16

Faculty Mentor: Edwin Li
Department of Biology

Supported by the Howard Hughes Medical Institute, and a Gift from Nick Nicolaides ‘87

Mucin 1 (MUC1) is a single pass membrane protein that plays a role in hydration and lubrication of the glycocalyx. There are two subunits that make up the MUC1 protein. The N-term subunit, MUC1-N, is heavily glycosilated. The C-term subunit, MUC1-C, passes through the membrane of the cell. MUC1-Cs can interact and form dimers which have been found in breast and lung cancer cells. The amino acid motif of cysteine-glutamine- cysteine (CQC) is believed to play a role in the dimerization of the MUC1-C subunits. The CQC motif is located just outside the transmembrane region of the MUC1 protein, in the cytoplasm.

The AraTM assay uses a chimeric protein that has three domains: maltose binding, transmembrane, and AraC. The chimeric protein spans the plasma membrane of the bacterial cell. The maltose binding domain, at the N-term of the protein, is located in the periplasm and the AraC domain, at the C-term of the protein, is located in the cytoplasm. When the transmembrane domains interact to form a dimer it brings the two AraC domains close together. When the two AraCs are close together it allows them to bind to the pBAD promoter. This allows for the expression of a gene that produces green fluorescent proteins (GFPs). The assay measures the fluorescence of GFPs in the bacterial cells as a reporter of the amount of dimers present in the bacterial cells.

The goal of my project is to measure the amount of dimerization that occurs with a chimeric protein containing the MUC1 TMD with the CQC motif (TMD-CQC). Dimerization is measured using the AraTM assay. The dimerization of TMD-CQC will be compared to the dimerization of TMD-AQA. This comparison will show if cysteines play a role in dimerization. Understanding the dimerization of MUC1 is useful because MUC1 is over-expressed in many types of cancer.
Mucin 1 (MUC1) is a member of the mucin family of proteins. Mucins function to help prevent infection by pathogens. Pathogens tend to bind to the oligosaccharides in the extracellular domain of mucins, which are particularly prevalent in MUC1. MUC1 is a heavily glycosylated, heterodimeric transmembrane protein made up of two subunits. The overexpression of MUC1 and the changes in glycosylation have been linked to various cancers.

Most of the oncogenic effects of MUC1 are caused by the C-terminal subunit of MUC1, known as MUC1-C. MUC1-C contains a CQC motif in the cytoplasmic domain. This motif has been shown to be responsible for the formation of dimers and the oncogenic function of MUC1. In order to study the role of the cysteine amino acids in the CQC motif, mutants of MUC1-C were created by changing the cysteines to alanines. Cells expressing MUC1-C can be used to study the role of the two cysteine amino acids. The goal of my research was to produce stable cell lines of NIH 3T3 expressing MUC1, MUC1-C, and mutants of MUC1-C (CQC→AQC,CQC →AQA). Western Blots were then performed to verify expression of MUC1 and MUC1-C in these stable lines and to compare it with cells expressing the proteins transiently.
Susan P. Liebell
Department of Political Science
Saint Joseph’s University
Ph.D., The University of Chicago

Susan P. Liebell joined the faculty of Saint Joseph’s University in Fall 2003. Dr. Liebell’s major fields of study are the history of political thought, environmental politics, and constitutionalism. She is particularly interested in public law, American political thought, and green political theory. Dr. Liebell’s research and courses connect political theory and current political issues. She maintains that studying debates about rights, justice, or representation in the 17th and 18th century help us better understand current debates concerning environmental degradation, gun rights and gun control, and toleration in the 21st century. In addition to courses in political theory, Dr. Liebell teaches courses in public law, film, environmental politics, and directs the Philadelphia Area Internship Program.

Her book, *Democracy, Intelligent Design, and Evolution: Science for Citizenship* examines the controversy over creationism and Intelligent Design in Dover, Pennsylvania. She asks that we look at fights over science education as a challenges to democratic citizenship rather than religion that the Constitution excludes from the science classroom. Americans miss the mark if they ask “is it tolerable in a multi-faith society to mention Intelligent Design in a public school?” Defending against religion depends upon a constitutional ‘wall of separation’ between religion and the state. Yet such an approach neglects the substance of a liberal political identity reinforced by public education. A more promising strategy suggests that the teaching evolution is essential to liberal democratic practice and values. Courts and contemporary political theorists lack an effective defense of science education or even an effective vocabulary to frame the debate. This book supplies a discourse that advocates teaching science rather than explaining why Intelligent Design should be excluded as religion. Because science is a key component of modern liberalism, liberals can and should explicitly justify science education generally and the teaching of evolution specifically as crucial to three aspects of the liberal person: political citizenship, economic fitness, and moral choice.
In the 2012 election, candidate for Missouri Senate Todd Akin was asked to defend his “no exceptions” policy on abortions that result from rape. Akin declared that “if it’s a legitimate rape, the female body has ways to try to shut that whole thing down.” The ensuing controversy over what makes rape “legitimate” made rape into a divisive political issue in this election. But Akin’s comments also functioned as part of an ongoing historical discussion about rape that is still being negotiated. Rape is an old crime – dating from the Old Testament and Ancient Greece – but how it has been defined and punished has evolved.

Since American laws have their origins in British common law, I began my research by examining discussions of rape in William Blackstone’s *Commentaries on the Laws of England*, which served as the basis of American rape laws until the 1970s. I examined how rape cases were prosecuted in colonial times, paying careful attention to the difficulty women often faced in proving their testimonies as well as to the ways in which black rapists were punished far more harshly than their white counterparts.

Following the colonial period, I researched the ways in which attitudes about rape slowly began to evolve over time. First-wave feminists began to pave the way for more strict laws about rape, claiming it was one of many ways that men oppressed women. They rejected the idea that women were men’s property, thus opening the discussion on marital rape laws. The standard of resistance women were forced to show was lessened, though many still felt that physical force was a necessary component of rape. Despite progress on these fronts, though, black rapists continued to face harsher penalties even after the passage of the 13th amendment.

Finally, by the 1970s, second-wave feminists began to seriously discuss rape and the significant changes that needed to be made, both in policy and attitude. Significant legislative changes came about, including a complete replacement of the old common-law attitudes in favor of laws that are less biased against women. Additionally, rape began to be seen as a crime of power rather than passion.

Despite this progress, though, there is still a significant amount of work to be done in regards to rape in 2013. Through my research, I have identified five major attitudes about rape that need to be changed in order to prosecute this crime more effectively. They are: the resistance standard, racism, victim-blaming, fear of false allegations, and the rape pregnancy myth. My research demonstrates that much more needs to be done in order to fully prosecute rape.
Mike Lyons
Communication Studies
Saint Joseph’s University
PhD Indiana University

Research Interests: Digital media and social movements, collaborative online communities, urban communication

My research interests currently focus on the intersection of media, particularly digital media, and social movements. I am currently working on a project that examines digital media use among “activists” concerned with the public school crisis in Philadelphia. I use the word “activists” in quotes because many of the people involved in this movement would not consider themselves activists. Nor would most scholars in traditional studies of social movements. Digital media and online platforms have allowed concerned parents, teachers and residents unaffiliated with any formal organization a means to participate in a crucial civic issue. This fluid form of “liquid organizing,” as opposed to “solid” forms of organizing like trade unions, is changing what it means to be civically engaged.

This stream of research fits nicely with my teaching interests and the overall mission of the Department of Communication Studies, which is at the forefront of teaching and examining the use of digital media for social change.

My interests also coincide Laur Fiatoa’s work on her Summer Scholars project. The citizen movements in the Middle East, where Ms. Fiatoa’s research is focused, in recent years have invigorated this area of inquiry and have given rise to this concept of “liquid organizing.” Ms. Fiatoa’s work helps fill a gap in our understanding of the role of “bridging” figures in the political change in the Middle East, particularly Egypt, Libya and Tunisia.
Social Media and Social Capital: A Case Study on Andy Carvin’s Use of Twitter to Effectively and Remotely Report the Arab Spring
Lauren Fiatoa,’14

Faculty Mentor: J. Mike Lyons
Department of Communications

Supported by the SJU Summer Scholars Program

Today’s digital media scholars are developing experts in a field that is consistently changing the way the average citizen is both producing and receiving information. Through the use of social media, the interconnectedness is clear; however as history is happening in the present, new complications arise. One issue is establishing credibility. Most social media platforms are a free service, and in turn they do not bar access. The idea of using Twitter as a source for news forces the individual to filter through information en masse on such an extensive site to find the most credible news source. Conversely, establishing credibility as an independent source for news, while not in direct conjunction with a major traditional media source, is increasingly difficult. These ideas sparked my interest in understanding how Twitter can be a verifiable news source. Andy Carvin, Social Media Manager for the National Public Radio was presented the rare opportunity during the Arab Spring to spearhead an entirely different position for himself. He was not merely posting links to what NPR was doing on various platforms, he was creating news- in real time.

Carvin’s coverage of the Arab Spring was entirely unique, forcing experts in social media to explore the way in which Carvin was reporting history in real time a continent away without ever leaving his home, or even the United States. He was able to do so due to intensive preemptive work to construct a network of primary sources on the ground in Tahrir Square that were fighting…and tweeting. To better understand exactly what and how Carvin was able to coalesce his credibility, as well as the information needed to stand out above the din on Twitter during the Arab Spring, my research lead to understanding Robert Putnam’s theory on bridging and bonding for social capital and then utilizing that knowledge to analyze Ethan Zuckerman’s work on bridging in the digital media age. Using Zuckerman’s work, I was then able to create a model in which to better understand how Carvin was able to effectively become a “bridge figure” for those not in Egypt at the time of the revolution but who wanted to know what was happening as it happened.

The rate at which social media is progressing, understanding what Andy Carvin was able to do in Egypt and (most importantly) replicate in Tunis, Bahrain and various other countries involved in the Arab Spring, highlights the efficacy and future potential for digital media new sources to report history.
Maria S. Marsilio
Director, Classics Program
Director, Honors Program
Saint Joseph’s University
Ph.D. University of Pennsylvania

Research Interests: Scholarly research and publications focus upon Greek epic poetry (Homer and Hesiod); Greek lyric, elegiac, and iambic poetry; Roman lyric and elegiac poetry (especially Catullus); poverty and hunger in antiquity

My research interests and scholarly publications focus principally upon Greek and Roman poetry and society and, in particular, themes of poverty and hunger in classical literature. My article “Hesiod and Theognis on Poverty” (2002) was the first in-depth exploration of the significance of the concept of poverty in Hesiod’s poetry and the first that showed how poets could differ in their views of poverty when speaking from different levels of society: Hesiod as “peasant” farmer/poet and Theognis as “aristocrat.” My article “Poverty and Poetic Rivalry in Catullus” (2006) is the first to demonstrate a literal and metaphorical reading of poem 23, addressed to Furius, with whom Catullus engages in a sexual and literary rivalry for the affections of a lover, the aristocratic Juventius. Catullus exploits the contrast between Furius’ poverty, which reduces him to beggary, and Catullus’ own poverty, which still enables the poet to offer something valuable: poetry that is witty, refined, and amorous. My article “Mendicancy and Competition in Catullus 23 and Martial 12.32” (2008) builds upon this last piece in its study of the epigrams of the poet Martial (born c. 38-41 CE and died c. 101-104 CE). Martial, who himself claims to write in the tradition of Catullus, in several of his epigrams on poverty, has borrowed from Catullus’ poetry far more closely than has been acknowledged. While Martial lived in the 1st century AD and Catullus lived in the 1st century BC, composing poetry within differing societies, both poets make claims of personal poverty in the context of asserting their literary merits, and both criticize rivals for their extreme poverty that reduces them to beggary and prevents them from a mutually satisfying, reciprocal exchange of material and creative gifts. Still, Martial takes a more ambivalent, problematical stance on the relationship of poverty and wealth, and he exhibits a greater awe of the wealthy and interest in the tensions between wealthy and poor. I explore the structural, thematic, and verbal correspondences between several of Martial’s poems on poverty and Catullus’ poems on poverty and hunger, and I argue that the closeness of these correspondences creates doubt that Martial’s and Catullus’ poems reflect the precise realities of Roman life. Among my most recent publications are an article on beggars for Wiley-Blackwell’s new Encyclopedia of Ancient History and an article on love and literary criticism in Catullus 36 for Collection Latomus.
Helen of Troy: Was it Seduction, Rape, or a Phantom?
Katherine Dodel,’15

Faculty Mentor: Maria Marsilio
Department of Classical Studies

Supported by the SJU Summer Scholars Program

Helen in antiquity is famous for possessing the “face which launched a thousand ships” thereby starting the war between Troy and Greece, but various authors shed differing lights upon Helen and whether or not she was snatched away from her Greek husband, Menelaus, or whether she went willingly with Paris to Troy. For instance, in Homer's *Iliad*, Helen is taken from Menelaus by the goddess Aphrodite and given to Paris as a prize. Although Helen seems to go with Paris willingly, Aphrodite must threaten her in order to drive Helen to his bed; these threats along with Paris's own physical allure lead Helen to surrender to him. Helen may have left with Paris, but she doesn't understand the egregious consequences of her actions until later. In Euripides's *Helen*, Hera steals Helen away from Aphrodite and hides her on an island ruled by a tyrant who wishes to marry her. In this account, a “phantom” takes the place of Helen in Troy while the real Helen is kept captive in this foreign land where she wishes day and night that Menelaus would return to her. In a work by the Greek poetess, Sappho, Helen is portrayed as a noble lover of Paris who willingly left her husband behind in order to follow her heart. She was not only physically seduced by Paris, but also mentally. In Greek law, there is a distinction between rape and seduction, the latter being more severe because it means that one has ensnared a woman's mind, as well as her body. Seduction was clearly apparent in Sappho's poem and would have been regarded as a more severe affront to the Greeks of Helen's time. In Stesichorus's *Palinode*, he claims that Helen never went to Troy. In Plato's *Phaedrus*, he records that Stesichorus was blinded due to the erroneous slandering of Helen, claiming she left for Troy with Paris. His recognition of this falsehood resulted in his *Palinode*, which stated that she never in fact left Greece.

This project began with research on each of these works and the contexts in which they were written, particularly in regards to Sappho and Stesichorus. Each account of Helen recalls the same woman, but the accounts differ markedly. The main goal for this project was to gain insight into the female psyche of Helen. One of the difficulties encountered while studying women of antiquity in literature is that these works, with the exception of Sappho's poem, were written from a male perspective. This means that the ways in which Helen responds to her situation and the understanding of her mental state during the course of her ordeals may be interpreted differently when a female perspective is applied. I wanted to take each story of Helen and dissect the different psyches given to her by the authors so that I might determine her internal dialogue. Through my project, I aimed to give Helen a female voice in each of these works through monologues. In order to do this, I used my experience in theatre and acting to develop the various characters of Helen. I was able to develop a more personal emotional background for Helen and attempted to recreate a vignette of the psychological ups and downs she would have experienced.
“Hic Vagabundus Romanus: A Year Musing and Freewheelin’ through Scotland”
Alexander Houpert,’14

Faculty Mentor: Maria Marsilio
Department of Classics

Supported by the SJU Summer Scholars Program

This Summer Scholars project is a bit unconventional. Then again, so was the trip. Having spent 9 months revivified in Edinburgh, Scotland on fellowship from the St. Andrew’s Society of Philadelphia, I sought upon my return to fuse my passions for writing, drawing, photography, and poetry into a distinctive batch of storytelling that hopefully will be unlike any other creative Summer Scholars project. The book was driven by honesty, and the stories are rooted in truth, for I strove to accompany the trailblazers upon the path by attempting to produce a true literary work, a whole embodiment of my efforts.

Throughout my brief 20 years, stories have shaped me, and adventure has carved me, but Scotland, that mystical land, has come to redefine me. The time I spent overseas reshaped my entire world view, and the stories and adventures I brought home begged and pleaded, “Tell us! Share us with whoever wants to hear, to read, to enjoy!” The book is thus one big story. It is my story. And I’m grateful to have been given the chance to recount my personal journey in my own voice.

The book’s modus operandi is eclectic, eccentric, and at times jarring. The narrative of my experiences unfolds like a piece of paper crumpled into a ball. Like Scotland herself, peaks and valleys intertwine with heather hillsides and rocky crags as it all tries northward. I endeavored to write honestly and diachronically. I took classes on Scottish fiction, researched Edinburgh’s secrets in the closes, and stammered out ancient Greek. I sprinted across English fields, brewed black tea constantly, and caressed old decomposing books. I horded ATM receipts from Italy, pocketed museum brochures in Amsterdam, and swam elated off of Portuguese beaches. Retrospection and introspection formed the girders of this project’s structure and atop sundry scaffoldings I hammered at the exterior. When inside the idea, I sat wide-eyed in wonderment and kept on writing. The book is the odd fruit of odd labors.

As a student of classical languages and literatures, I cannot help but marvel ad infinitum at the mammoth influence ancient cultures, especially the Romans and Greeks, have had on the Western World. During my travels, I was confronted by legions of Roman phantoms along Hadrian’s Wall; I heard lions roar and swords clangor in the Amphitheatrum Flavium; I now too call Edinburgh the “Athens of the North”; I wandered through Neolithic kitchens, and I wondered at all I saw. All the while, I kept reading, questioning, and immersing myself in the intimate marriage between modernity and antiquity. This union holds firm the iron sickle of history, slash-hooking choice story-stalks to ascend sunwards while time carps incessantly at the old roots and shoots of forgotten legends. Through this strange field which covers the isle Brittania I tread and through the fog and wind I hiked onwards whichever way the trails lead, inspired forever mad by the thrill of writing and the joy of storytelling.
John J. McCall  
Departments of Philosophy and Management  
Saint Joseph’s University  

Ph.D. University of Notre Dame  

Research Interests:  
Business Ethics, Moral Philosophy, Political Philosophy  

My primary teaching and scholarly focus is at the intersection of Philosophical Ethics and Business. I teach Business Ethics classes at the undergraduate, MBA and Executive levels, an Ethics in Educational Leadership course in the Ed.D. program as well as undergraduate classes in Moral Philosophy. My scholarship has primarily been in Business Ethics with a special focus on questions of employee rights. With those interests, I was lucky to find a home at Saint Joseph’s 30+ years ago. The mission and tradition of the university offered a natural fit for my scholarly focus and made easier my bridging between Philosophy and the Haub School of Business. As former President Nick Rashford, S.J. often noted, Philosophy and Business were two of the first subjects taught in the early years of Saint Joseph’s College. That is a tradition that I am proud to help sustain.
The Ethics of Microfinance
Rosanna DeFilippo,’15

Faculty Mentor: John J. McCall
Departments of Philosophy & Management
Director – Pedro Arrupe Center for Business Ethics

Supported by the SJU Summer Scholars Program

Since the mid-1970s, thousands of microfinance institutions have been established globally. While there are many small microfinancing organizations, some of the largest microfinancing institutions are branches or sectors to large global banks. This expansion has begun to blur the borders between traditional microfinancing and the larger, global financial system. Due to this large expansion, it is arguable that the goals of microfinancing have shifted which raises the question “do microfinancing institutions currently maintain the ethical objectives with which they began?”

The goal of microfinancing is two-fold: to eradicate global poverty and to ensure “equitable and sustainable development.” This foundational statement for microfinance as a whole will be the standard for evaluating the ethics of three organizations: Grameen Bank, Kiva.org, and Swayam Krishi Sangam (also known as SKS). Even though all three of these companies are a part of the microfinancing world, each brings a unique and different stance on the execution of microfinancing. The goals of these ethical analyses are not to judge organizations as a whole as ethical or unethical, but to objectively look at organizational practices and raise ethical concerns about specific practices. Specifically, the analysis asks whether the original goal of microfinancing, the eradication of global poverty and the ability to ensure “equitable and sustainable development,” is the first priority for the organization and for those who work for it.

In this assessment, the focus is on two specific areas: the outcomes of the lending and the process of the lending. When looking at the outcomes of the lending, the focus is on the quality of life of the borrowers and the degree to which the loans further equity by improving the standing of women in their communities. By evaluating the quality of life before, during, and after the microloan is made, and by inquiring about the impact of the loans on the status of women, an ethical assessment can be made about the effectiveness of the practices of microlending institution. When evaluating the lending process, the main focus was the transparency provided to both borrowers and contributors by the microfinancing institutions. Some of the items that were evaluated were loan interest rates, and the type and amount of information released to borrowers and contributors to name a few.
Research in my laboratory involves the examination of animal behavior through studies on rare, exotic and, in many cases, endangered species of fish, reptiles, amphibians, and insects.

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

Our amphibian work focuses on environmental factors such as temperature, pH, density and pollution that influence metamorphosis. We are currently looking at metamorphosis across a wide variety of poison frogs and we run a yearly project in which elementary school children study metamorphosis in American toads.

Our reptile work involves the study of life history traits in rare turtles and we currently house a number of assurance colonies containing some of the world’s most endangered species. In addition we are involved in a long-term study to catalog the turtle community at the John Heinz Wildlife Refuge.

Finally, our work with Drosophila involves analysis of the genetic and evolutionary bases of sexual behavior. Current projects include an examination of interspecific interactions in local Drosophila communities and a project to understand the effects of sleep deprivation on sexual behavior in Drosophila.
Long-term Mark-Release-Recapture Study to Analyze the Population Dynamics of Turtle Species at John Heinz National Wildlife Refuge
Maria Galassi,’15

Faculty Mentor: Scott McRobert
Department of Biology

Supported by the SJU Summer Scholars Program, the McNulty Scholars Program and Howard Hughes Medical Institute Grant

The John Heinz National Wildlife Refuge at Tinicum is designed to protect the last 200 acres of freshwater tidal marsh in Pennsylvania. Despite its urban surroundings, the Refuge has become a sanctuary to a broad diversity of wildlife, including five species of turtles. These include PA-state-threatened Red-bellied Turtles (*Pseudemys rubriventris*), Eastern Painted Turtles (*Chrysemys picta*), Common Snapping Turtles (*Chelydra serpentina*), Common Musk Turtles (*Sternotherus odoratus*), and invasive Red-eared Sliders (*Trachemys scripta elegans*). This summer, I worked in collaboration with St. Joseph’s University and John Heinz National Wildlife Refuge to begin a long-term mark-release-recapture study to analyze the population sizes for all turtle species on the refuge. In general, freshwater turtle populations have been declining worldwide. Gathering information now about the population size of all turtle species within the Refuge is important for gauging how changes in the environment will affect them in the future.

This study involved the trapping of turtles to gather data on size, distribution, diet, population, and movement. Turtles were collected using three techniques: baited hoop net traps, floating basking traps, and hand captures/dipnetting. Processing turtles involved measuring weight, plastron length, and carapace length, width, and height. Sex was determined by assessing secondary sex characteristics, and any signs of deformity or injury were noted. Fecal samples were also collected for dietary analysis. Each captured turtle was identified by use of PIT tags (Passive Integrated Transponders), microchips that contain a unique serial number that can be read by a scanner. AVID ® 2023 MUSICC Chips were inserted into the right flank of each turtle using AVID ® Monojet Injector 3001. The chip was scanned with the reader AVID ® Power Tracker 1003, and the serial number was recorded. This information, along with environmental factors (weather, temperature, etc.), was entered into a database, which will continue to grow in the years to come. Over the course of this summer, 123 turtles were captured, marked, and released.

Another component of this project involved visually marking adult turtles in a way that it was easy for members of the public to see. All-weather livestock paint sticks were used to mark 10 turtles of each species. Each species was given a specific color, and various shapes were assigned to identify individuals within a species. By marking the shells this way, we involved visitors to the Refuge in the project by having them report turtle sightings. This “Citizen Science” component provided a great opportunity to communicate the importance of conservation and scientific study of our wetlands.
A Survey of the Wild Populations of Drosophila in the Philadelphia Area
Leigh Anne Tiffany,’15

Faculty Mentor: Scott McRobert
Department of Biology

Supported by the Howard Hughes Medical Institute, and the Department of Biology

*Drosophila* is a genus of over 2,000 small flies commonly named as pomace flies or vinegar flies. Often incorrectly referred to as fruit flies, *Drosophila* are model organisms in the study of genetics, and are frequently studied in captivity and in laboratories. With their diet of rotting fruits, *Drosophila* typically have no impact on agricultural or other ecological industries, as do true fruit flies that feed on living fruit.

In this study, we have begun an investigation of the *Drosophila* species living in the Philadelphia area. This work follows on earlier studies conducted in this area in the 1980’s and, we hope, will continue for many years to come. The results of this work will provide an understanding of the native *Drosophila* community and will provide a foundation for examination of changes to the community such as those that might accompany the appearance of the invasive species, *Drosophila suzukii*. In addition, species collected in the wild are brought into the laboratory where life history profiles, including copulation frequency, copulation latency, copulation duration, and offspring production, will be completed.

Since January 2013, *Drosophila* have been collected from two location sites in the Philadelphia area: one in a suburban neighborhood in Villanova, Pennsylvania, and a second at Latches Wood in Bala Cynwyd, Pennsylvania. At each site a trap consisting of a plastic cup filled with a mixture of bananas and yeast was hung from a branch at eye level. Every Monday, Wednesday, and Friday, *Drosophila* were collected from these traps. The time of collection, air temperature, weather patterns, and number of flies (listed by species) were noted. Some females were housed in vials and their offspring were used to create laboratory stocks for future studies.

![Counts of Drosophila Collected in the Philadelphia Area by Month](image)

**Fig. 1:** Counts of *Drosophila* collected in the Philadelphia area in May, June, and July 2013.
Life History Analysis of \textit{Drosophila simulans}
Neil York, ’15

Faculty Mentor: Scott McRobert
Department of Biology

Supported by the Howard Hughes Medical Institute, and the Department of Biology

In \textit{Drosophila} the mating system is known as “female-choice” because the female controls the acceptance or rejection of copulation in response to male courtship displays. These reproductive behaviors are part of an overall description of a species known as a life history profile, which encompasses growth, development, and specific reproductive traits such as courtship behavior, copulation frequency, copulation latency, and copulation duration. Also, despite recognition as model organisms in genetics since 1908, little is known about the life history of many \textit{Drosophila} species.

Annually in August, \textit{D. simulans} are collected in Emerald Isle, North Carolina to form a laboratory stock. This study compares the sexual life history parameters of two \textit{D. simulans} stocks collected from Emerald Isle, NC, one from 2010 (’10) and one from 2011 (’11). This comparison was conducted to determine if reproductive life history characteristics vary between years. Sexual life history traits may be the first parameters to change in response to environmental change; therefore, differences in these traits may signal evolutionary divergence between populations.

Virgin flies were collected within 6 hours of eclosion. Males were housed individually and females in groups 2-10 for 3-5 days. For each test, an individual male and individual female were aspirated, without anesthesia, into a vial containing Carolina Instant Media, a 0.5% propionic acid solution, and yeast. The vial was placed on its side and observed for 3600 seconds. During observation, the following parameters were monitored: Male Courtship (yes/no), Copulation (yes/no), Copulation Latency (time in seconds until copulation is initiated), and Copulation Duration (time, in seconds, the pair remain in \textit{copula}). Crosses were initially performed on flies within the same year’s population: \(\delta^{'}11 \times \varphi^{'}11\) and \(\delta^{'}10 \times \varphi^{'}10\). To test interactions of \textit{D. simulans} from different populations, copulation tests were run: \(\delta^{'}10 \times \varphi^{'}11\), and \(\delta^{'}11 \times \varphi^{'}10\).

Copulation frequency for the \(\delta^{'}10 \times \varphi^{'}10\) cross (71%) was significantly higher than copulation frequency for both the \(\delta^{'}10 \times \varphi^{'}11\) cross (46%) and the \(\delta^{'}11 \times \varphi^{'}10\) cross (47%). Copulation latency was not significantly different between any of the crosses. Copulation duration for the \(\delta^{'}10 \times \varphi^{'}10\) cross (1193 +/- 67 sec) was significantly lower than the \(\delta^{'}11 \times \varphi^{'}11\) cross (1520 +/- 62 sec), the \(\delta^{'}10 \times \varphi^{'}11\) cross (1484 +/- 80 sec), and the \(\delta^{'}11 \times \varphi^{'}10\) cross (1664 +/- 61 sec). The 2010 \textit{D. simulans}, crossed within population, had the highest copulation frequency and spent the least amount of time in \textit{copula}. Future plans for this project include adding a 2013 \textit{D. simulans} stock from Emerald Isle to the analysis.
I am most interested in the area of hunger, both domestic and global. I traveled to Ghana in West Africa in 2007 to work with farmers. My reason for being there was to help them to distribute their products more effectively. I also traveled to Ghana later that year to help small businesses develop business plans with microloan funding. While neither of these trips directly dealt with hunger, they allowed me to work with poor farmers and others to develop a source of resources which would make them more able to buy the foods that they needed.

I am the faculty advisor for the Hawks against Hunger and I am pictured (I am the grey beard) above with officers and members at last year’s Walk against Hunger. This is an annual walk which takes place the second Saturday in April. The Hawks have consistently been in the top five among organizations raising money through the event.

I also teach a class “Food and the Poor” in which the students, besides learning about the causes and possible solutions to hunger, have to volunteer for three hours a week at a site which feeds those in need.

I am a member of the Board of Directors of Philabundance, which runs the Philadelphia Food Bank, and have been an integral part of developing creative on the ground solutions to hunger. Two of these, Fresh for All and the Community Food Cupboard have gotten a great deal of publicity in the local media.

Currently we are working on another project which we hope will be a partial solution to food deserts, urban areas without access to full line supermarkets and too much access to fast food restaurants. I worked with Lauren Cherry this summer studying the differential effects of urban and rural food deserts. This ties into my current sabbatical research project studying “Best Practices for Food Banks in the U.S.”
Efficient Distribution of Food in Rural and Urban Food Deserts
Lauren Cherry,’15

Faculty Mentor: Martin Meloche
Department of Food Marketing

Supported by the SJU Summer Scholars Program

The term “Food Desert” is one that has grown in use more and more lately, but what does it really mean? A food desert is a region with low access to fresh food retail locations like grocery stores and farmers’ markets. It also involves an over availability of foods that lack proper nutrition are found at fast food restaurants and corner bodegas. Everyone knows that fruits and vegetables are a vital part of a healthy diet, but when the products are out of reach because of distance people are simply not going to get the proper nutrition. If a mother who has no car has to balance a full time job and children with no car, getting to the grocery store that sells a large variety of healthy foods five miles away is nearly impossible. In this case, the mother has to settle for the convenience store down the street that sells the food filled with salt and cholesterol.

The concept of a food desert has become a main contributor to many negative health conditions in America such as obesity, diabetes, heart disease, and high cholesterol. The worst part about the growing issue of nutrition deficiency is that children are affected just as much as adults, but with worse effects. This problem starts when a child is in their mother’s womb; if the mother is not eating well, neither is the child. That problem carries over into school because children especially need nutrition to develop properly and learn sufficiently in school. When proper nutrition does not occur during early education, the whole cycle of poverty and malnutrition starts over with a new generation.

Although food deserts are common in inner city neighborhoods, the bigger struggle is found in rural food deserts. Rural food deserts present even more challenges because of the long distances to stores and town centers and the lack of public transportation. Residents of rural areas are accustomed to driving long distances to stores, but if someone is sick, cannot afford gas, or does not have a car, getting food is much more difficult.

Joe Arthur, the Executive Director of the Central Pennsylvania Food Bank, faces the challenge of getting fresh foods to both urban and rural residents every day. He says that reaching rural people with fresh food is much more difficult than urban people because the long distances mean farther truck routes, higher gas costs, and more time. The cost of delivering food per person in a rural region is much higher than in urban areas. Arthur also pointed out the difference in attitude in the two regions; people of rural regions are more likely to be conservative with a sense of pride that rejects government “handouts” while city dwellers are more apt to apply for and accept government food programs like SNAP and WIC. Arthur states that the food bank’s programs like “Fresh Express”, which is a refrigerated truck that delivers fresh food to different regions of the 27 counties in the Central Pennsylvania territory, has been very effective in getting to those hard to reach regions of the state.
Martha Mercantini
Department of Special Education
Saint Joseph’s University

Ph.D. The State University of New York at Buffalo

Research Interest: Using a Sociocultural Reading Practice (Family Literacy Night) to Increase Student Engagement with Summer Reading

My research examined the effects of supporting a summer reading program for struggling readers with special needs, utilizing balanced literacy instructional methods and a sociocultural practice (Family Literacy Night) as a summative component. Teachers and literacy experts agree that children of all ages need to be read to or to read by themselves and to talk about books over the summer. However, in many cases, summer reading is non-teacher facilitated, leaving students to practice and redefine literacy skills on their own. In this study, the metacognitive modeling that sociocultural theory demands not only helped the students recall successful reading strategies/practices, but it also gave students the opportunity to experience a complete literacy process, one that encourages students to read for pleasure.

Having student summer scholars to assist and share in both the development and execution of this project was an extraordinary advantage. Casey Leonard ’15, and Taylor Oskowiak ’15 were both interested in studying literacy engagement and because their theoretical foundations that supported their projects were similar to my own, it was a wonderful opportunity for us to work collaboratively.

Casey Leonard ’15 project How Teachers Can Create Interested Readers in the Classroom examined how teacher’s reading habits and instructional values support student interest. As an assistant in my research project, Casey witnessed how the value for student readers to be interested and engaged in what they are reading, especially for those students that are struggling, could directly impact their attitude and efforts. Furthermore she recognized that much of this responsibility falls on the teacher. Thus, the focus of her research became how teachers can transform classroom reading practices into instructional time that allows children to not only become better readers, but also more interested, involved, and active booklovers. Taylor Oskowiak ’15 project Linking Theory to Practice: The Process of “Building” an Effective Classroom Library contemplated how a classroom library can best support literacy practices in a culturally and exceptionally diverse classroom. The extensive classroom libraries at the school for our summer research project intrigued Taylor. She began surveying and interviewing the teachers involved in the study about their use of classroom libraries. Accordingly, the focus of her research considers what is needed in order to develop effective classroom libraries that are diverse, can generate student interest and motivation for reading, support differentiated instruction, and provide the means to develop expert reading skills. It was a successful experience for us to work collectively this summer. I am especially excited to incorporate these findings in my courses as I help prepare future teachers to work with students with high incidence disabilities in the reading process.
Research suggests that today’s teachers direct the majority of reading instruction time towards improving students’ reading ability and use of strategies (Daily Times, 2013)\(^1\). Our students are struggling to enjoy learning with the present constraints placed on school programs and teachers. Schools direct reading instruction towards best practices that focus on improving fluency, speed, and comprehension in order to better outcomes on standardized testing (Clark et. al, 2006)\(^3\). However, after conducting a review of the available literature, I found a lack of research suggesting the influence student interest poses on young readers. As a summer scholar, I have had the opportunity to question how enthusiastic teachers can transform ordinary classroom reading practices into instruction time that allows children to not only become better readers, but also more interested, involved, and active booklovers.

In order to begin my research, I began with a thorough review of literature in order to discover what types of reading instruction are being used, which are most effective, and the overall goal of these practices. After reading articles by teachers, researchers, and parents, the consensus is that in the early years of education, children are not given the chance to learn to love to read (Daily Times, 2013). While there are many appropriate strategies for teaching phonics skills, comprehension, vocabulary, and fluency, there is little information available to support uninterested readers. After my experiences working as a summer scholar this summer, it is my opinion that interest in reading is as equally important as ability.

Then, to support my findings, I was able to conduct a brief survey in hopes to find more information directly from teachers currently working in the field, to confirm and support my findings. The survey, which was distributed in convenience to multiple K-8 teachers, helped me narrow my research come to more accurate conclusions. As the summer progressed, I was given the opportunity to take part in a summer program at a school in the area. While working as a research assistant this summer, I was able to witness first hand the influence of enthusiasm as a stimulant for reluctant, struggling readers.

This experience has helped me further not only my experience within a classroom, but my overall teaching philosophy. As I continue my project, I hope to be able to apply my findings to my education and my future practices. I hope to use my research to write about interest in reading and how to best incorporate it into the classroom.


Linking Theory to Practice:
The Process of “Building” an Effective Classroom Library
Taylor Oskowiak, ’15
Faculty Mentor: Martha Mercantini
Department of Special Education
Supported by the SJU Summer Scholars Program

From the start of the Summer Scholars program, I conducted a review of research to find out which practices were most effective when building a classroom library. The amount of time students spend reading in the classroom accelerates their growth in reading skills (Neuman). Reading achievement, however, is influenced not only by the amount of time-spent reading, but by the frequency, amount, and diversity of reading materials available for students. There are multiple elements that go into building an effective classroom library that span from organization, to gathering culturally relevant reading materials. Stocked, high-quality classroom libraries can generate interest and motivation for reading, support differentiated instruction, and provide the means to develop expert reading skills (Catapano 2009). In the education field today, there are many classrooms that do not have classroom libraries, or do not have effectively constructed libraries. The purpose of my research was to understand the elements of how a classroom library could be built in order to effectively benefit students.

Throughout my research, I found that implementing the right practices when building a classroom library results in a more literate classroom environment. The more contact children have with books, the better readers they become. An effective classroom library will support literacy practices under the pretense that specific criteria are met. Effective classroom libraries focus on quality over quantity. Books inside of one’s classroom library should consist of various texts, formats, genres, and topics. An availability of selections for differentiated reading levels must be present (Catapano 2009). The contents of the library should be organized in a way so that students are able to select books that are both of interest to them and on their independent reading level (Kimberly 2012). The library should contain literature that is culturally relevant in order to open students to new perspectives (Neuman). The classroom library serves to not only support literacy instruction but also provides opportunities for independent reading and curricular extension.

Linking theory to practice, I distributed a survey to current educators teaching emergent readers in K-8 classrooms. The survey inquired about literacy within their past, current, or future classrooms. The survey consisted of likert scale questions, which required the participants to best define their literacy practices. Additionally, the survey included open-ended questions, which inquired about their pedagogical practices and the benefits of having, or creating, a classroom library. Once I receive the survey results, I can identify what an effective classroom library looks like and how theory can be put into practice. From my preliminary research, I can further my findings in establishing a model for teachers to reference, a ‘steps to appropriate practice,’ which outlines and explains the criteria of building an effective classroom library. It is the hope that future and current teachers will be able to correctly establish a classroom library that benefits the literacy needs of their students.

Neuman, Susan B. The Importance of the Classroom Library. Scholastic.
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, and media images and interests. Such work has led to books on such varied subjects as slavery and freedom in the Old South, soldiers and the home front during the Civil War, Lincoln and leadership, 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 (especially in urban settings), urban transformations (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 is the book, “Dear Master”: Letters of a Slave Family (Cornell University Press, 1978, rev. and enlarged pbk. ed., University of Georgia Press, 1990), 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 push 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). Most recently, I have been exploring several topics related to home fronts in wartime and politics and religion, and I recently co-authored a book on the northern home front during the Civil War. At the same time, I continue my interest in discovering the dynamics and directions of American politics, a subject that includes team-teaching a course on elections with Dr. Frances Graham Lee of the Political Science Department and commenting on politics for radio, TV, and newspapers, when asked. Such interest led to discussions with Victoria DeMarco about the Catholic vote in presidential politics, a concern much debated over the past half-century but only erratically investigated. Her current work on the election of 1964 promises to fill a significant gap in the literature, which has focused much on the Catholic vote and John F. Kennedy’s 1960 presidential run but left the immediate post-Kennedy era in the shadows. Understanding the ways political parties sought to recruit and hold Catholics and Catholics’ own heightened political awareness during the 1960s, and after, is essential to understanding both American politics and Catholic identity(ies) and interests.
Due to xenophobia and fears of popery, the role of Catholics in politics in the United States has often been limited. From the anti-Catholic sentiments of the Know-Nothing Party in the 1840s and 50s, to the failed presidential campaign of Catholic Alfred Smith in 1928, Catholics have faced years of discrimination and distrust from the rest of the American population. Following Smith’s loss and despite the increase of Catholics from approximately one-sixth to one-quarter of the US population by mid-century, no other Catholics would be nominated for the presidency until John F. Kennedy’s nomination in 1960. With 78% of Catholics supporting Kennedy, the Catholic vote played a crucial role in ensuring his close victory over Richard Nixon. As a result, the 1960 election is still remembered as a major event in Catholic history in America, and the role of Catholic voters in Kennedy’s victory has been heavily researched. Yet despite the fact that a Catholic has not been elected President since JFK, the Catholic voting bloc has continued to be an influential force in American politics in the years following 1960. However, its impact on presidential election results during the years immediately following 1960 has been little studied in comparison.

During the summer of 2013, under the mentorship of Dr. Randall Miller, I have examined the role of the Catholic vote in the 1964 presidential election and have come to a better understanding of the impact of Catholics in politics during this period. Concerned with social justice, civil rights, and foreign relations issues, Catholics rejected Republican candidate Barry Goldwater as an extremist, and chose incumbent Democrat Lyndon B. Johnson by a margin of 76% to 24%. By studying Catholic journals, such as Commonwela and America, Catholic archdiocesan newspapers, scholarly works, and political polling available from the time, it is evident that issues such as poverty and racial integration (both in neighborhoods and schools) played a much larger role in determining the Catholic vote than a candidate’s religious preference. For example, despite the fact that Barry Goldwater chose Catholic William E. Miller of New York as his running mate, Goldwater still lost the Catholic vote in an extraordinary fashion. In comparison, Johnson, who had championed the Civil Rights Act of 1964 and his War on Poverty during his short tenure as president following Kennedy’s death, won the Catholic vote by focusing on issues that directly concerned them. From the primaries to the final presidential vote of the 1964 campaign, it was clear that the religion of a candidate had become a less important issue, while religious matters, such as care for the poor and fair treatment for minorities, had become increasingly more important.
Elizabeth Morgan
Music, Theatre & Film
Saint Joseph’s University

Ph.D University of California, Los Angeles

Research interests: Keyboard and chamber music of the late eighteenth and early nineteenth centuries, music and gender, music and the body, virtuosity

My research focuses on music as an embodied practice. Rather than study musical works as texts, I am interested in music as an activity, one that reflects the social and cultural dynamics of the time and place in which it is performed. My historical and geographical area of focus is late eighteenth- and early nineteenth-century Europe, particularly England and north Germany. I am especially interested in music making in venues other than the public stage, studying music as an activity performed by amateurs, particularly women.

Looking at the kinds of repertoire that women played and the act of performing that repertoire provides insight into the relationship of women to the cultural expectations for their gender. For instance, I have noted in my research that amateur women pianists in Georgian-era England were constantly cautioned against striving to attain a virtuosic level of ability at the keyboard because such an aspiration was considered immodest. Restrictions about musical study were detailed in conduct books and behavioral manuals of the period. Yet much of the repertoire that women studied lent itself to a showy, bravura performance style. I have concluded that the fervor with which conduct books forbade showing off at the keyboard is evidence of a strong interest among women in becoming virtuosi. As they read conduct books and picked up musical works to learn on the piano, women were not passive agents, but active participants who shaped their own worlds.
“Rockin’ in Rhythm,” Race Relations, and American Culture: Exploring Jazz as a Socio-Political Movement in the 1920s
Anna Ryan,’14

Faculty Mentor: Elizabeth Morgan
Department of Music, Theatre & Film

Supported by the SJU Summer Scholars Program

The “Jazz Age,” as it is commonly identified throughout the literary works of F. Scott Fitzgerald, flourished in the United States of America in the 1920s during what is also called the Prohibition Era. Jazz music provided the soundtrack to a decade filled with political unrest, social change, and cultural upheaval. The constitutional illegalization of alcohol (contrary to the government’s intention) facilitated the rampant growth of an underground speakeasy culture that popularized not only the illicit consumption of alcohol, but also jazz, the great American contribution to the field of music.

Musicology, or the study of the history of music, often focuses on the ways in which culture, politics, and society affect music in different historical eras. However, I chose in my Summer Scholars research to investigate the possibility of the reverse effect: I explored the ways in which music has informed society through the lens of jazz. In many ways, as the title of my research suggests, 1920s jazz was much more than a musical genre that reflected an age of rule-breaking and social upheaval. It bridged racial divides, providing opportunities for integrated ensembles in the early 1930s, thirty years before the Civil Rights Act ended legal segregation in the United States. As a style of music developing primarily in the U.S., jazz was also unitive. It provided a common ground for musicians, composers, and listeners to rally (despite their differences) around a shared interest. This unity not only brought together people of different races, ethnicities, and cultural backgrounds, but also crossed between defined socioeconomic classes that had developed at the turn of the century. I further highlight these aspects of jazz through a closer look at the lives and work of composers and musicians from the era including Irving Berlin, George Gershwin, Louis Armstrong, Duke Ellington, and William Grant Still.

My research highlights the critical role music plays in the world, in this country, and within each of us. Not only does music provide an important reflection of the world around it, it also informs and embodies what exactly it means to be a part of society, to be political, to be human. Jazz in the 1920s united Americans in ways that the government, an overtly “political” entity, was unable to do racially until the 1960s and which it still struggles to do today.
Throughout my career, I have focused my research efforts on trying to understand the role gender plays in people’s behavior and lives. Being a feminist, I have often employed the perspective of satiric empiricism in my research, a method for exposing biases and unwarranted assumptions often implicit in traditional research approaches. The goal of this perspective is to transcend artificially constructed barriers between people reified in the concept of difference. For this reason, the research I conduct includes both men and women with the focus both on similarities as well as differences between women and men as well as differences within each group. In many areas, within- gender differences eclipse between-gender differences suggesting the importance given gender in our society is often exaggerated and unwarranted. Over the years, the specific focus of my research has shifted. One of my current research interests concerns the interplay of gender and sexuality. Most recently, I have become interested in exploring similarities and differences between heterosexual men and women and homosexual men and women and their attitudes toward each other. Both of the students who worked with me as Summer Scholars this year shared this interest.

Alyssa Lopez was particularly interested in factors resulting in heterosexuals committing micro-aggressions, a common expression of heterosexist attitudes today, against gays and lesbians. After a comprehensive literature review, Ms. Lopez has designed a study that she will implement this fall that looks at the interrelationships of heterosexist beliefs, endorsement of stereotypes of gays and lesbians and tendency to engage in micro-aggressions actions. This research will add substantively to current knowledge in this area given that it employs a newly developed multidimensional measure of heterosexism and explores the role stereotypic beliefs play in micro-aggressions, a relatively understudied question.

Stephanie Rescigno focused her research on the in-group favoritism-out-group negative bias phenomenon, a commonly observed phenomenon in which individuals typically express more favorable attitudes toward individuals who are similar to them (in-group members) than individuals who are different from them (out-group members). Most members of groups show this phenomenon which is thought to play an important role in evaluative attitudes toward the self. In fact, only two groups have been found to not show the typical finding, namely, older people and homosexual men, both of whom show more favorable attitudes towards out-group members than in-group members. The latter finding is especially evident in studies using the Implicit Association Test, a measure thought to tap unconscious attitudes/feelings. In the past ten years this test has been widely used although it is not without its share of critics. Ms Rescigno shared the concerns about the validity of the IAT that have been raised in the literature and searched for a measure to use as an alternative. As a result, she will be using a priming technique comparing in-group and out-group attitudes of heterosexual and homosexual men and women using explicit and implicit measures. She aims to update and expand research in this area since the finding concerning homosexual men is a decade old and no studies to date were found that looked at this phenomenon in heterosexual and homosexual women.
A Look Into Modern Heterosexism
Alyssa Lopez,’15

Faculty Mentor: Catherine Murray
Gender Studies Program

Supported by the SJU Summer Scholars Program

Homophobia is thought to be out of date in today’s society; we see ourselves as wholly accepting and the homophobes are the out-group. While blatant homophobia may be much less apparent, heterosexism, otherwise defined as a system of attitudes, biases and discrimination in favor of heterosexual relationships, dominates our culture. Positive stereotypes labeling gay men as quirky or lesbian women as assertive still set a prescriptive categorization that simply makes an archetypal gay or lesbian without paying respect to the whole person. A seemingly harmless comment such as “gays and lesbians aren’t treated any differently in today’s society” neglects the struggle the LGBT community is going through.

During Summer Scholars 2013, Dr. Catherine Murray and I looked into different facets of modern heterosexism. Our goal was to see how one’s expression of heterosexism affected one’s behavior towards homosexual men and women. We then thought it would be interesting to look at heterosexism and heterosexist behaviors from the point of view of the offender, rather than the homosexual minority, since we found little research that used this approach.

In doing our initial research, we found that people who score low on explicit measures of heterosexism, such as self report tests, may still often score high on implicit measures, such as the implicit associations test. This led us to look at the reasoning behind that. The research led us to believe that having a difference in explicit and implicit reactions to a socially sensitive topic such as heterosexist views on homosexuality, is most likely to be swayed by the need to self-present as having socially desirable views. We also looked into the ways that heterosexism can be categorized outside of traditional heterosexism, which led to include denial of continued discrimination, aversion toward gay men and lesbians respectively, and positive stereotypes. We wanted to look at how these aversions or denial would shape one’s behavior and tendency to micro-aggress toward gay men and lesbians, as well as how this related to the endorsement of positive or negative stereotypes of gays and lesbians. These stereotypes seem to derive not from homosexuality itself, but from gender norm violations associated with homosexuality, for example gay men being seen as feminine and lesbians being seen as masculine.

Dr. Murray and I decided to conduct our own study comparing level of heterosexism, typical behaviors in situations involving gay men and lesbians, and agreement with gay and lesbian stereotypes. We plan to use Massey’s Polymorphous Prejudice scale (2009) which includes 70 items from tapping varying aspects of heterosexism to act as our measure of heterosexism. We intend to prescreen with an abridged social desirability scale. We have created a scale measuring social distance, to capture one’s likely actions involving gay men and lesbians respectively. We have also developed a scale to assess endorsement of gay and lesbian stereotypes. We intend to conduct our study in the Fall semester of 2013.
In-group Favoritism and Out-group Bias in Heterosexuals, Gays, and Lesbians
Stephanie Rescigno,’15

Faculty Mentor: Catherine Murray
Department of Psychology, Gender Studies

Supported by the SJU Gender Studies Program and the Council on the Status of Women

During the course of the summer, I completed a literature review of psychological research on heterosexism, which is defined as discrimination or prejudice against gays and lesbians. Traditionally, research has shown that heterosexuals possess negative attitudes toward gays and lesbians; however, there has been a shift to more positive attitudes in recent years. Current research also demonstrates the concept of internalized heterosexism, which occurs when gays and lesbians internalize negative stereotypes about themselves. Traditional heterosexism and internalized heterosexism can have detrimental effects on gays and lesbians – not only are they experiencing prejudice from heterosexuals, but they also harbor negative emotions toward themselves because of their deviation from societal norms of sexuality.

Expanding on the topic of heterosexism, my literature review also included research on in-group favoritism and out-group bias. Current social psychology research shows that in most socially advantaged groups, like heterosexuals, members have a strong implicit preference for their in-group and negative bias against their out-group. This in-group preference may occur to confirm the individual’s high self-esteem or to be in agreement with what is valued by mainstream culture. Conversely, members of disadvantaged groups, like gays and lesbians, generally exhibit negative bias against their in-group and favoritism toward their out-group. The same pattern has been found in light-skinned people versus dark-skinned people, young people versus old people, etc. In-group/out-group research relates to the findings on heterosexism; heterosexuals may tend to favor their in-group above gays and lesbians in order to justify their self-importance, whereas gays and lesbians may tend to reject their in-group because they have internalized the negative stereotypes associated with it.

My mentor and I have developed a study to extend research on in-group favoritism and out-group bias. While previous research has looked at this phenomenon in heterosexual men and gays, no research has yet been done on heterosexual women and lesbians. We plan to implement this study in the fall of 2013 at Saint Joseph’s University and other colleges in the Philadelphia area, using both heterosexual and gay and lesbian participants. Our study will utilize both intrinsic and extrinsic measures to capture participants’ attitudes toward their in-group and out-group. We want to determine if there are gender differences in patterns of in-group/out-group preferences among heterosexuals, gays, and lesbians. Additionally, we are interested in whether attitudes have shifted given recent societal changes.
Cristian Pardo  
Department of Economics  
Saint Joseph’s University  
Ph.D. University of Maryland at College Park  

**Research Interests:** Macroeconomics, International Finance, Dynamic Microeconomic Modeling

My main area of research focuses on the causes of business cycles. In particular, I have investigated the link between entrepreneurial risk aversion, financial imperfections and business cycles. Private entrepreneurs, who are more common in emerging markets, tend to invest large fractions of their wealth in a single, small company, thus highly vulnerable to risk. Consequently, risk aversion among private entrepreneurs can impose costs to society as unfavorable shocks that reduce entrepreneurs’ wealth increase this cost and thus reduce private entrepreneurs’ willingness to invest. Therefore, the said behavior towards risk may result in a mechanism that magnifies the effects of shocks thus producing stronger output fluctuations.

In a related area, given that most emerging economies tend to borrow mainly in foreign currency, changes in the value of their currency affect the value of foreign debt and thus entrepreneur’s wealth. In my research I show that domestic depreciations, an economy’s natural response to adverse shocks, are stronger under fixed than under flexible exchange rate regimes. Therefore, fixed exchange rates may further magnify the effects of shocks due to the resulting stronger depreciation. I show that flexible exchange rates could be preferable under conditions less restrictive than those found in the past.

I also do research on Dynamic Microeconomic Modeling, both in the area of health and labor economics. My research deals with the question of what factors people base their choices of major decisions, such as to whether or not have family, have kids, work, study, what type of work, what kind of health insurance, etc. In particular, I have a paper that examines the determinants of the choice of health insurance type in a stochastic, dynamic environment. Developing an structural model and using panel data from Chile, I estimate the importance of certain variables that individuals take into account in choosing health insurance types (private or public), such as premiums, expected out-of pocket costs, and individual preferences in choosing. Another paper in this field relates to the choice of the type of job individuals choose: to be a wage-employee and receive a paycheck every period, or to be self-employed and potentially earn more, but face more risks. I here again develop a dynamic stochastic structural model, which together with the use of data, allows me to estimate the parameters that best reflect the actual choice made by people.

While structural models face trade-offs between complexity and computational tractability, structural analysis allow researchers to model the actual processes that lead to changes in individual behavior. With them, we can predict the evolution of such choices into the future, given some demographic assumptions, such as on population aging and growth. In the health insurance paper, I examine the impact of eliminating restrictions due to pre-existing conditions. In the labor economics paper, I analyze the effect of mandating self-employed workers to pay for unemployment insurance.
In January of 2011, the Egyptians vocalized their concern for the current state of their country, government, and economic stagnation. Although “revolution” was not an uncommon threat equivocally used by society in spite of the government, the animosity the Egyptians possessed had surpassed its’ limits, thus the thought of revolution become much more realistic. On January 25th, 2011, the apprehensive thought of an Egyptian revolution resonated and became a reality. The unprecedented demonstration lacked both organization and leadership, yet momentum accumulated against a country once accredited for it’s characteristically sedated political apparatus and seemingly eternal authoritarian rule.

Consumed with awe and utter confusion, the world became spectators to the instantaneous evaporation of president Hosni Mubarak’s thirty-year regime. It is no question that Egypt did not have deep grievances; in fact, they had a plethora. From issues pertaining to the vast amount of poverty, the immense lack of employment, and excessive corruption and inequality are few of the many issues coined as the catalysts of the revolution. Current reports tend to indicate that the nexus of power and wealth is significant in determining the dynamic cause of the historic commencement of the eighteen-day revolution in Tahrir Square. Allegedly, Hosni Mubarak may have concentrated wealth as well as power in the hands of a very small, affluent group of men who corruptly controlled politics and economic markets. By reading scholarly articles and reports, analyzing IMF economic projections, and conducting a multitude of interviews, I propose the contrary. Based on empirical evidence, during Hosni Mubarak’s thirty-year reign, the Egyptian economy was developing quite dynamically. Moreover, it is imperative to note that during the world financial crisis of 2008, Egypt’s economic growth continued to flourish. Thus, succeeding president Mohamed Morsi opted to adopt Mubarak’s economic policies as oppose to retreating to economic reform.

By evaluating shifts in the GDP, unemployment, inflation, national debt, and population on the eve of the revolution, I concluded that the unemployment rate in Egypt remained unchanged during Mubarak’s regime; however, the number of the young nearly doubled. In saying that, the catalyst of the revolution is attributed to the fact that about one million of the unemployed were aged in the 20-24 cohorts who had access to the Internet as well as social media.

Moreover, through my research of the Muslim Brotherhood, I analyzed the political consequences of the 2011 demonstrations, and how it attributed to the fall of president Mohamed Morsi during an unpredictable recent second revolution on June 30th, 2013. Although it is very recent, I have deduced that the Brotherhood’s vague outlook on their vision of Egypt and former president Morsi’s failure to take decisive action led to their demise.
Mark Reynolds  
Department of Chemistry,  
Saint Joseph’s University  
Ph.D. University of Wisconsin

Research Interests: studying the O₂ sensing mechanism of FixL, a heme-based sensing protein from *S. meliloti*; designing inhibitors of the human IDO enzyme for cancer therapeutics

My research is in the areas of biochemistry and inorganic chemistry because I study the role of metals ions in biological systems. My particular area of research interest is the heme-based gas sensor proteins that sense either carbon monoxide (CO), nitric oxide (NO), or oxygen (O₂). These gas sensor proteins have a sensing area that receives the signal and communicates the information to a transmitter domain that sends out the amplified biological signal. These proteins are involved in many important biological signaling processes such as blood pressure regulation, neurotransmission, gene transcription and chemo taxis in a wide variety of mammals and bacteria. However, the detailed mechanisms by which many of these proteins function are not yet well understood.

In my research laboratory we study FixL, which is an oxygen sensing heme protein from the bacterium *Sinorhizobium meliloti* that regulates nitrogen fixation in the symbiotic root nodules of legumes and is part of the heme-PAS and histidine kinase family of sensors. The kinase activity of FixL is “off” when oxygen is bound to the heme sensor but “on” under hypoxic conditions in the root nodules when oxygen is not bound to the heme sensor. FixL is an excellent model for both the heme-PAS family and the two-component histidine kinase family of response regulators because there is a wealth of biochemical data available to us.

This summer our research team (Michael Desciak, Chemical Biology ’14; Amanda Stoltzfus, Chemical Biology ’14; Kelsey Berger, Chemical Biology ’14 and Jasmin Martin, Chemical Biology ’15) looked at the role of conserved proximal residues in the oxygen sensing domain of FixL using site-directed variant proteins, where individual amino acids are replaced to probe their function. In particular, we looked at the role of two conserved amino acid in the heme sensor region of the protein that binds oxygen, arginine 200 and tyrosine 197. Past groups had made a variety of site-directed mutants and found that several gave stable variant proteins with interesting properties.

This summer my students grew up the *E. coli* cells of five of these variant FixL proteins (R200A, R200E, R200H, R200Q and Y197A) and the native WT protein and purified them using column chromatography in our large cold closet. They characterized their proteins with a wide variety of techniques including SDS-PAGE, pyridine hemochromagen assays and gas binding studies with UV-vis spectroscopy in our lab.

My students discovered that all of these variant proteins were purified to a high degree by SDS-PAGE(purified so that they are the only protein in the sample and determined their concentration using the pyridine hemochromagen assay. We looked at the binding of CN- (cyanide) to our variant proteins as an analog to oxygen binding that can be done aerobically and discovered that several of the variants proteins, particularly R200A, R200E and Y197A had a much lower affinity for cyanide than the native WT protein. The affinity went in this order: WT ~ 200Q >> R200H ~ R200E ~Y197A >>> R200A. R200E. This suggests that altering the interactions of the heme periphery dramatically affect the electronic properties of the heme iron and its ability to bind molecules. Based on these and other studies we propose that R200A and Y197A will have impaired kinase activity because they are important for oxygen sensing. This fall we will test out this hypothesis using oxygen binding assays a new kinase assay with our purified variant proteins.
The Biochemical Mechanism of the Heme-based Oxygen Sensor FixL from *Sinorhizobium meliloti*

Kelsey Berger, ’14

Faculty Mentor: Mark Reynolds
Department of Chemistry

Supported by the SJU Summer Scholars Program, and the McNulty Fellowship Program

The research we did this summer focused on the growth, purification, and study of the biochemical mechanism of the heme-based oxygen sensing protein, FixL. FixL is found in *Sinorhizobium meliloti*, a bacterium that fixes nitrogen in the root nodules of alfalfa plants. The FixL protein contains a heme component, as well as the conserved amino acids distinctive to the PAS domain, characterizing and heme-PAS family. Heme-PAS proteins are found in most gas sensing proteins. FixL is also a part of the histidine kinase family, meaning that the protein has both a heme and a protein kinase domain. FixL’s kinase domain is in the “off” state when the heme component is oxygen bound and in the “on” state when the heme is not bound to oxygen. In the active “on” state, FixL is believed to autophosphorylate, then transferring the phosphate to the protein FixJ. FixJ controls the expression of regulatory genes for the transcription and activation of nitrogen fixation genes.

To better understand the mechanism of oxygen sensing, five variants were made using site directed mutagenesis on conserved amino acids within the heme-domain that are believed to be crucial in both oxygen sensing and binding. The mutants were R200A, R200E, R200H, R200Q, and Y197A. The first letter of the variant signifies the original amino acid, the number designates the location of the residue, and the final letter signifies the new amino acid. The variants were expressed through *Escherichia coli* cells, These cells were then treated with lysozyme and sonicated to lyse the cells, before the cellular waste was removed and protein collected through centrifugation. The protein was then purified through a diethylaminoethyl anion exchange column and an S-200 gel filtration column.

Following the purification process, the protein was concentrated to begin its characterization. The variants were introduced to an oxygen analog, cyanide, which helped in the determination of a structural change within the protein. This summer, our research team studied all five variant proteins and I was responsible for the R200Q variant, which replaces a positively-charged arginine amine with a neutral glutamine amide. The cyanide dissociation constant was determined for each of the mutants to understand the linkage between the mutants and the affinity the mutant heme domain had for cyanide ($K_D$). The wild-Type $K_D$ for cyanide was found to be 6 $\mu$M and the R200Q $K_D$ for cyanide was found to be very similar. This indicates that the mutation does not affect binding affinity for cyanide, since it can still hydrogen bond to the heme propionates. It also marks the protein as relatively stable, compared to the much higher $K_D$ values determined for R200A, Y197A, R200E, and R200H. This result confirmed findings from last year. Further studies will include determining the $K_D$ for these mutants using F, NaN$_3$, and O$_2$ and fluorescence kinase activities to determine the effect of the activity of SmFixL.
The Biochemical Mechanism of the Heme-based Oxygen Sensor FixL from Sinorhizobium meliloti
Michael Desciak,’14
Faculty Mentor: Mark Reynolds
Department of Chemistry

Supported by the SJU Summer Scholars Program

Our research this summer focused on the purification and the study of the biochemical mechanism of the heme-based oxygen sensing protein, FixL, from Sinorhizobium meliloti, which is a nitrogen-fixing bacterium found in the root nodules of alfalfa plants. FixL is a member of the heme-PAS family, meaning that this protein has a heme component and the same conserved amino acids as the PAS domain, which is found in most gas sensing proteins. FixL is also a part of the histidine kinase family, meaning that the protein has both a heme domain and a protein signaling kinase domain. When the heme has oxygen bound, the kinase domain is in the “off” state. Conversely when the heme is not bound to oxygen, the kinase domain is in the “on” state. In the active “on” state, FixL is believed to autophosphorylate and then phosphorylate the protein FixJ. FixJ controls the expression of regulatory genes that regulate the transcription and activation of nitrogen fixation genes.

In order to better understand the mechanism of oxygen sensing, five SmFixL variants were made using site directed mutagenesis on conserved amino acids within the heme-domain that are believed to be crucial in both oxygen sensing and binding. The mutants were R200A, R200E, R200H, R200Q, and Y197A. These variants were expressed in Escherichia coli cells, which were grown up and plated out on Luria-Broth with ampicillin. These cells were then treated with lysozyme and sonicated in order to lyse the cells. The cellular waste was removed and the protein was collected through centrifugation. The protein was then purified through a diethylaminoethyl anion exchange column and an S-200 gel filtration column.

After the purification process was complete, the protein was then concentrated and characterized using UV-vis spectroscopy, SDS-PAGE, and pyridine hemochrome concentration assays. To study the properties of the heme domains of these variants, we studied the binding of CN⁻, since cyanide is an aerobic analog of oxygen that turns the kinase off just like oxygen. This summer, I focused on the R200A and Y197A variants. The cyanide dissociation constant was determined for each of the mutants in order to understand the linkage between the mutants and the affinity of the heme iron for cyanide. The Wild Type K_D for CN was found to be 6 µM. The Y197A K_D for CN was found to be 40 µM, which is over a six-fold increase from Wild Type. This result confirmed findings from last year. The R200A K_D for CN was determined to be over 250 µM, at least 40-folder lower affinity than wild-type. A definitive K_D was unable to be found due to the high concentrations of CN needed to titrate the mutant. However, this does indicate that amino acid length at this residue plays a critical role in CN binding. The side chain of arginine is considerably longer than the side chain of alanine and has a positively charged amine that my help to stabilize the charge on the heme iron. This may allow for the arginine side chain to stabilize the porphyrin ring enabling the heme iron to bind CN. Further studies will include determining the K_D for these two mutants using fluoride (F⁻), azide (N_3⁻), and the physiological regulator O_2.
The Biochemical Mechanism of the Heme-based Oxygen Sensor FixL from Sinorhizobium meliloti
Jasmin Martin,’15

Faculty Mentor: Mark Reynolds
Department of Chemistry

Supported by the SJU Summer Scholars Program

This summer I worked in Dr. Reynolds’ lab along with three other students, to contribute to his research in purifying and observing the heme-based oxygen binding protein, also known as FixL*. FixL, from Sinorhizobium meliloti, is a nitrogen-fixing bacterium found in the root nodules of alfalfa plants. FixL is a member of the heme-PAS family, in other words this protein has a heme component that is composed of the same conserved amino acids as the PAS domain; the PAS domain is found in most gas sensing proteins. FixL is also a part of the histidine kinase family, meaning that the protein has both a heme domain and a protein kinase domain. When the heme component is oxygen bound, FixL’s kinase domain is in the “off” state. Conversely when the heme is not bound to oxygen, the kinase domain is in the “on” state. In the active “on” state, FixL is believed to autophosphorylate and phosphorylate the protein FixJ. FixJ controls the expression of regulatory genes that regulate the transcription and activation of nitrogen fixation genes.

For further understanding of the mechanism of oxygen sensing, five variants were made using site directed mutagenesis on conserved amino acids within the heme-domain that are believed to be crucial in both oxygen sensing and binding. The mutants were R200A, R200E, R200H, R200Q, and Y197A. The first letter of the variant signifies the original amino acid, the number designates the location of the residue, and the final letter signifies the new amino acid. These variants were expressed through Escherichia coli cells, which were grown up and plated out on Luria-Broth with ampicillin. These cells were then treated with lysozyme and sonicated in order to lyse the cells. The cellular waste was removed and the protein was collected through centrifugation. The protein was then purified through a diethylaminoethyl anion exchange column and an S-200 gel filtration column.

Once the entire purification process finalized, the protein was then concentrated. The variants were introduced to CN, which served as oxygen analogs. The CN titrations aided in the determination of a structural change within the protein in the presence of an oxygen analog, thus allowing the determination of how each protein binds to oxygen to be concluded. This summer, I focused on the R200Hvariants. The cyanide dissociation constant was determined for each of the mutants in order to understand the linkage between the mutants and the affinity the mutant heme domain has for cyanide. The Wild Type $K_D$ for CN was found to be 6 µM, while for R200H the $K_D$ was approximately 50 uM, almost twenty-fold lower affinity. This suggests that the R200 residue is important in binding cyanide and may play a role in signal transduction. Further studies will include looking at the binding of other small molecules F, NaN$_3$, and O$_2$ and kinase activity assays.
The Biochemical Mechanism of the Heme-based Oxygen Sensor FixL from Sinorhizobium meliloti
Amanda Stoltzfus,'14
Faculty Mentor: Mark Reynolds
Department of Chemistry
Supported by the SJU Summer Scholars Program

The objective for our Biochemistry lab this summer was to purify and observe the biochemical mechanism of a heme-based oxygen sensing protein known as FixL*. FixL* is a truncated version of FixL in which the N-terminal transmembrane domain has been removed. More specifically, the original FixL protein consist of 505 amino acids in contrast to FixL* protein which is only 368 amino acids. The bacterium Sinorhizobium meliloti contains the heme protein FixL, which regulates the expression of nitrogen fixation genes in the root nodules of Medicago sativa (alfalfa) plants through a two-component regulatory system. FixL is a part of the heme-PAS family, therefore it possesses a heme-containing PAS domain with conserved amino acids, which ultimately binds O₂ and is common throughout many gas sensing proteins. In addition, FixL is also a part of the histidine kinase family, meaning it contains a transmembrane domain and a kinase domain. Under aerobic conditions, O₂ binds to the ferrous heme iron to form a low-spin, 6-coordinate heme which inactivates the kinase domain of FixL. However, under anaerobic conditions, O₂ detaches from the heme iron, which in turn activates the kinase domain of FixL and undergoes autophosphorylation from ATP. The phosphoryl group is then transferred to another protein, FixJ, to form FixJ-PO₃, which is the transcriptional activator for the nitrogen fixation genes (Reynolds et al, 2009).

To further study the effects of FixL’s oxygen sensing mechanism, variations were made to the conserved amino acids in the heme-domain that are thought to be crucial in both oxygen sensing and binding. Previous work in our lab used site-directed mutagenesis to make the SmFixL variant proteins, R200A, R200E, R200H, R200Q, and Y197A. The first letter represents the original amino acid followed by the position of the residue and the final letter represents the new amino acid residue. In order to collect a purified sample of the aforementioned mutants, we first had to express them using Escherichia coli cells, which were grown up and plated on Luria-Broth with ampicillin. Next, lysozyme was added followed by a sonification step in order to break open the cells. The cells were then centrifuged and the supernatant, containing our desired protein, was collected. Subsequently, the liquid was then purified using diethylaminoethyl anion exchange column and an S-200 gel filtration column. The purified variants were then concentrated in the final step in order to start the characterization process.

We focused on characterizing the structural change within the protein in the presence of an oxygen analog, cyanide (CN⁻). More specifically, the cyanide dissociation constant was determined for each of the mutants to identify the various binding affinities of the mutant heme-domain for cyanide. Although our research team studies all the variants together, I was responsible for the R200E variant, in which a positively charged arginine amino acid is replaced with a negatively charged carboxylate. The K_D (dissociation constant) for R200E is approximately 50 uM and about 10x lower affinity than wild-type. The R200E cyanide binding curve unexpectedly showed a sigmoidal curve, signifying that the mutant cooperatively binds to cyanide. Additional studies are needed to figure out what exactly is happening in the specific case. Furthermore, since this binding pattern is unique to R200E, additional investigations including kinase activity studies using fluorescence and determining the K_D when bound to fluoride (F), azide (N₃⁻), and the native regulator O₂, will be performed to better understand this binding pattern and its significance.
My recent studies combine two of the areas in which I have spent much of my research in higher education: the study of transition from high school to work or school for students with disabilities and the study of autism spectrum disorders.

The trend has been for students with disabilities to be placed in the least restrictive environments appropriate throughout their K to 12 schooling. Consequently, students with Asperger’s Syndrome (AS) are looking to attend colleges and universities upon high school graduation. Currently, most post-secondary institutions are not prepared to support the ‘tsunami’ of students with AS who are heading their way. Disability service providers at colleges typically offer learning supports such as extra time on tasks, distraction-free test-taking environments, etc.

Those supports are appropriate for students with learning differences, but may not meet the unique needs of students with AS. Their difficulties are more social in nature. Students with AS may exhibit deficits in communication, socialization, peer interaction, and flexibility. Additionally, at adolescence, students with AS tend to develop social anxiety, which can lead to behavior issues.

My research is focused on the best practices for supporting students with AS as they transition to college from high school and then the transition from college into the world of work. To that end, I am investigating ways in which high school personnel can best prepare their students with AS for the transition to college, the supports that are being offered to students with AS at college, the challenges that have been encountered along the way, the strategies used which have overcome those challenges, and the process by which colleges and universities are preparing their students to transition to adult lives after college.
More and more research is surfacing every day, and the field of Special Education is ever-growing. Many students with disabilities are currently benefitting from the educational laws, programs, and interventions while in school. However, once persons with disabilities “age out” of school when they reach 21, they often find themselves with limited opportunity. School provided structure, routine, comfort, challenge, and ample opportunities for socialization and real-world situations. These characteristics of schooling are crucial for many people with disabilities to work with and learn, and the missing entity of school can cause a void in somebody’s life that is living with disabilities. There are an assortment of both day and residential programs adults with disabilities can take advantage of that provide structure, as well as a variety of therapies and recreational activities. Often times, these programs cater to individual interests such as horseback riding lessons, dance lessons, or sports teams. They also work with people with disabilities on their needs such as speech therapy, physical therapy, or social skills.

Something that could greatly benefit a person with disabilities after he or she graduates high school, however, is a job. People with disabilities are often overlooked when employers are hiring new staff, and many companies simply do not hire people with disabilities because they believe they have a lack of knowledge, training, resources, and/or time. The aforementioned programs often have resources to link individuals to jobs, and there are many agencies who work to match adults with disabilities to jobs they will be both interested in and willing to perform well in. It is a slowly growing process, but it is important to focus on the potential benefits for employees with disabilities and employers alike. Adults with disabilities simply are not being taken advantage of in the work force. Many are more than able to perform various tasks that would make them stellar employees. It also greatly benefits the individual by providing the routine, structure, and real-world experiences school used to provide, as well as the responsibility of receiving income.

Through interviewing companies who hire adults with disabilities, interviewing agencies who work to match jobs to individuals, and researching relevant articles, I have gathered enough information to construct a training manual. This manual is to be used to give companies who are hiring staff with disabilities expectations, guidelines, and helpful hints in order to create the best possible experience for employers and employees alike. This training manual will hopefully encourage more employers to reach out to employees with disabilities by providing companies with more training and resources.
In recent decades, financial economists have focused on maximizing shareholder wealth when allocating scarce resources. However, in order to improve society’s welfare, it is necessary to increase the wealth of not just shareholders, but the firm’s other stakeholders (customers, suppliers, employees, lenders, fellow community members) as well. This realization is spreading among academics and practitioners alike. I am very interested in this development and in researching how we can measure progress in this area.

Beyond looking at a firm’s financial performance, I am interested in finding ways to evaluate managers’ impact on the environment, society, and governance (ESG). While financial performance measures are fairly well established, researchers are only beginning to define measures that capture ESG factors. Disclosure of relevant information in this regard is neither required nor standardized, so data are difficult to find. However, to the extent data are available it is possible to define performance dimensions that go beyond shareholder wealth maximization to include measures of stakeholder wealth more broadly.

Rasch models have the ability to provide composite rankings of firms in a given industry across multiple performance dimensions. This methodology allows combinations of financial and ESG variables to measure a firm’s overall performance while simultaneously taking into account the difficulty of achieving favorable variable readings. To the extent the investing public becomes aware of ESG performance measures and overall performance rankings, resources are likely to flow to firms that not only reward their shareholders, but also manage to avoid damage to the atmosphere and our ecosystems, support our social systems and contribute to the common good.
Are E.S.G Factors Priced by the Market?
Eileen Castaneda,’15

Faculty Mentor: Carolin Schellhorn
Department of Finance

Supported by the SJU Summer Scholars Program

Society’s welfare improves when firms shift their focus from shareholder wealth maximization to increasing stakeholder wealth by reducing risks associated with environment, social, and governance (E.S.G.) factors. Recent research suggests that investors’ long term risk-return choice may improve when E.S.G. factors are taken into account. However, there is currently no consensus on which E.S.G. factors are relevant for pricing a firm’s securities, and E.S.G. data are not yet readily available in a standard form. Dr. Schellhorn and I researched the link between financial variables and E.S.G variables, which is necessary for sustainable value creation. Ultimately, we are trying to rank the performance of firms in a given industry not only along the financial dimension, but also simultaneously along the E.S.G. dimensions. I retrieved data from Bloomberg (a company that collects and sells financial data about individuals firms). I categorized E.S.G. variables for various industries to define performance dimensions that could be used in a Rasch model to rank firms by their overall performance across multiple financial and E.S.G. dimensions.

Environmental performance refers to the responsible use of natural resources in delivering products and services so as to minimize a firm’s environmental impact. Social performance reveals a firm’s effect on people and social issues. This includes: business conduct, ethics, health, and human relationships. Governance factors address the goals of business managers, promoting the common good, improving firm risk profiles and disclosures. The concepts and theories that are currently taught in finance allow investors to take a short term view. The nature of E.S.G. factors challenges this thinking and forces investors to take a long-term view. For example, it is critical for companies to improve health and safety in the work place especially in the chemical sector. If accident prevention and safety management are poor, the workforce could be exposed to toxic and dangerous substances, thus affecting the company’s human capital, reputation, and exposure to litigation for years to come.

New rating agencies have emerged that have taken steps to integrate ESG factors and financial ratios. Vigeo, Morningstar, KLD database, Bloomberg data terminal, FTSE4Good, MSCI, and ASSET4 are just some providers of independent research in this area. Most have similar methodologies but all use their own framework and criteria indicators. A Trucost and RLP Capital study found that mutual funds incorporating ESG analysis in their investment decisions outperformed traditional funds over a three year period. Furthermore, Goldman Sachs an investment banking securities firm reports that they generate superior returns because they use ESG criteria when making investment choices.
George P. Sillup, Ph.D., M.S.
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, and is establishing a presence in the literature. In 2013, he has completed and submitted research with College of Arts & Sciences professor, Eileen Sullivan, about the use of an interventional therapy, Timeslips®, as an alternative for treating agitation and anxiety.

Additionally he and Steve Porth have published their ninth consecutive audit of the newspaper coverage of ethical issue affecting pharmaceutical industry in *Pharmaceutical Executive*, and are working on the 10th with the Summer Scholars, Danielle Puccino and Dante Gleason.
Stephen J. Porth
Associate Dean and Executive Director of Graduate Business Education
Professor of Management
Haub School of Business
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 the Executive Director of graduate business programs in the Haub School, which includes nine degree programs and over 1200 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 third 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 on the Board of Directors of *Nutritional Development Services* and 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 in the Media
Dante Gleason, ’16

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

Sponsored by the SJU Summer Scholars Program

This summer, my partner and I researched how articles in major newspapers portrayed pharmaceutical companies and/or their products. We read multiple articles, starting in the fourth business quarter of 2012 and ending with the third business quarter of 2013, covered in articles from newspapers such as The New York Times, The Los Angeles Times, USA Today, Wall Street Journal, and Washington Post.

To find these articles, SJU’s Business Reference Librarian, Cynthia Slater, ran a search through databases using certain keywords (pharmaceutical for example). These articles were then sent to Dr. Sillup to send to Ryan Fox, ’14, who is leading the EthicsTrax® database, who then divides the articles into two batches, one for my partner and one for me.

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 Ryan for the data to be input in the EthicsTrax® database.

Some of the articles that I’ve read since the beginning of the summer have to do with drug safety. In fact, this problem has been the most common in all of the articles that I have read this summer. In the articles from October and November, the main issue in question was a compounding pharmacy (one that provides individual prescriptions for special case patients, and falls through the cracks of FDA regulations) produced an injection for back pains in mass quantities, but it was infected with a black mold which led to numerous cases of meningitis across the nation. More recently, however, the biggest drug safety issue appearing in articles is the underestimation of the addictive qualities of painkillers such as Vicodin. Within the past few years, the amount of deaths due to prescription painkillers has risen dramatically. There was talk about reclassifying the drug and those similar to it (anything containing hydrocodone) as a Schedule II drug, making it harder to obtain and prescribe. However, some are convinced that doing this will do little to stop the ever increasing death toll due to these prescription painkillers.

Throughout this entire summer, I’ve learned a lot about what is happening in the pharmaceutical world that I did not know about before. But most importantly, I’ve learned what aspect of pharmaceutical marketing that I would like to follow in my years after Saint Joseph’s University: improving drug standards, safety, and efficacy.
Pharmaceutical & Healthcare Marketing: An Industry Ethics Review
Danielle Puccino,’14

Faculty Mentors: Dr. George Sillup
& Dr. Stephen Porth

Supported by SJU Summer Scholars Program

The Pharmaceutical industry has grown to be one of the most lucrative and developed industries in the world. Companies of all sizes have made huge strides in pharmacologic advancements, finding cures for life-threatening diseases, and contributing countless research towards unmet medical needs. Despite the positive recognition, however, the industry has also grown to be viewed in a controversial light, as it has been criticized for a wide-variety of unethical conduct. These issues include but are not limited to, drug safety and shortages, high drug prices and religious concerns with the Healthcare Reform. This summer we continued our extensive research on how the pharmaceutical industry has been portrayed by the media—focusing specifically on newspaper coverage.

We investigated newspaper coverage about ethical issues and the pharmaceutical industry from the five largest newspapers. Articles from The LA Times, The New York Times, The Washington Post, The Wall Street Journal, and The USA Today were then filtered through our methodology. Determining factors we used to categorize these articles include whether they were front page or editorial news, whether the headlines and actual article content was negative or positive, and which companies and products were being mentioned. We monitored this information using excel spreadsheets and an access database we call EthicsTrak™. By examining this information, we were able to review our findings and come to conclusions on the industry’s ethical stance in the media. We met regularly throughout the summer to discuss our reviews, as sometimes dissecting an article can prove to be difficult.

When all of the articles from the year are analyzed, Dr. Sillup and Dr. Porth use our carefully gathered research to write their annual article which is published in the Pharmaceutical Executive magazine. The article combines the research and their insight to make conclusions about the current ethical situation of the pharmaceutical industry. Working with Microsoft Excel and contributing to a very developed Access database has greatly improved our computer analyzing skills. More importantly, this project has given us a hands-on experience and an opportunity to really learn about our field of study. In hopes to one day be a part of the industry, it is very meaningful to have knowledge of the happenings, both positive and negative, that go on in these companies. The knowledge and awareness gained through our extensive summer research project will greatly benefit me in my upcoming year of classes, and the experience will help me in any future interaction with the industry.

In addition to Summer Scholars, Danielle is the President of SJU’s Pharmaceutical Industry Leader’s of Tomorrow (P.I.L.O.T) Club, and a marketing intern at B.Braun Medical Inc.
My current scholarly research as a Catholic theologian is driven by questions about God and his relationship to humanity. Some of the deepest questions that most, if not all, persons ask during their lives include the following: where have we come from? (questions related to origins); what makes life worth living, and why do we suffer? (questions about meaning or purpose); what is good and evil, and what is right and wrong? (questions about morality); who are we? (identity); and what awaits us at death? (destiny) These common questions stem from our natural inclinations. To the extent that we seek answers to these kinds of questions, human beings can become the persons they were meant to be. Thus there is a causal relationship between the study of theology and everyday life.

Part of my research centers around the origins of the Christian movement. I want to know who Jesus was and whether he was/is the savior of the world. Did Jesus exist? If so, then was he merely a Jewish rabbi? Was he a peasant cynic? Was he a revolutionary? Or was he God incarnate? My work with Mark Zatta in the summer scholars program will be centered around historical questions that pertain to Jesus of Nazareth. We will also be concentrating on how his earliest followers understood and interpreted his life, death and resurrection.

A historical approach to the origins of Christianity can offer believers and skeptics the opportunity to assess for themselves whether or not the Christian faith can satisfy our natural curiosities about God and his relationship to human beings.
The quest for the historical Jesus is an academic undertaking that attempts to develop a historically accurate portrait of Jesus. There have been three different movements, or quests for the historical Jesus. Each of the quests began with a new idea or process of biblical criticism and ended because of different controversies. Critics agreed about many characteristics of Jesus. However, those same critics had individual motives for the research, which resulted in many dissimilar portraits of Jesus.

These quests have used the historical critical method in their attempts to find the historical Jesus. The historical critical method is a form a literary criticism that attempts to find and understand the original meaning in the original context behind texts such as the New Testament documents. The historical critical method was originally condemned by the Church during Pope Leo XIII’s papacy because it was seen as a Protestant enterprise to discredit the creedal Jesus. The majority of claims made through the historical critical method reduced Jesus as a mere teacher of ethics.

However, as the Church recovered from the initial shock of these claims, the Church began to recognize the importance of historical affirmation of the person and nature of Jesus. The method was later accepted and embraced through the papacy of Pope Pius XII and Vatican II’s Dei Verbum. Today the Church accepts historical critical methods, but recognizes their limits. Sometimes the historical critical method can be used to strengthen the claims of faith.

For example, contemporary scholarship indicates that the earliest Christology was already the “highest Christology.” The use of divine terms and meanings was assigned to Jesus toward the very beginning of the Christian movement, not decades later. Developments in the field of Christology were not additions of something new altogether, but can be understood as a new understanding of what had already been present from the beginning.
Jury Smith

Department of Art
Saint Joseph’s University

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

Research Interest: Ceramics

My current research focuses on non-utilitarian clay objects. In practice, I utilize a craft approach (repetition and systems) coupled with my own conceptual responses to that practice. I am interested in horizons and boundaries: visual, cultural, and historical. I am also curious about deconstructing the path of identity—from object to thing to category to value. For this reason, I welcome the friction invoked when my work expresses a flexible identity—an identity that shifts among notions of art, design, and craft.

Overall, I am motivated by the questions that a practice inspires and how these questions might reflect certain human conditions. In this sense, I use ceramics as a means to explore what historian M. Anna Fariello describes as a “document, ritual, metaphor, and talisman.” For me, my pieces: document an approach, create a ritual, exist as tangible things representing something less tangible, and serve as an interpretive tool.
Multiplicity in Ceramic Form and Surface
Morgan Twist,’14

Faculty Mentor: Jury Smith
Art Department

Supported by the SJU Summer Scholars Program

For this project, I explored multiplicity, line, pattern, alternative firing, and large-scale sculpture by researching artists who work with these themes and processes. For multiplicity and pattern, I researched Bean Finneran and Annabeth Rosen. Bean Finneran arranges fired coils of clay to create sculptures. What I am drawn to about his work is the flexibility. Each time one of his sculptures is moved and reassembled it is a different piece. Building off this idea, I created closed forms in various shapes that could be stacked and layered to create many different forms. Annabeth Rosen uses different shapes in her work, scoring and slipping them together to create pattern. In my own work, I make shapes from slabs of clay and arrange them to create a sculpture of line and pattern.

Before my research this summer, I did not understand what the repetition in my work meant. Both Bean Finneran and Annabeth Rosen use multiplicity in their work to create mass. I have discovered that using multiplicity in my work to create mass has a direct tie to nature. Things in nature multiply to create mass like moss and mushrooms. Looking at my pieces, there is a conflict between regeneration and deterioration. In one way my work can look like it is being built up and in other ways it looks like it is being torn down.

Another aspect I researched in my work was balance. I pushed the clay as far as it could go to test the limits of gravity. I stacked shapes cut out of clay on top of each other with each piece a little farther from the center. After much trial and error, I learned how far the material could be stacked before it needed to be brought back toward the center. This physical balance represents the emotional balance that people need in their lives.

For the first half of the summer I used only geometric shapes to create my sculptures. As the summer went on, I searched for an element that would introduce another layer of meaning, and I became interested in the idea of using letters. I started spelling out words to represent important global issues. My “Hunger” sculpture looks like a collapsing wave that will engulf anything in its way. Through this sculpture, I wanted to express the damaging effects of hunger.

With the help of my mentor, Professor Jury Smith, I learned how to successfully load and fire the gas kiln. I learned the best firing method for these challenging pieces. Firing a gas kiln is much more involved than firing the smaller programmable electric kilns. During a gas firing you can control the atmosphere your piece is being exposed to by turning up the gas and controlling the airflow. Because of the reduction atmosphere in the gas kiln, I had to research what types of glaze would work. The gas kiln brought a new element to my work that did not happen in the electric kiln.

After this summer, I am even more excited to continue my education in ceramics. I will continue my research of multiplicity, line, pattern, large-scale sculpture and different firing techniques. In addition, I am looking forward to discovering deeper meaning in my work.
Jean M. Smolen
Department of Chemistry
Saint Joseph’s University

Ph.D. Johns Hopkins University

Research Interests: Water quality and environmental fate

My research focuses on the fate of complex organic molecules in model systems that mimic the natural environment. Many organic pollutants are degraded via chemical processes influenced by chemical (organic and inorganic) species. Ongoing projects in our lab seek to contribute to the vast effort underway to identify the constituents of natural sediments and aqueous environments that contribute to or can accelerate the degradation of organic pollutants. The goal of this work is to construct a chemical model of the natural environment that evaluates whether the presence of naturally-occurring chemical constituents, such as natural organic matter and organic acids, contribute to the abiotic reduction of organic pollutants through the generation of ferrous iron from ferric hydroxides or through the generation of other effective reductants.

Experiments that examine the degradation of organic compounds susceptible to reductive transformation are currently being conducted in batch systems in which reducible organic compounds (such as 4-cyanonitronbenzene) are added to aqueous suspensions of clean metal oxides (FeOOH) and organic reductants (ascorbic acid and cysteine). Metal oxides are used as models for natural sediments. Dissolved metal ions such as Fe(II) are generated due to the reaction of the organic acids with the oxide surface. The effect of the organic acids on oxide dissolution is evaluated along with the effect of metal ion concentration on rates of chemical transformation.

Ultimately, the results of these experiments will be compared to results from experiments conducted with groundwater, lake or marine sediments. After identifying some of the important chemical constituents of these sediments, the rates of degradation will be compared with those in clean systems with a similar composition. With this information, it will be possible to predict degradation rates based on the chemical composition of natural systems.

These research projects have already had a significant impact on student learning and experience. With some guidance, my research students are able to design specific experiments that will generate the data that is necessary to better quantify our experimental systems. The students are exposed to analytical equipment and techniques that they will encounter in industry and academic labs including liquid and gas chromatography, atomic absorption spectroscopy, inductively coupled plasma spectroscopy, and ultraviolet/visible spectrophotometry.
Role of Cysteine Concentration and Particle Size in the Reductive Dissolution of Goethite and the Subsequent Transformation of 4-Cyanonitrobenzene

Zach Dobson,’14
Andrew Kusterbeck,’14
Faculty Mentor: Jean M. Smolen
Department of Chemistry

Supported by the SJU Summer Scholars Program, Department of Chemistry, and the SJU Environmental Science Program

Industrial pollutants are introduced into the environment daily, and many of them are harmful nitroaromatic compounds. Iron oxides are prevalent in the environment, and they can often facilitate the transformation of said pollutants into less harmful compounds. Our study concerns how different iron oxides and naturally occurring reductants react with nitroaromatics. 4-Cyanonitrobenzene (4-CN) is the nitroaromatic used for our study, due to its solubility in water, good mass balance, and rapid reaction with other chemical compounds. Since there are numerous iron oxides in the environment, we used goethite (FeOOH) as the constant oxide in all of our experiments. We varied particle size of the goethite to examine how this property affected the overall reaction.

Ferric oxides predominately contain Fe$^{3+}$ in their natural state. Previous research in the field of environmental chemistry has observed that ferric oxides generate Fe(II) through a reaction with naturally occurring reductants. Ascorbic acid and cysteine are the two reductants used in our experiments. When Fe(II) is produced and adsorbed onto the surface of the ferric oxide, it is effective in the transformation of nitroaromatics (Klausen et al., 1995). Previous research by the Smolen group demonstrated that neutral pH ferric oxide solutions produce larger amounts of Fe(II), as well as re-adsorb more Fe(II) onto the oxide surface.

Our research tested the hypothesis that smaller goethite particle sizes with greater surface areas would react with 4-cyanonitrobenzene more rapidly (Cwiertny et al, 2008). We examined Bayer goethite, micro-rod, nano-rod, intermediate sized particles, and aluminum goethite, and our data was consistent with the previous hypothesis. The goethite used in our research was synthesized by the 2009 Smolen group.

A significant portion of our research focused on how the concentrations of ascorbic acid and cysteine affected the transformation rate of 4-cyanonitrobenzene. When we held the goethite particle size constant, we observed that higher concentrations of both ascorbic acid and cysteine produced more Fe(II) in solution. This ultimately lead to faster transformations of 4-CN.

Determination of Ionic and Inorganic Concentrations in the Belmont Water Supply and Saint Joseph’s University Campus
Amy Dougher,’15
Luke Serensits,’14
Faculty Mentor: Jean M. Smolen
Department of Chemistry

Supported by the SJU Summer Scholars Program, and the Department of Chemistry

The Belmont water supply is the water provider for the West Philadelphia area, including parts of the St. Joseph’s University campus. To determine the concentrations of trace metals and inorganics in the Belmont water supply, tap water samples were collected from water fountains, water bottle refill stations, and other sources within the Science Center, Mandeville, Post Hall, Campion Hall, Merion Hall, O’Pake Gym, and Connelly Hall. To gauge the effects of commercially available water filters on inorganics in tap water, tap water samples from these sites were also treated using a Brita filter, a ZeroWater filter, and a reverse osmosis filtering system. For comparison purposes, untreated water samples were collected from various creeks in the West Philadelphia area.

Using standard methods, the collected samples were tested for phosphorus, iron, lead, copper, cadmium, zinc, aluminum, and calcium carbonate. The Philadelphia Water Department’s Annual Water Quality Report was referenced to determine which inorganic substances would be most relevant to our survey of drinking water.

After a complete analysis it was observed that the phosphorus concentrations of the tap water samples gathered from St. Joseph’s University were above the EPA maximum contamination level (MCL) of 0.1 mg/L. The phosphorus content of tap water samples treated through the Brita filter increased, while the ZeroWater filter decreased phosphorus levels to below the detectable range of 0.1500 mg/L. It is hypothesized that the increase in the detection of phosphorus after treatment thorough the Brita filter is due to the makeup of the activated carbon in the Brita water filter. Activated carbon water filters leach small amounts of phosphorus into water. Data from the summer of 2012 illustrated that tap water samples had copper concentrations below the EPA MCL of 1.3 mg/L. Copper concentrations further decreased after being treated with the Brita and ZeroWater filters. All samples had lead concentrations below the detection range of 5 parts per billion (2012). Iron detections gave varied readings across all sampling sites but remained below the EPA MCL of 0.3 mg/L (2012). This summer, the detection of calcium carbonate classified campus tap water samples as slightly hard water ranging between 17.1-60 mg/L. The Brita water filter significantly decreased the amount of calcium carbonate to below 17.1 mg/L; after treatment with the Brita, the samples were classified as soft water. The ZeroWater filter completely removed calcium carbonate. The reverse osmosis system gave results at or below detection level for all analyses.

Indian Creek and the Schuylkill River were sampled for analysis. These untreated samples were classified as moderately hard water. The samples were below the EPA MCL for all other analyses, giving concentrations lower than SJU for phosphorus (2013) and copper (2012) and concentrations below the detection limit for lead and iron (2012). Our goal is to add to this project by further investigating the effectiveness of water filters and performing a comparative analysis of creek and tap water. We wish to continue to investigate the apparent increase in phosphorus content in conjunction with the use of the Brita water filter by resourcing other forms of phosphorus. Samples will be tested for cadmium, copper, iron, lead, zinc, and aluminum using an ICP (Inductively coupled plasma). In previous years, the AA Spectrometer was used to analyze our samples. The ICP allows for simultaneous multielement analysis.
I am interested in plants and fungi, and especially in the interactions between these two groups of organisms. 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. 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. Lately this has taken the form of some preliminary studies of plant distribution in highly disturbed urban landscapes.
Formation of *Ustilago maydis* infection filaments in the leaves of *Zea mays*
Amy Brady,’15

Faculty Mentor: Dr. Karen Snetselaar
Department of Biology

Supported by a Gift from Nick Nicoklaides ’87, and the Howard Hughes Medical Institute

This summer, I examined the formation of infection filaments of *Ustilago maydis* within the leaves of *Zea mays*. *U. maydis* is a dimorphic fungus, meaning it has two forms in its life cycle. The first is a haploid form that is not pathogenic and grows by budding, similar to yeast. The second form is the dikaryotic hypha, which is able to infect a living host. I worked with the fungus in its virulent, filamentous form. I sectioned the *Z. mays* leaves and cleared them, leaving behind only the plant cell walls and fungal cell walls. To view the cell walls, I used confocal microscopy. To do this, I had to use two fluorochromes, which stained the plant cell walls blue and the fungal cell walls red. Confocal microscopy allowed me to focus on one plane within the leaf and eliminate noisy, out-of-focus detail. This technique really enabled me to view how the fungus infected *Z. mays* throughout the epidermal cells, the parenchyma, and the bundle sheath cells. Because *Z. mays* is a C4 plant, the dark reaction of photosynthesis occurs within the specialized bundle sheath cells in order to eliminate the competition between oxygen and carbon dioxide for the active site of Ribulose-1,5-Bisphosphate Carboxylase Oxygenase (RuBisCO) - the enzyme responsible for the carboxylation of carbon dioxide into sugar. The bundle sheath cells are closely associated with the vascular tissue, which transports sugars and nutrients throughout the plant. I have found that filaments appear to invade the bundle sheath cells and that the fungus expands its biomass within or around these cells. In epidermal cells, I have found collapsed filaments, or older filaments that result from the hyphal tip growth characteristic of the dikaryotic form of *U. maydis*.

This finding may suggest that the fungus knows where it wants to go and spends its energy to reach its destination. In the future, I want to find more patterns in the formation of the infection filaments in order to better understand the infection process of the *U. maydis - Z. mays* model system.
Analyzing Small Pathogenicity Proteins Secreted by the Corn Smut Fungus, *Ustilago maydis*
Adeline Fagan,’14

Faculty Mentor: Karen Snetselaar, Ph.D
Department of Biology

Supported by the National Science Foundation, GeoKids and the Botstiber Foundation

*Ustilago maydis* is pathogenic fungus that infects corn plants, *Zea mays*, and causes the disease, corn smut. The fungus is a basidiomycete which characteristically has a dikaryotic stage where two nuclei are found within the same cell. At this dikaryotic stage, the fungus forms infection filaments, able to penetrate and infect the corn plants. For this dikaryon to form, two haploid yeast-like cell with compatible genes at locus $a$ and locus $b$ mate, fuse together to create the dikaryotic cell. The cell is then able to form the infection filaments which are pathogenic and can infect its host.

My Summer Scholars project involved looking at the secretory proteins that have a role in pathogenicity of the infection filaments. As part of the Genome Project, the genome of *Ustilago maydis* was sequenced and it was found that many genes for small unknown proteins had secretion tags. Gene knockout experiments showed that these proteins play a role in infection and pathogenicity. We worked with a specific secretory protein, TIN 2 that was engineered to include hemagglutinin (HA), a highly antigenic protein from an influenza virus. This HA tag allows us to track the TIN 2 protein using antibodies to HA.

Our goal was to see if the secretory proteins were actually secreted and taken up by the plant cells. We did this by tagging the proteins in an infected maize leaf with antibodies and examining under a light microscope. First we took cross sections of maize leaf, newly infected, and fixed it so that the proteins would remain in their current place. The leaf cross sections were then exposed to the antibodies. One of the antibodies has a gold piece attached with allows for the protein to be seen in a cross section. The gold piece is only nanometers long, therefore an amplifier, silver, was used make the gold piece visible under the light microscope. Preliminary results showed antibody-tagged proteins within the plant cells. However, control experiments also showed labeling in some experiments, so further modification of the procedure will be necessary to confirm specificity of the antibody label.

Fig: This figure shows a plant nucleus that as darkened due to the congregation of the silver-labeled proteins. A specific TIN 2 protein with a nuclear localization sequence was used so that all of the tagged proteins would be localized in the plant nucleus. This allows for confirmation that the proteins are being tagged as well as makes them more visible under a light microscope.
Comparison of *Ustilago* Adenylyl Cyclase Mutant Growth Patterns to Wild-Type *U. maydis*

Tommy Nguyen,’14

Faculty Mentor: Karen Snetselaar
Department of Biology

Supported by the SJU Summer Scholars Program

*Ustilago maydis* is a pathogenic fungus that is responsible for smut disease of *Zea mays*, also known as maize or corn. *U. maydis* is a dimorphic basidiomycete that transitions from a haploid phase to a pathogenic dikaryotic phase. The transition to the pathogenic dikaryotic stage is dependent on the compatibility of two mating loci that regulate cell fusion and pathogenicity. Only dikaryotic filaments are capable of infection. A major player in the characteristic switch in *U. maydis* is the signaling molecule, cAMP, which is synthesized by adenylyl cyclase. Mutations of the genes that encode adenylyl cyclase effect growing patterns, specifically leading to constitutive filamentous growth during the haploid stage.

This summer I worked with a mutant of *U. maydis*, the *Ustilago* adenylyl cyclase (uac1) mutant. I wanted to use this mutant that displays nonpathogenic filamentous growth to study the switch of *U. maydis* from nonpathogenic budding to pathogenic filaments. To complement the uac1 mutant, cAMP was added, which allowed the budding growth to be restored.

When conditions are appropriate, the uac1 mutant grows a filament from one end of the parent cell and then forms another filament from the opposite end. Eventually, the filaments are triggered to grow aerially (Fig. 2), which is similar to the infection filaments of wild-type *U. maydis*. Further research will include identifying the particular chemical or environmental cues that trigger aerial growth as well as using a diploid uac1 mutant to further observe the growth patterns of *U. maydis*.

![Fig. 1 Budding in U. maydis](image-url)
Fig. 2 Growth of Aerial filaments in \textit{uac1}
Suzanne Sorkin  
Department of Music, Theatre and Film  
Saint Joseph’s University  
Ph.D., University of Chicago  
Research Interests: Music Composition

One significant aspect of my approach to music composition is the use of timbre as a variation procedure and as a structural device. I am interested in applying the traditional understanding of harmonic progression (forward motion, tension and release) to timbre, in order to create an overall sensation of timbre progression in my works. Central to my methodology is the use of orchestration, instrumentation, and changes in coloration of a constant musical object (a single chord, short harmonic progression, melodic motive, or collection of pitches) to provide timbre progression as well as an overall cohesive form. Although this fixed musical object remains a constant throughout the composition, the sound world into which the object is placed is continually changing. In addition to providing my work with a sense of unity, timbre variations of a constant musical object also help to create formal structure. Each fresh re-orchestration of the musical object becomes a signpost to the listener for a new formal section.

I have received awards, commissions, and grants for my compositions from national and international organizations including the Fromm Music Foundation at Harvard University, Meet the Composer, American Composers Forum, Earplay, and American Society of Composers, Authors, and Publishers (ASCAP). My compositions have been performed throughout the United States and abroad by such ensembles and soloists as counter induction, Mannes Trio, Chamber Music Now, Third Angle, Third Millennium Ensemble, Washington Square Chamber Players, and Amy Briggs Dissanayake.
The classical Mass is a form of music that combines elements of sacred and secular classical music. The classical mass consists of several movements including a Kyrie, Gloria, Credo (which is often omitted), Sanctus, Benedictus, and Agnus Dei. Each movement has its own set of musical characteristics that illustrates the meaning of each text. This summer, I was able to further delve into this form of music by composing my own classical Mass for a four-part choir, and piano.

In beginning this undertaking, I researched each movement by listening to works of other major classical composers, such as Mozart, Haydn, and Vivaldi, to study different aspects of each movement such as texture, form, and harmonic variation. After doing this, I then looked at the Latin text to see if there was any pattern between the types of text, and the overall affect of the movement. For example, the Kyrie is considered to be more of a lament while the Gloria has a more triumphant feel to it.

After researching the different movements, I then work on creating the choral, and accompaniment parts. In doing so, I was also able to add different aspects that were non-traditional to the classical mass. For example, the only instrument in my mass is a piano to make it more accessible, as opposed to the organ, which is more traditionally seen. In addition to this, I divided the Gloria into smaller sections in order to add variation and to explore different textures. There are very distinct musical characteristics within each section (while some have similar themes). Lastly, the harmonic progression of this work varies within each movement. For example, the majority of the work is in either f minor, c minor, or b flat minor(closely related keys), but then it shifts distantly into b minor in the sanctus, then ends in D minor in the Agnus Dei. This shift makes the Mass harmonically interesting.

After this process, I then add the expression markings. In beginning this process, I take each individual section and play through them at the piano in order to determine the appropriate dynamic. This is done last in order to allow the parts to work with each other first.
During the summer of 2013, I worked with Summer Scholar Marissa Marzano to explore compensation models for the staff of the *The Hawk*, St. Joe’s student newspaper. I served as the main faculty adviser of *The Hawk* for a number of years and continue to work with the staff in the capacity of contributing adviser. While not directly related to my own scholarly work and writing, one of my long-standing research interests has been ethical issues in writing. Fair pay is an ethical issue as well, of course, so I did not stretch too far in this endeavor. Like the editors-in-chief of the paper, including Marissa, I set various goals during my tenure as adviser that were important to me and that would serve as my “stamp” on the paper. One of those goals was to figure out a way to compensate the student journalists for their time-consuming labors. When Marissa approached me about her project, I gratefully accepted the role of mentor, eager to cross off this goal on my Hawk Adviser Bucket List. Many of the top editors at *The Hawk* work well over 40 hours each week, and while the real-world experience is priceless, I believe strongly that they should be paid for their real-world work. As studies indicate, such is the norm nationally for college students who work for campus media outlets. Marissa’s proposal initially had a few critics. After all, it seemed so self-serving: to undertake a project from which she would directly benefit monetarily (if only for one semester). But the project was always bigger than Marissa herself, and even the current Hawk staff. Marissa’s survey of student publications at all 28 Jesuit colleges and universities in the United States—plus a handful of universities in the Philadelphia area—provided her with useful data that spotlights norms regarding compensation practices. A paycheck of some sort is typical; volunteering is not. In talking to the newspaper staffs at these institutions, in learning about the pros and cons of the various compensation models they employed, she also began to understand the benefit of paying students for their work and solidified the real reason why compensating young college media professionals is so important: It yields a more committed staff and, ultimately, better journalism. That, I’m sure, is a goal for all of us, here at St. Joseph’s, and beyond.
Cashing In On the College Newsroom: A Study of Student Journalism Compensation
Marissa Marzano, ’14

Faculty Mentor: Jenny Spinner
Department of English

Supported by the SJU Summer Scholars Program

I have been a part of “The Hawk” student newspaper since the fall of 2011. In that time, I have seen student editors, writers, and photographers put in an enormous amount of time and energy into the production of the newspaper week in and week out – oftentimes, up to what one would put into a full-time job. However, these students were not compensated financially. While student editors at “The Hawk” could receive academic credit, these credits were only for English or Communications classes, and oftentimes not applicable to students outside of these majors. We aim for a balanced newsroom at “The Hawk,” with students representing all disciplines at St. Joe’s, ranging from history and natural science majors to finance and food marketing majors. However, it was difficult to attract a more diverse group of students if their only means of compensation would be credits that wouldn’t be applicable to their field of study.

The first part of my summer scholars project was research-based. I contacted student editors and faculty advisors at every Jesuit university and several benchmark Philadelphia universities (La Salle University and Villanova University) to research how they seek to compensate their student journalists. I found that a majority of these universities are paying their newspaper editors, either on a per-issue basis or in the form of a yearly stipend.

In the interest of keeping our newspaper program on par with other universities, I then began to devise a method of payment that could be feasible for “The Hawk.” This included working on the newspaper’s current budget system to make this financially possible and responsible going forward in the future for “The Hawk.” I also redrafted portions of “The Hawk’s” Constitution and Staff Expectations Manual and devised contracts for each position, outlining additional responsibilities that will be added in return for financial compensation.

Going forward, I plan to submit a proposal to host a panel discussion based upon my findings at the upcoming College Media Advisors’ conference in spring 2014. I am also seeking publication in several journals of college journalism, including the College Media Review and the College Media Newsletter.
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. Currently we are investigating the physiological mechanism involved in altered developmental timing in plants caused by elevated atmospheric CO$_2$; the role of mycorrhizal fungi in improving the yield of crops in an urban setting; and the changes in soil bacteria that occur throughout the year in a variety of composting techniques used in urban environments.
Microbial Diversity Identification within
Three Different Methods of Household Compost
Jonathan Angstadt, ’15

Faculty Mentors: Catalina Arango and Clint Springer

Supported by the National Science Foundation and the GeoKids

Population growth and the urbanization of the United States have put significant pressure on the modern agricultural system to supply Americans, especially those living in urban environments, with nutritious and locally grown produce. One solution that is gaining steam is a move towards urban agriculture. Unfortunately, little is known about production methods needed for an urban environment. The urban farm presents significant challenges that are unique to the urban environment such as soil development, soil fertility, plant spacing requirements, and water requirements. This project explored various methods to maximize urban agricultural production in Philadelphia. To do so we have set up several experiments with this goal in mind on an urban farm that is being initialized in the Overbrook section of Philadelphia during the summer of 2013.

We first examined microbial diversity of three different methods of household compost bins. There are a total of seven bins, where three of them are homemade wooden bins, three are Earth Machines, and the last bin is a large Earth Tub. Three samples were obtained from the seven different tubs at the urban farm. A common way to examine microbial diversity within compost is to target a small subunit ribosomal DNA (rDNA) genes, such as 16s rDNA. The following is how each of the twenty-one different compost samples is treated. DNA is extracted from each of the compost samples. Once the sample’s DNA is extracted, a polymerase chain reaction was carried out in order to amplify the 16S rDNA fragments present in the DNA extracted from the compost sample. Gel electrophoresis is performed on each of the PCR products in order to assure that the reaction is successful. The presence of a 1500 bp band indicates successful amplification. This band is cut from the gel, and the amplified 16S rDNA fragments are purified. After purification, the 16S rDNA fragments are ligated into a vector (pGEMT-Easy).

Presently, 16S rDNA fragments from all twenty-one samples have been ligated into pGEMT-Easy. Three samples, B2, E2, and G2, were then selected for further analysis. These three samples represent the three different types of household compost located at the urban farm. The pGEM-16S rDNA constructs corresponding to these three samples electroporated into Escherichia coli cells. Transformants were spread onto an agar plate that contains ampicillin, X-Gal, and IPTG (Isopropyl β-D-thiogalactoside). The colonies are incubated overnight to allow growth of mass colonies. The pGEMT-Easy vector has genes for ampicillin resistance, which allows selection for E-Coli cells carrying pGEMT-Easy (with or without the 16sRNA fragment). IPTG and X-Gal are lactose analogs. IPTG induces the lac operon, while, X-Gal is a substrate of LacZ, and when cleaved it yields a blue product. The plates grew to form many colonies of blue and white color. White colonies contain the 16sDNA fragments. Ten white colonies from each plate were selected and streaked onto another plate in order to purify the clones. The next step is to grow liquid cultures of the clones in order to perform a plasmid preparation. Restriction digest will allow us to choose clones that are different from each other. These clones will be sent for sequencing, which will allow for determination of the microbial diversity within the samples. This project will continue to be carried out in the fall semester with acquiring and sequencing of clones from all remaining samples.
Elucidating the Mechanisms for Delayed Flowering Under Elevated Atmospheric CO

Erica Lawrence, ’14

Faculty Mentor: Clint Springer
Department of Biology

Supported by the SJU Summer Scholars Program

Elevated atmospheric CO$_2$ can act as an environmental cue that may alter flowering time. However, responses have been unpredictable both within and among species. To accurately predict plant responses to future atmospheric CO$_2$ levels, a basic mechanism needs to be found for altered flowering time under these conditions. Generally, elevated CO$_2$ results in increased photosynthetic rate that increases foliar sugar and starch content. Recently, sugar signaling has been implicated as having a significant role in regulating plant gene expression, especially those associated with growth and development. Sugar signaling may therefore play a role in altered flowering time under elevated CO$_2$. To assess this possibility, the present study included seven Arabidopsis thaliana transgenic lines with a single mutation in a sugar metabolism or signaling gene. These mutants and their respective wildtypes were grown under current (400 ppm) and future (1000 ppm) [CO$_2$] where days to flowering, leaf number at flowering, and biomass were measured. Mutants that flower at a different time than the wildtype under ambient conditions, but return to a wildtype flowering phenotype under elevated CO$_2$ would indicate that gene as possibly playing a role in flowering time responses to elevated CO$_2$. One mutant, (abi5-1, abscisic acid insensitive 5-1), which flowered early in respect to the wildtype under ambient conditions, showed significantly delayed flowering under elevated CO$_2$ compared to that of the ambient-grown wildtype. The abi5-1 mutation is an abscisic acid (ABA) mutant that has a glucose- and ABA-insensitive phenotype. None of the mutants showed significant interactions for leaf number at flowering. These results indicate that ABI5 could play a previously unknown role in the mechanism of altered flowering time under elevated CO$_2$. 
Investigating the Role of Mycorrhizae in Crop Production on an Urban Farm
Marisa Wagner,’14

Faculty Member: Clint J. Springer
Department of Biology

Supported by a Gift from Nick Nicolaides’87

Mycorrhizal fungi play a significant role for plants. Mycorrhizae are involved in ecosystem function and productivity, soil properties, plant community composition, and the global carbon cycle. Mycorrhizae play such a significant role in all of these areas by having a symbiotic relationship with plants, in which mycorrhizae take in extra nutrients such as phosphorous for the plants by expanding the root surface area and in turn the plants give the mycorrhizae carbohydrates. Plants with mycorrhizal associations will take up more essential nutrients, such as phosphorous, than plants without the association. The research uses organic farming to compare the productivity of plants grown with mycorrhizal versus plants without the fungi. During this project we inoculated seeds with mycorrhizae fungi to see how the productivity of the plant differs. Our hypothesis was that the plants inoculated with the mycorrhizae fungi will have at least a twenty percent increase in productivity than the plants not involved in the symbioses. The increase in productivity comes from an increase in nutrient availability to the plant, which increases the rate of photosynthesis. With an increase in photosynthesis and nutrient availability, we expected the plants to have increased productivity and yield. With the increase in the productivity of the plant, we saw a difference not only in the size and health of the plants, but in the fruit size as well.

The research this summer was carried out on a small urban farm, The Walnut Hill Community Farm. This increase in productivity and yield is not only important in our research but of great importance for small farms located throughout the city. Urban agriculture, while small, seeks to make the biggest impact environmentally as well as economically. The increase in productivity and yield helps to increase the efficiency of urban farms. While this is essential to an urban farm’s well-being, it also helps to close the gap on the spread of food deserts within our city limits.
Sustainability, viewed at its most fundamental level, requires accountability. We are masters of our own fate. We create and alter the world around us. Ultimately, we must ask whether we are, in the words of the United Nations Commission on Environment and Development, “meeting the needs of the present without compromising the ability of future generations to meet their own needs.” Each generation is called upon to give a reckoning of its stewardship of the physical environment that nurtures life and sustains the planet. As inconvenient—in the sense that Nobel Laureate Al Gore used the term—as it may be, we are called upon to account for the outcomes engendered by human activities. Research in the area of corporate social responsibility is all about assessing the state of reporting on the impact economic activities have beyond the narrow confines of shareowners’ interests. It is here that most of my scholarly contribution efforts, typically empirical research projects, have been focused for more than 35 years.

Disclosures concerning financial activities of publicly held companies in the United States are regulated by the Securities and Exchange Commission. Most reporting with respect to non-financial aspects of corporate business activity remains unregulated and voluntary in nature. Sustainability and environmental responsibility results are disclosed when corporate managers see an advantage and withheld if doing so might be detrimental to stockholders and/or managers. In other words, legitimate needs of non-owner stakeholders to be informed by full, fair, transparent disclosures remain subject to the personal preferences of corporate managers. It is obvious that the interests in knowing about all the effects of business operations easily will differ between owners/managers and the firm’s external stakeholders. Yet, to date there have been few concrete attempts to bridge this gap, to reconcile the varying needs of data users.

Can we design and implement a sustainability reporting system that does not compromise the goal of objectivity and fidelity in measurement? We’re not certain, but continuing to conduct research will be of assistance in making progress. And, if we are to make progress towards a greener more sustainable planet, much greater attention to producing decision-relevant corporate responsibility information will be required.
Within the past decade, technology has become a significant part in the lives of everyone. According to the Government Accountability Office, or GAO, over 150 million United States citizens are connected to the Internet and in 2006, over $102 billion were spent over the Internet by the private sector. This number is even larger for public corporations. Unfortunately, the major increase of data available through the Internet has created an increase in the desire to acquire this data illegally. In order to protect the valuable information, Cybersecurity has become increasingly more important. The Securities and Exchange Commission, or the SEC, defines Cybersecurity as the body of technologies, processes, and practices designed to protect networks, systems, computers, programs and data from attack, damage or unauthorized access. Despite best efforts, there have been many incidents where public companies or corporations have lost millions of dollars’ worth of data in the past decade. One victim where events like this, known as cybercrimes, have impacted is the public vacation company known as Wyndham. Between April 2008 and January 2010, Wyndham experienced three data breaches where millions of dollars’ worth of information was stolen and thousands of customers were affected. In order to address this issue, the SEC issued guidance in 2011 as to how public companies should report cybercrime risks and losses on their annual reports, or 10-K’s, as well as ways to improve their Cybersecurity.

For my summer scholar’s project, I wanted to determine how many corporations are following this guidance and reporting cybercrime losses and risks. In order to accomplish this, I downloaded and analyzed the annual reports from the past five years of a large sample of the Fortune 500 corporations. I then identified key terms regarding cybercrime and cyber security in the annual reports and created documents with extracted paragraphs containing these terms so that further analysis can be made. With all of the collected data, we will be able to determine how many corporations reported cybercrime risks and losses before and after the guidance issued by the SEC. We hope to find that the number of corporations reporting cybercrime risks and and losses dramatically increased each year after the issuance of the guidance.
Financial Reporting of EU Companies That Participate in the Emissions Trading System
Brandon Talisesky,’14

Faculty Mentor: A.J. Stagliano
Department of Accounting

Supported by the SJU Summer Scholars Program

Around the world, many countries are becoming aware of climate change and the detrimental impacts it can have on a society. Since the January 27, 2010 guidance by the SEC approving disclosure recommendations of climate change, results have been positive. Disclosures have increased each year and have had an impact on reducing the carbon footprint worldwide. However, our goal in this project is to extend this project to the European Union to see how and if companies are disclosing financial risks related to climate change. All disclosures will create many questions and uncertainties concerning the materiality of climate change risks as they apply to a particular business.

My role in this project was to extend a previously developed database of company annual financial reports into year 2012 filings. From that, I identified text disclosures regarding climate change in the newly downloaded annual report documents. I then extracted paragraphs of relevant text disclosures so that content analysis can be performed by the principal researchers. In addition, I did this same process with sustainability reports for each company. Both sets of documents would give us a clearer understanding of how and if companies are disclosing financial risk in the European Union. We then can compare these results to the outcomes of how companies in the United States are disclosing financial information. This information can be used to see how the new regulations such as the climate change disclosure guidance initiated by the SEC and the cap and trade policies are impacting companies around the world.

Climate Change is here to stay and will only get worse if action doesn’t take place. Accountability will be the key in reducing our carbon emissions into the atmosphere. These regulations are one small step in making the planet a greener place.
As a clinical pharmacist and Health Services faculty, my research includes improving the quality of life in patients diagnosed with dementia and Alzheimer’s Disease. Patients diagnosed with dementia or Alzheimer’s Disease require coping mechanisms to help maintain quality of life not only for the patient, but also for caregivers and family members who are impacted by this debilitating disease. Creative Expression has been proven helpful in the patient population. Over this past year I have been researching a program called TimeSlips®, a creative expression program used as an activity builder in patients with dementia. I am interested in researching Alzheimer’s Disease quality of life as a whole to include the patient, the caregiver, and the family. My interest is to identify what daily tasks a patient with Alzheimer’s Disease can re-learn to increase their quality of life and how caregivers and family members can maintain their own quality of life while caring for a loved one, once diagnosed. My interests also include supportive in-home care for patients with Alzheimer’s Disease, lower stress levels for caregivers, and identification of coping skills to keep family units intact and their relation to overall quality of life.

I am interested in researching the co-morbidities which affect caregivers of patients with Alzheimer’s Disease. Caregiver stress is a great impact related to Alzheimer’s Disease. In the clinical setting, we are now seeing when an Alzheimer’s Disease diagnosis is made; heart disease, blood pressure, diabetes, and depression are just several of the Alzheimer’s Disease co-morbidities which affect the caregiver. Prevention of caregiver illness, as well as patient illness prevention, is of utmost importance. I am interested in researching the use of disease prevention education, coping mechanisms, and Alzheimer’s Disease education.

Dementia and Alzheimer’s Disease trickles down to the patient and to the family. Coping skills (to include the patient, caregiver, family unit) and caregiver co-morbidity prevention are my main interests of focus.
Implementation of Proactive Storytelling in Patients with Alzheimer's Disease and Patients with Dementia and its Relationship to a Reduction in Agitation and Anxiety
Kelsey Schranze,'14

Faculty Mentor: Eileen Sullivan
Department of Interdisciplinary Health Services

Supported by the SJU Summer Scholars Program

Alzheimer’s disease and dementia can cause behavioral and psychological symptoms in many patients. While these symptoms can sometimes be managed with antipsychotic medications, undesired side effects can occur. These side effects can range from lower cognitive function to even stroke or death. The behavioral symptoms we chose to focus on were agitation and anxiety, which can affect up to 70% of patients with Alzheimer’s and dementia. There are various scales that can be used to evaluate these behavioral and psychological symptoms.

There is some evidence that shows that creative expression therapy, such as proactive storytelling, can decrease these behavioral and psychological symptoms. One of these programs, called TimeSlips, is a storytelling program that decreases the pressure to remember events from the past and focuses on creativity. During a TimeSlips session, a trained facilitator works with a group of Alzheimer’s patients or patients with dementia to create a story based on a selected photograph. A trained facilitator presents a group of participants with an image and assists them to create a story with the utilization of open-ended questions. Everyone is asked to participate, using either words or sounds. The process of asking questions and answering them is repeated over and over until the group decides the story is finished. The completed story is read to the group.

I helped Dr. Eileen Sullivan and Dr. George Sillup complete a paper on finding the appropriate scale to measure agitation and anxiety before and after a TimeSlips session. We thought that an ideal scale would be free to access, reliable and valid, and have a short observation time. The scale we found most effective was the Overt Agitation Severity Scale (OASS). This scale takes only 15 minutes to administer, is specific to measuring agitation, and includes a place on the form to list medications a patient is currently using. Additionally, we are preparing to conduct a study at St. Ignatius nursing home, which will take place in during the fall semester. The purpose of the study is to determine if patients’ agitation and anxiety decrease after participating in a TimeSlips session. TimeSlips sessions may reduce the current drug regimen for patients experiencing agitation and anxiety. Patients will be assessed twice a week for six weeks using the OASS before and after a TimeSlips session.
This research provides valuable insight regarding the impact of human trafficking in general and sex trafficking specifically in Philadelphia. It points to social inequities, both in terms of power and economics and how the lack of resources and opportunities affects the health, safety and future of individuals and the community.

Current laws fail to address the economic issues of human trafficking or offer appropriate sanctions for those who control the industry. Brynna’s research sheds light on a covert activity that is seldom discussed and has few advocates. She has given a voice to the plight of women who have no voice.
Progress and Need: A Snapshot of Sex Trafficking in Philadelphia, Pennsylvania
Brynna Rao,’14

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

Supported by the SJU Summer Scholars Program

My interest in the complex problem of sex trafficking began while volunteering throughout the Fall 2012 semester in rural San José, Costa Rica, at Fundación Rahab, a facility that aids sexual commerce survivors and their families. This work gave rise to my research questions upon returning home where I chose to look at services being provided in Philadelphia to sex trafficked survivors, the means by which survivors are identified and treated at the criminal level, prevention efforts, and progress being made to combat sex trafficking.

Sex trafficking makes up an estimated 80% of all human trafficking and is a growing crime in Philadelphia. The United Nations estimates 2.5 million people worldwide are subject to forced labor or sexual exploitation, and 1.2 million of those are children. Due to the covert nature of these crimes, data on sex trafficking and awareness is lacking on global and regional levels.

During the summer of 2013, I served as a volunteer at Dawn’s Place, a housing rehabilitation facility for international and domestic sex trafficked persons in the Philadelphia area. At this facility, I made observational notes while building relationships with residents through providing tutoring and other support services. According to the facility’s Day Resident Coordinator, Sister Eileen White, women over the age of eighteen are referred to Dawn’s Place from a variety of sources including: Immigration Customs Enforcement, Department of State, Federal Bureau of Investigation, the criminal justice system, social workers, self-referral, or other human service agencies. Covenant House PA, a shelter for homeless youth in Philadelphia, provides services to sex trafficking survivors under the age of eighteen.

Post-trafficked women and girls face a lifetime of health, social, and psychological repercussions. Basic necessities, language services, emergency medical care, safety, shelter services, and legal advocacy are common immediate needs. Dawn’s Place and Covenant House PA service these needs; funding, however, is a constant struggle.

There have been recent national strides to identify trafficked survivors in the United States through the Polaris Project, which receives calls on potential victims through the National Human Trafficking hotline. This program is one of the only steady means of identifying trafficked survivors in the United States. The Human Trafficking in Pennsylvania: Policy Recommendations and Proposed Legislation of June 2012 states, “Current examples in Pennsylvania are common...forced labor at a nail salon in York to a spa in Camp Hill that serves as a front for a brothel and involuntary servitude in Philadelphia or prostitution at interstate truck stops.” Pennsylvania is known both as a ‘pass-through state’, with its interstate highway system, truck stops and transient truckers, and also as a ‘source’ and a ‘destination’ for sex trafficked persons.

Pennsylvania’s human trafficking laws are vague; only one person has been convicted under current human trafficking legislation. Revisions are needed, especially in the areas of prosecution, prevention, and survivor protection; sex-trafficked survivors even here are often falsely criminalized as prostitutes.

My work suggests that more funding is needed for post-trafficking services, public outreach and awareness campaigns, and for efforts to revise current statues and legislation.
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Research Interests:  
State Formation and Political Culture in the Western Hemisphere  

My research is grounded in the study of nineteenth-century political culture in Latin America. Many of my early publications focused on Mexico City in the late colonial and early republican periods (ca. 1780s-1840s), in which I explored the repercussions of the rise of popular sovereignty as both discourse and practice. In recent years, I have built upon this foundation in three ways. The first has been a series of publications that reflects upon and assesses changes in the way history is written, including considerations of the methodological challenges and opportunities inherent in the study of political culture. The second are works that broaden the temporal, geographical and conceptual frameworks of my work. The third, and most recent, is related to my investment in bringing contemporary historical scholarship into the undergraduate classroom at Saint Joseph’s University as an architect of the university’s new required general education course in history, Forging the Modern World. As a result of our work designing and implementing this course over the last five years, Dr. James Carter and I are completing a book, to be published by Oxford University Press, that expands to an analysis of the global context the political and social transformations that have so fascinated us in our investigations of East Asia and Latin America over the years.

The project that Brooke Severe completed this summer is related to my own research on the life and times of Agustin Iturbide y Green, the grandson of independent Mexico’s first head of state, who became the adopted heir of Maximilian and Carlota, rulers of Mexico’s short-lived imperial experiment in the 1860s. Ms. Severe’s research on gender and diplomacy during the Victorian era has both complemented and inspired my own ongoing project.
Modern female celebrity memoirs are a common sight. Such was not the case during the nineteenth century. Though women’s travel literature was an emerging genre at the conclusion of the century, Victorian gender roles generally placed women in the private domain of the home. This summer my project has focused on three women who defied this expectation, not only venturing outside the home but going to distant countries and publishing memoirs about their public and private experiences. These women became for their audiences interpreters of the social and political conditions in Brazil and Mexico during an era when both countries were emerging as places of increased interest for European and American publics. My goal was to examine the memoirs for areas of “difference,” either gendered or cultural, which reinforce or undermine Victorian expectations.

Isabel Burton was the wife of Sir Richard Francis Burton, one of the most famous (or infamous) characters in Victorian English diplomacy. From 1865 to 1868, while Sir Richard served as a British consular officer in Brazil, Isabel did much of the work for her husband, entertaining the diplomatic corps and performing many consular duties. She would later edit her husband’s best-selling memoirs. There is much to be learned from her own writing, including her letters and a memoir, published posthumously in 1897.

Agnes Leclercq Joy was an American who, in 1862, married a Prussian military officer, Prince Felix Salm-Salm. Princess Salm-Salm, as she was later known, accompanied her husband on the battlefields of the American Civil War and later to Mexico, ruled at the time by the Hapsburg Emperor Maximilian. Agnes resided in Mexico for two years (1866-1868), and during her brief stay she became involved in the international effort to save the life of the Emperor, condemned to death by the Mexican republican government after his defeat. She published her memoirs in 1876.

Sara Yorke Stevenson, also an American living in Mexico during the Empire, later became one of the most famous Egyptologists of the early twentieth century. Her memoir, published in 1899, presents an interesting case: her reflections on life in Mexico as a young, unmarried woman in the social circles of the court provide, in excellent detail and with literary merit, descriptions of the social and political conditions of the French intervention.
My research focus is the analysis of the time series generated by the electrical activity of nerve cells connected together in what is referred to as a small world network. Small-world networks are commonly used to model complex systems; their inherent properties of rapid signal propagation, synchronicity and high computational power arise from the many local connections that exist between neighboring nodes (Watts et al., 1998). The synchronous behavior of the small-world network is what makes it useful as a model for epilepsy, as these systems are a hallmark of hippocampal network architecture in regions CA3 and CA1. Designing small-world models of neural networks within regions CA3 and CA1 of the hippocampus allows for an observation of relationships between network properties and the arising activity. Building upon the findings of Netoff et al., (2004) on the ability to manipulate a small-world network to transition from bursting to seizing, we study small-world models of regions CA3 and CA1 to study the relationship between variable network properties and the resulting epileptiform activity. Specifically, simulations of random network rewiring to introduce long-distance synaptic connections, stochastic ion channel behavior, variable [K+]o and the nature of subsequent electrical activity are observed in models with excitatory synaptic connections.

The small-world network approach is also being used to study models of a region in the brain called the suprachiasmatic nucleus (SCN). It is a tiny region on the brain's midline, situated directly above the optic chiasm and composed of around 20,000 neurons. It is responsible for controlling circadian rhythms. The neuronal and hormonal activities it generates regulate many different body functions in a 24-hour cycle. We are building models of the SCN in order to determine the mechanism of the rhythm changes that are observed during the day vs. at night. There is a complex genetic mechanism that controls much of the electrical activity of the neurons and that relationship has yet to be understood.

Currently we have networks consisting of sixty-four neurons and 32 pacemaker type neurons that are used in both studies.
The Influence of Vasoactive Intestinal Polypeptide on Circadian Rhythms Depicted in a Small World Network
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Faculty Mentor: James Watrous
Department of Biology

Supported by the SJU Summer Scholars Program

Essential to human life is the entrainment of circadian rhythms, or the body’s way of maintaining a sense of time throughout a 24 hr. day. The structure responsible for maintaining these rhythms is known as the suprachiasmatic nucleus (SCN), located in the hypothalamus of the brain. A characteristic unique to SCN neurons is the regulation of spontaneous action potentials (Fig 1A). This in part is accomplished through the release of neurotransmitters such as vasoactive intestinal polypeptide (VIP). The influence of VIP on the firing rate of SCN neurons was studied by working with calcium concentrations within the nerve cells.

Using the Java-based software Simulator for Neural Networks and Action Potentials (SNNAP), a SCN neuron with a calcium ion channel, ion pool, as well as a calcium-dependent potassium ion channel was constructed (Fig. 1B). This model neuron was used to construct VIP neurons (expressing the neurotransmitter VIP) and pacemaker neurons (firing without stimulus). These neurons differ from the typical Hodgkin-Huxley type which contains only the sodium; potassium; and leak channels (Hodgkin and Huxley, 1952). The calcium ion played an important role in the way VIP and SCN neurons produced nerve impulses. The calcium ion channel was a source of ions for the calcium ion pool, which was then directed to the calcium-dependent potassium channel. The kinetics of this system in VIP and SCN neurons were different. Consequently, the firing of a VIP neuron was marked by an action potential followed by a period of subthreshold activity. On the other hand, SCN neurons fired action potentials consecutively with no subthreshold activity. Action potential counts were taken for one VIP and one SCN neuron over a period of 4 seconds. The VIP neuron had a lower frequency of action potentials whereas the frequency of the SCN neuron was increased. Furthermore, when the kinetics of a VIP neuron was incorporated into that of an SCN neuron, the SCN neuron behaved in a manner characteristic of a VIP neuron (Fig. 1C; first and third traces). The action potential frequency and the change in the SCN firing rate suggests that the concentration of the calcium ion with respect to time corresponds with different levels of activity throughout the day and night for SCN and VIP neurons. Furthermore, the change in firing rate also suggests that VIP plays an important role in regulating circadian rhythmicity and synchrony among neurons in the SCN (Reghunandan & Reghunandan 2006).
Epilepsy is one of the most commonly diagnosed neurological disorders and is identified by seizures produced from an excess of synchronous positive feedback in the neural networks of the brain. Research by Netoff et al. (2004) showed that the CA3 region of the hippocampus is responsible for ictal (sudden physiologic attack) bursting activity (50-100 ms) while the CA1 region is attributed with prolonged seizing (100+ ms). The inclusion of pacemaker neurons, neurons that fire independently without an external stimulus, affects these two types of epileptiform activity.

Representative models of the CA3 and CA1 regions were assembled using the Java-based software Simulator for Neural Network and Action Potentials (SNNAP). Networks of 64 neurons were constructed, each with the appropriate number of synaptic connections and strengths. These models simulated the predicted epileptiform activities in voltage versus time output screens in the 3, 6, 9, and 12 clock positions of the ring-shaped network; ictal bursting in the CA3 region and prolonged seizing in the CA1 region. A pacemaker network of Morris-Lecar neurons was then electrically connected to each network separately and used as a stimulus.

The Morris-Lecar Spiking Neuron Model was the first pacemaker neuron to be modeled computationally in order to provide a way to observe the behavior of barnacle muscle cells. This study simulates the addition of pacemaker neurons in the CA3 and CA1 neural networks and how it will affect the epileptiform activity. The Morris-Lecar network consisted of 32 neurons electrically connected, but only the first neuron was given pacemaking ability. After electrically connecting the first neuron of the Morris-Lecar network to randomly selected neurons in the CA3 and CA1 networks, differences in the simulation output were noted.

The ictal bursting activity of the CA3 region network model (Figure 1A) switched to prolonged seizing after the addition of the Morris-Lecar Network (Figure 1B) causing an overload of synchronous positive feedback in the neural network. The prolonged seizing activity of the CA1 region of the hippocampus (Figure 1C) still remained after the addition of the Morris-Lecar Network (Figure 1D) because the CA1 region is already attributed with this behavior and thus already experiencing an excess of synchronous positive feedback in the network.
In higher education, across many disciplines are increasingly focusing on encouraging students’ moral reflection and assessing their moral development. Christine’s research project gets at a fundamental question one faces teaching a course like this: Does it really make a difference? While I can be confident that my students are academically challenged, as a teacher I want to know that they will leave my class better equipped to face current and future social injustice and commit themselves to making a difference.

As background, I teach courses in business ethics in our graduate business programs. Many of the ethical issues that arise in our organizations center on issues of opportunity, fairness, inclusion, and integrity, whether we are discussing gender equity, labor conditions in a firm’s supply chain, or the impact of business on the environmental, or a host of other topics. Students recognize the ethical issues of wide range of topics to which they had not had previous exposure and learn how to make decisions. Sometimes they change their own beliefs, but that’s not the goal. By exploring ethical issues of today, my students learn to handle the complex, controversial issues they will face as decision makers tomorrow.

Creating a new First-Year Seminar, "Serious Comedy and Social Justice" seemed like a natural progression from my business ethics courses. As an educator, I am always working on ways to better engage students. This course uses comedic and humorous material as a lens through which students examine social justice issues – often by highlighting social injustice.

By “serious comedy” we mean humor as a form of social commentary. It’s a fun, funny, engaging, hard, and, at times, fairly intense class. Teaching the course has taught me a lot about serious comedy, my students (they are open with their viewpoints and arguments), and about why I teach. Christine’s research project helps me better understand the latter, and will help inform and improve teaching that literally changes lives, both in the classroom and far beyond it.

Since this course is a FYS, students are taking it in their first or second semester of college. Any 20 first year students possess widely varying high school experiences and personal backgrounds. For this class it is essential that students feel safe in the classroom expressing (and questioning) their own ideas and exploring others’ perspectives.

Although our society has seen a good deal of social progress, injustice and unequal opportunities remain. Our organizations and institutions – in the private sector, public sector, or NGOs – can either be agents of positive change, or can perpetuate social injustice.

This research project examines both pre- and post-course assessment of students’ views on social dominance and their moral development. It will be exciting to see the results in the coming year, and for years to come. Given the interest in moral development of young adults across higher education, I believe Christine’s research will be of interest to many college teachers.
Impact of Social Justice Education on Perceptions of Equality
Christine Dignam,'15

Faculty Mentor: Ken Weidner
Department of Management

Supported by the SJU Barbelin Scholars

In the fall of 2012, Dr. Ken Weidner introduced a new Freshman Seminar course in the Leadership, Ethics, and Organization Department Program of in the Haub School of Business. The course, entitled “Serious Comedy and Social Justice,” focuses on perceptions of racial discrimination, gender and sexuality justice, and class separations and the influence of comedy upon these perceptions. Weidner requires the students to purchase (a) a textbook which addresses social justice in the categories of race, gender and sexuality, and class and (b) a subscription to Netflix in order for them to view movies, television episodes, and video clips that address these issues using comedy. The students are required to prepare for class by completing assigned readings from the textbook and watching a related video clip, movie, or documentary. In class, students engage in open discussions about what they have read and seen. The concept of this class sparked my interest and made me wonder whether taking a class like this would change students’ perceptions of social justice in the world. I spent the summer conducting research on the theoretical foundations of social justice and theories behind education that aims to foster a sense of responsibility in students to promote social change.

Culminating in the 1960s, the American civil rights movement ushered in a new era of understanding of racial justice and political rights. However, this awareness was reserved for the historically marginalized and easily identified groups of the time. Since then a richer understanding of diversity has become necessary as the dimensions of diversity have been diverging into additional groups than those previously recognized. With the recognition of these added dimensions, members of society have become more attuned to issues such as discrimination and injustice based on differences in gender, sexuality, race, and economic status. These issues are prevalent in institutions such as schools and business. It is evident that these social changes have exerted pressure on the institutional norms and standard practices that were established before the widespread awareness of the many dimensions of diversity. It is the responsibility of the representative population of this diversity to incite change in order to actuate advancement from these issues of social injustice.

Within education, theories of critical pedagogy have been developed to embrace schools as vehicles for change. Critical pedagogy calls to redefine education from a process of indoctrination of robots to a fostering of critically thinking individuals. It seems fitting that along with the growth of this theory, recent trends show an emphasis on teaching for social justice in higher education. The effort to integrate social justice into education has been spreading across the country. My research seeks to assess the need for social justice education and to evaluate strategies and efforts to integrate such education into higher education. I plan to continue my research by administering a survey to the students taking the course, Serious Comedy and Social Justice, in order to statistically analyze the impact the course has had on the students’ attitudes of social dominance.