The College of New Jersey

TCNJ MUSE

Mentored Undergraduate Summer Experience

2008 Projects

The College of New Jersey's
Mentored Undergraduate Summer Experience – 2008

The TCNJ students and faculty who participated in the Mentored Undergraduate Summer Experience (MUSE) created a vibrant scholarly community of faculty-student collaboration for eight weeks during the summer of 2008. Our community was truly multi-disciplinary with 69 students and 41 faculty members representing 21 Departments, Programs, or Centers, from five different Schools.

The students engaged in authentic research or creative projects full-time, as junior collaborators with their faculty mentors. In addition, we gathered twice weekly as the MUSE community for food and conversation across the disciplines. Faculty members led participatory workshops at Monday lunches on ethics in research, funding strategies, the publication process, mentor and mentee roles, graduate school, communication skills, and interdisciplinary projects. On Thursday afternoons we enjoyed refreshments while hearing from many students about their ongoing projects. MUSE was not all work and no play – faculty and students spent a day canoeing the Delaware River, there was a Wednesday Ultimate game each week, and students enjoyed coordinated, fun evening activities that strengthened the MUSE community. Fifty of the students were housed together, providing unlimited opportunity for making new friends and interacting informally with fellow scholars of widely varying interests.

This wonderful program was possible because of the generous support and dedication of many people and organizations. The Director and all of the students and faculty of MUSE extend our deepest thanks to . . . Interim Provost Beth Paul for her vision of long-term growth and sustainability for MUSE and a substantial budget; the Office of Academic Affairs, with administrative support from Janice Huang, for taking care of so many logistical details; student program assistant Nikketta Pressley for organizing all of the community activities; Dean Jeff Osborn (Science), Dean John Kirnan (Business), and Dean Taras Pavlovsky (Arts and Communications) for supplemental funding; the Offices of Residential Education and Housing, Conference and Meeting Services, Finance and Business Services, and every School and Department office and Chair with MUSE students, for administrative support; the Faculty-Student Collaboration Committee, consisting of Drs. Sunita Ahlawat, the late Alan Dawley, Candice Fiering, David Hunt, Dean Jeff Osborn, Nick Ratamess, Ralph Reed, Jess Row, Greg Seaton, and Jennifer Wang, for guiding the vision of MUSE, reviewing proposals, and selecting participants; and our generous external funding sources – the American Association for the Advancement of Science and Merck & Co. Inc.; National Starch and Chemical Company; the National Science Foundation; the National Conferences on Undergraduate Research and the Alice and Leslie E. Lancy Foundation; and a Roebling Grant.

Janet Morrison
Director of Faculty-Student Collaborative Activity and MUSE
Associate Professor

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Interdisciplinary Projects

African Coverage of AIDS: A Focus on Sub-Saharan Anglophone Countries

Amanda Burd, Kristen Kiernicki, Janna Raudenbush: Communication Studies / English (Journalism)
Faculty Mentors: Dr. John Pollock, Dr. Paul D'Angelo, Donna Shaw, M.S.

2008 MUSE Project

During the Mentored Undergraduate Summer Experience we had the privilege of working with Dr. Pollock, Dr. D'Angelo, and Prof. Shaw to explore media coverage of AIDS in Africa, exploring in particular coverage of "progress" or "decline", and "government" or "social" responsibility regarding AIDS. We began by researching modern descriptions of media systems in thirteen countries in Sub-Saharan Africa (chosen last summer), applying them to Daniel Hallin and Paolo Mancini's dimensions for comparing media systems. Eventually, our research led to a proposed original model/typology locating countries in one of three categories we created describing freedom of the press: Participatory, Instrumental, or Hegemonic.

The original focus of our project was to extend research conducted last summer. However, we discovered that previous newspapers, while organized and coded well, were uneven representatives of Sub-Saharan African media. To introduce more sampling rigor, we investigated each country to determine the highest circulation, English-language daily newspaper. A thorough search of various sources, including the Princeton Public Library and the World Association of Newspapers, ultimately led to the discovery of the AllAfrica database, containing many heavily circulated newspapers unavailable in databases used by last summer's group. We purchased subscriptions to the AllAfrica database and to the *Johannesburg Star* of South Africa. With these databases, we sought all articles relating to HIV/AIDS since 2002, comparing various search terms to produce the most relevant and reliable results.

Using our knowledge from the initial research on press freedom, we designed a 2 by 2 analysis of the coverage. This design will compare AIDS coverage in four countries with different levels of AIDS prevalence and different levels of press freedom. We are currently working towards a ten percent stratified random reliability sample of over 2000 articles in four major newspapers, one sample from each cell of the analysis. We are also drastically reworking the coding instrument. All students are continuing with the project in Fall 2008.

Amanda Burd Personal Statement

The undergraduate research program allowed me a chance to become immersed in the research process. Throughout the course of the project we were able to express our concerns about the way in which the focus of the research was going. We were able to improve pieces of the methodology in order to make it as strong as possible. I learned how to use a variety of databases including ways to find additional databases. We also had to use SPSS in order to enter and analyze our data. What I will take way from this experience is the confidence to question methodologies in order to ensure that the most rigorous way, not the easy way, is used to gain the results. As I approach my post-TCNJ education I will have gained a powerful new skill set through MUSE.

Kristen Kiernicki Personal Statement

My participation in the MUSE program helped contribute to my post-TCNJ goal of attending graduate school, where I plan on conducting various types of research. This summer, I learned the importance of proper methodology and using reliable sources. Various search techniques also became an integral part of the project, as gaining access to African newspapers was difficult, mainly due to lack of technology (some newspapers are only available in hardcopy, not online) and variations in media freedom in the region. Operationalizing variables continues to prove challenging, though with the ongoing revision of a coding instrument, I am confident that we will eventually produce reliable and valid results. Since the AIDS in Africa project is original research, I am both excited and honored to be participating in such a valuable study at the undergraduate level, an opportunity I would not have been afforded without the help of MUSE.

Janna Raudenbush Personal Statement

This summer's MUSE project was a valuable learning experience for me-- one that goes far beyond what I would be able to learn in the classroom. As I am planning on continuing my education in graduate school, I will need to be familiar with carrying out large and in-depth research projects. Through MUSE, I was able to gain experience by having a very active, hands-on role in this project. We practiced procedures such as content analysis, random sampling, and reliability testing, and we stretched our research skills to find information about the media systems in Africa, very difficult due to wide variations in press freedom and internet access in many countries. It was also exciting to know that my work will be a unique and important contribution to the communication field. Although our project is far from over, I have already learned many lessons about the research process that are best understood not from reading textbooks or listening to lectures, but through personal and group involvement.

Community and Environmental Transitions in Metropolitan Trenton: Institutionalizing Research in a Struggling Post-Industrial City (funded by National Conferences on Undergraduate Research and the Alice and Leslie E. Lancy Foundation)

I. Capacity Building and Nonprofit Organizations in Mercer County

Johanna Soto, Sociology
Faculty Mentor: Dr. Dave Prensky

2008 MUSE Project

This summer I worked with Dr. Prensky, in the School of Business. The focus of the research was nonprofit organizations in the Mercer County area, with a concentration on Trenton. My summer research was directed to understanding the challenges nonprofits experience and determining the resources they lack. I read literature focusing on the history, predicted future, and key issues of nonprofit organizations in the United States. In addition, I conducted interviews with nonprofit organizations and key people in the nonprofit sector.

Before I could begin my research I had to understand nonprofit organizations in the United States and thus I read an estimated 20 articles. This information was essential for my research because it provided direction. Through the literature, I realized the problems facing nonprofits and the need for capacity building. In the nonprofit sector the term capacity building is described as the development of an organization's core skills and capabilities, such as leadership, management, finance and fundraising, programs and evaluation, in order to build the organization's effectiveness and sustainability. The literature has demonstrated that, unfortunately, capacity building is an area that most nonprofits do not include in their budget.

After reading the literature I was able to create an interview schedule and a list of possible participants, using a list of registered nonprofit organizations in the area. I set up interviews via the phone and email. The interviews were done in person and lasted one hour. This summer I have been able to conduct interviews with four organizations, one consultant for nonprofits, and an auditor for nonprofits. My research still has not been completed as I still have several other interviews scheduled. Thus far, I can conclude that capacity building remains one of the least important aspects in the organizations I interviewed because of limited financial resources.

Personal Statement

The undergraduate research program gave me the opportunity to strengthen my interviewing skills. In the beginning of the summer program I was hesitant that I would be interested in the topic of nonprofits and capacity building. As a sociologist, I understood the importance of nonprofits but I did not know why capacity building was essential. After meeting and discussing my concerns with Dr. Prensky, he helped me understand the true importance. Once I started conducting interviews I realized that without capacity building nonprofit organizations encounter several difficulties that are easily avoided in the private sector, but because of limited financial resources many nonprofits cannot invest in capacity building. Overall, this summer experience broadened my mind and taught me about a topic I previously did not understand. After this research, I am now considering possibly working for a nonprofit organization as one of my future goals.

II. Land Use and Policy: Improving the Municipal Environmental Planning Capacity of the City of Trenton Brownfields Program

Jessica C. Godofsky, Sociology/Anthropology
Faculty Mentor: Dr. Martin Bierbaum

2008 MUSE Project

This community-based research project was comprised of two ongoing tasks designed to foster capacity-building within the City of Trenton Brownfields Program. A brownfield is a commercial or industrial site currently vacant or underutilized that is or is suspected to be contaminated. Trenton's history as a once lucrative ceramic and steel industrial powerhouse has left hundreds of brownfield properties to locate, remediate, and redevelop. The first project was to identify resources, both technical and financial, that would assist the Brownfields Environmental Solutions (BEST) Committee and the City in making better informed and appropriate land use decisions when planning the redevelopment of a brownfield. Data and mapping resources made publicly available by agencies in the public, private and academic sectors were researched and compiled into a user-friendly electronic report to allow interested parties to access the demographic, economic, agricultural, transit-oriented and environmental information essential to strategically establish a claim that a certain land use, such as residential, will match the social, fiscal and physical elements of a particular site.

The second project aimed to consolidate multiple brownfield site inventories into one coherent, updated and comprehensive register that would allow the City to more easily evaluate its redevelopment progress. This register will also be used to prioritize the redevelopment of sites according to their economic potential and social advantage to the City and as a marketing tool to assess investment opportunity of properties. A research paper is currently being developed to accompany this summer's work that will include a review of academic literature and an outline of recommendations to encourage capacity-building. The paper will analyze how the previously mentioned projects, along with the establishment of a public relations program, are needed to overcome common challenges encountered when attempting to make effective, economically feasible and socially acceptable environmental planning decisions within a municipal Brownfields Program.

Personal Statement

My participation in this research project complements my academic coursework, as I have come to further understand the complexities of decision-making within and among multiple levels of government. Brownfield redevelopment is a multifaceted and interdisciplinary subject, with far-reaching social, political and scientific impacts on the community. Contributing to weekly meetings with the NCUR-Lancy group and my experiences with political actors have given me the ability to see the challenging opportunities the City faces rather than just its recurring problems. Professionally, I have learned that it is important to persistently seek guidance from faculty mentors; understanding their intentions and the target objectives of the assignment is essential to formulating and completing a useful, successful project. Through my MUSE experience, I have developed advanced analytical and interpersonal skills that will be of invaluable assistance to my future academic career. I am excited to continue learning about brownfields as I write my Senior Thesis in the fall semester.

III. The Utilization and Knowledge of Sexual Assault Resources in Mercer Teens

Erin-Ellen Dillon, Nursing
Faculty Mentor: Assistant Dean Antonino Scarpati

2008 MUSE Project

Sexual assault is a major health concern in the United States, and one of the highest risk populations is female teenagers. However, there is very little literature on teens between the ages of 13-17 who have been sexually assaulted. Furthermore, little is known about this age groups' knowledge base about sexual assault and the availability of sexual assault resources, specifically Sexual Assault Nurse Examiners (SANE). SANEs are specially trained nurses who not only gather forensic data but also provide support for a victim. Much of the research has shown that SANEs improve the long-term outcome for a client by providing victim-sensitive service and helping the victim to feel a sense of efficacy during the process. Under the NCUR model with "communities in transition" we focused on Mercer County's SANE program and the teens they serve. We worked with Womanspace, the New Jersey Coalition Against Sexual Assault (NJCASA), and Jane Reynolds, the head of Mercer SANE. We constructed surveys that asked hotline workers, counselors, advocates and SANEs about their professional opinion regarding female teens' knowledge of both sexual assault and sexual assault resources. A mini phone interview was conducted with the head of Womanspace's counseling services and a SANE from Mercer. Much of the data still needs to be collected but the perception currently is that there are few resources for these girls and they have a low knowledge base about their limited sexual assault resources and sexual assault itself. Currently, a brochure containing information about sexual assault resources, SANEs and what constitutes sexual assault is being constructed in an attempt to increase teens' knowledge of resources and sexual assault. This brochure is being constructed in conjunction with Womanspace, NJCASA and the Mercer SANEs. We will be attempting to place them in high school nurse's offices this fall.

Personal Statement

Nursing students often hear "do research" in order to gain recognition for nurses as professionals. I am proud to be a "nurse researcher" and to have grown not only as a researcher but also as a nurse. I believe the rejections I came up against, and the small triumphs of finding people who not only wanted to help me but were excited to help me, made this project worthwhile. The SANEs inspired me to become licensed as a SANE and to continue working towards my goal of getting a Master's in nursing. Before this project I was passionate about the issue of sexual assault and victims' responses to it. This research has encouraged me to work towards finding ways to help educate teens between the ages of 13-17 about sexual assault and SANEs. I had a wonderful mentor and an incredible experience as a student research and I hope to continue to work tirelessly on this issue throughout the rest of my career as a nurse.

IV. Investigating Partnership Opportunities for Community Based Research in Metropolitan Trenton

Susan Cosgrove, Sociology
Faculty Mentors: Diane Bates and Elizabeth Borland

2008 MUSE Project

The purpose of this project was to assess the need for community-based research partnerships between the faculty and students at TCNJ and local community and non-profit organizations. While TCNJ already has strong relationships with some organizations through the Bonner Center, this project sought to gain a better understanding of the population of organizations in the Trenton and Ewing area. The first step was to compile a database of the community and non-profit organizations in this region. From this list of almost 800 organizations, we randomly selected 83 to contact. I designed a brief phone survey to gather information about whether the organizations have worked with students in the past, whether they would be willing to work with students and faculty in the future, and if they have any immediate research needs or projects. I also designed and completed a phone survey for four organizations that worked with student groups for an applied sociology class last fall.

The work I have done on this project is just a step towards incorporating community-based research at the College. During the phone interviews, a number of organizations expressed great interest and enthusiasm at the idea of partnering with the college. Some even mentioned specific projects that could utilize TCNJ students and faculty. The next steps in this project will involve determining faculty interest in partnerships and finding ways to pair up organizations with members of the College community.

Personal Statement

My past experience working with an organization using a community-based research model was very rewarding, so the idea of initiating more of that type of research at the College is very appealing to me. The most challenging aspect of this project for me was thinking about how disciplines outside of the social sciences may be able to partner with organizations. When I came up with the initial inventory, I made it as inclusive as possible so as to give all students and faculty at the college the potential to engage in community-based research.

Working as a part of the NCUR program enhanced my understanding and appreciation for the city of Trenton. Though it's right around the corner from TCNJ, I had little knowledge of the city aside from sensationalized news reports touting high rates of violence and crime. Social problems do indeed exist in Trenton, but to malign the city or its people is to neglect the complexity of these issues and to undermine its potential.

V. Restoration of a Waterway in Trenton, a Postindustrial City
Alex Rass, Biology
Faculty Mentor: Dr. Curt Elderkin

2008 MUSE Project

The Assunpink Creek watershed bisects the former industrial city of Trenton, New Jersey. However, due to economic hardships the creek is mostly a neglected waterway within Trenton City limits. Ever since the end of its industrial heyday, Trenton has faced numerous problems evolving into a cleaner, healthier city. The industrial complexes that once were common in the city limits are, in most cases, abandoned brownfields. However, the city administration has made steps towards recovery. Public programs such as Green Acres, the US Economic Development Administration, and private donors like the Wachovia Foundation, along with others have donated to Trenton's recovery. Currently the city has budgeted millions of dollars in state funds and private grants to remediate environmentally problematic areas in Trenton, and its money has not gone to waste. Very recently, a recovery plan to reconstruct the major downtown area has been created, including recreating the riparian zones of the Assunpink, as well as uncovering the box culvert that plagues the stream. According to the visuals depicted in the master plan, a large greenway containing natural areas, parks, and playing fields is to be built in place of an industrial sector. Despite the many problems that lie ahead, the outlook is hopeful. In the short term, funds are plentiful and there is initiative. The plans are in place, contracts are being signed, and work is being done. However, in the long term, money may be scarce, and the excitement that initially started the project may dwindle in the future. This is indeed not a small project and it will take many years to accomplish, but with these plans in place, the Assunpink Creek will hopefully become a more environmentally sound place that aids in the recovery of this post industrial city, while also giving citizens somewhere to rest and unwind.

Personal Statement

Completing my second year as part of the summer research program here at The College has continued to show me how much can be accomplished and the sheer quantity that can be learned when working closely with a mentor. Part of my research this summer focused on an interdisciplinary project through which I was able to collaborate with six other students from a multitude of disciplines to discuss the current state of affairs in Trenton. These discussions, led mainly by officials invited from Trenton, allowed us to gain a deeper understanding of the problems that plague the city. A major part of my personal project, which focuses on the poor condition of the Assunpink Creek, was learning to interview administrators involved in this project. This skill is one that needs to be learned, and from my personal experience can only be done through practice. The rest of my time was devoted to analyzing microsatellite DNA from freshwater mussels in order to confirm conclusions reached in my independent study in the past year.

VI. Public Art

Michelle Nugent, Fine Arts
Faculty Mentor: Sarah Cunningham

2008 MUSE Project

The Trenton Summer Research Project at TCNJ funded by the National Conferences on Undergraduate Research and the Lancy Foundation emphasize interdisciplinary community-engaged research to cultivate ties with the city of Trenton. This summer I worked with Sarah Cunningham on the program's first art-based project. My involvement came in three parts: creating a mosaic for a neighborhood park, volunteering for ArtWorks' "Art All Night" exhibition, and painting a large-scale mural for Trenton's West Ward Center. All three projects allowed me to meet and collaborate with city officials and the residents of Trenton by focusing on the impact public art can have on Trenton and its people.

The community mosaic introduced me to the communication and cooperation needed with a community in order to conduct a successful public art project. With the neighborhood's helping hand, we placed numerous small glass tiles together into a design I had made that showcased the neighborhood's name.

I also volunteered to assist Trenton's downtown visual arts center, ArtWorks, produce "Art All Night". This event was a 24-hour art happening that offered free exhibition opportunity to people of all ages and skill levels. I helped publicize the event, take inventory on the submitted artwork, install and take down the pieces, and conducted surveys. I was able to talk to many artists and art admirers from and around the Trenton area, as well as connect with ArtWorks' board of trustees and volunteers who shared the same passion for spreading art throughout Trenton.

Lastly, my major project was a mural the children at a local recreation center helped me paint. The design consists of a vibrantly colored Trenton city skyline alongside sport themes popular with the children at the Center. This 8'x 32' mural will be installed within the Center's gymnasium upon completion.

Personal Statement

This project gave me the invaluable opportunity to learn about Trenton from city experts and get to know Trentonians on a personal level. I discovered how different disciplines, such as science and art, become easily interconnected through the common interest of developing a better community. The Trenton Summer Research Project, in conjunction with MUSE, gave me the chance to meet students in other areas of research to exchange ideas. My mentor's guidance gave me the confidence to become more independent in my artistic endeavors. My projects provided me with more experience and a better mindset for graduate school and the pursuit of an art career. Through this program, I am proud to have represented TCNJ by contributing to Trenton through art. I hope my projects helped promote an even greater pride and connection to Trenton as not just a city, but also as a center of cultural diversity with strong community ties. Special thanks to the TCNJ's Bonner Center, the West Ward Center, and the City of Trenton's Department of Natural Resources, Recreation and Culture.

VII. Documentary on Immigration in Chambersburg, NJ
Mary Michalopoulos, Communication
Faculty Mentor: Dr. Susan Ryan

Personal Statement

MUSE has given me an opportunity like no other. Classroom and personal projects cannot compare to the wealth of knowledge and experience you gain from working with a professional on a production. Working with Dr. Susan Ryan on this documentary on Immigration in Chambersburg has not only taught me proficient research skills, organizational tactics, the time management required when working on a real production, and sharpened my technical skills as far as camera and lighting operation, audio, and editing; it has given me a new understanding of the fundamentals and strategies behind documentary filmmaking and video. In this one summer I have gained more real based knowledge and experience than maybe in my entire educational career, and I know it will set me apart in both the work place and in graduate school. Furthermore, the project has allowed me to gain a true understanding of Trenton, all its many people, the issues it is facing, the wonders it possesses and its unlimited potential. I am extremely fortunate for having this experience.

Content Management and Multithreaded Storytelling
(funded by the National Science Foundation and MUSE)
Becky Bernot, Andrew Chiusano, Dan Gill, Scott Kieffer, Brett Taylor, Nancy Sai; Computer Science, Interactive Multimedia, and English (Journalism)
Faculty Mentors: Dr. Monisha Pulimood, Kim Pearson, M.A., Dr. Ursula Wolz

2008 MUSE Project

Our research program is a collaborative project being conducted by a combination of a dozen faculty members and students from more than three different schools. The program has various goals that derive from the three areas of study, which are journalism, interactive multimedia, and computer science. The primary goal, which was the basis of the National Science Foundation grant, relates to computer science. The American educational system is increasingly failing to produce enough graduates of computing disciplines to fill all the available technology jobs. Research shows that this problem begins at a young age, when students of middle schools and high schools develop premature notions about computer science; often, these are negative views. We are working with a group of middle school students from Ewing to try to change their perceptions about the computing fields.

To accomplish these goals, our students are learning and doing interactive journalism, with the goal of producing an online magazine. In creating interactive journalism projects, the students will be learning basic programming. But because the students are practicing journalism, another one of our goals is for them to learn the essentials of journalism by the end of the session. We are accomplishing this through the use of activities, games, and most importantly, hands-on experience. The students are interviewing a number of real professionals from around the country, such as actors, scientists and comic book authors. The programming language we are using, Scratch, provides the link between journalism and computing. Developed by MIT, Scratch is a kid-friendly program that makes programming easily accessible. The final piece of our program is CAFE, the Collaboration And Facilitation Environment. Developed by one of our MUSE students, CAFE is a content management system that is used to store and display all of the students' work.

Becky Bernot Personal Statement

Before this summer's research program, I hadn't imagined that there would be many situations in my undergraduate career where I would be called to draw upon my dual background in mathematics and journalism. The Interactive Journalism Institute does just that: it seeks to bridge the gap between traditionally writing-dependent careers and the computing disciplines, two fields that were ostensibly at odds in the past, but now have become increasingly codependent. While the majority of our research has been focused on planning and developing the learning institute for middle school students, the collaborative process has demonstrated the results we are working to put into effect. Although working with representatives of several different disciplines has had its challenges, many of which surfaced in the form of conflicting goals or differing ideas of how to approach the common ones, they were not unlike the conflicts that we faced when working with children with varied skills, learning styles, and manners of expressing their talents and creativity. Further, the experiences that I've benefited from have been invaluable lessons that I can apply in the workplace and in the furthering of my education. These ancillary rewards have been both revealing and enriching.

Andrew Chiusano Personal Statement

The MUSE summer program has been a rewarding experience. I believe that working with students and faculty from other disciplines has let me learn new ideas beyond my major. Also, working on a project that will actually go into use has let me learn valuable new skills that are not taught in class. I now have practical experience working with others to implement a computer system that meets the goals of a larger project.

Dan Gill Personal Statement

The undergraduate research program that I did in interactive journalism presented me with an invaluable opportunity to develop my leadership and analytical skills. Working with a group of 17 rising eighth graders from Fisher Middle School, as well as several of their teachers and a guidance counselor, gave me the opportunity to hopefully have an influence on one of these kids' lives. We are trying to provide an environment that promotes open-mindedness by ensuring that all the children in the camp feel like they have a voice that is being listened to. The idea behind the interactive journalism camp is to broaden the horizons of the children by superseding the stereotypes that have been created by our society. This is being accomplished by providing them with a different teaching method, since most kids don't learn the same way. Having a strong computer science background, I really enjoy how accepting the children have been to programming using interactive animations, and how quickly they learned new things.

Scott Kieffer Personal Statement

I could not possibly list all of the things I learned this summer in 175 words. But these are a few of the most relevant. As a journalism major, I spent a lot of time analyzing new ways of doing interactive journalism and storytelling. As media moves steadily to the web, this kind of technology expertise will be valuable. I made projects such as interactive magazines and timelines to explain stories in a visual way. To create these interactive projects, I learned the programming language called Scratch. This was my first programming language, and I am amazed at how much I can do with it. The possibilities of Scratch allowed me to expand on some of my other interests. One project gives background information for a book series I am writing. Other projects let me explore my interest in gaming journalism. Recently, I have been designing and programming an actual video game. The most rewarding part of the program, though, is that I am now passing on these skills to a younger generation.

Brett Taylor Personal Statement

I think that I'm taking a lot away from this program, which is infinitely more than I expected I would. Did I think I'd learn such an immense amount about journalism? No. Did I think I'd ever want to learn so much about journalism (and especially how it ties into my major, Interactive Multimedia)? No. As far as I was concerned, IMM was divided into two departments: Digital Media and Interactive Computing. Professional Writing wasn't even on my radar. However, reaching outside my comfort zone by exploring these facets of journalism has been a tremendous asset I can take with me through the rest of my college career, and probably beyond that, too. I look forward to continuing with this program next year. I now know I've only begun learning about the topic that may actually be an extremely helpful asset with my (rather ambitious) plans for the future!

Nancy Sai Personal Statement

From MUSE, I am leaving with a strong understanding of collaboration. When one collaborates, the possibilities are endless. As I enter my future workplace, I know to look out to others-with varying abilities-in working to achieve a single goal.

Development of Small Molecule Proteasome Inhibitors

(funded by the American Association for the Advancement of Science and Merck & Co., Inc.)

I. Inhibition of the Proteasome in *C. elegans* by Small Novel Proteasome Inhibitors

Michela Fiaschi, Biology
Faculty Mentor: Dr. Sudhir Nayak

2008 Muse Project

The goal of this project is to study germ-line development in the microscopic worm model *Caenorhabditis elegans*. The focus of this project revolves around the protein GLD-1 (defective in Germ Line Development), which is an RNA binding protein required for normal germ-line development and oogenesis. In wild-type worms, the GLD-1 protein has a tightly restricted expression pattern with high level of expression during meiotic progression and low levels during oogenesis. The mechanisms by which GLD-1 protein levels are down-regulated and maintained at very low levels during oogenesis are not known. To identify genes involved in the down-regulation of GLD-1 protein we took advantage of a transgenic strain with GLD-1 fused to GFP (Green Fluorescent Protein) that allows for the visualization of GLD-1 expression. Preliminary data suggest that loss of function in proteasome components (i.e. *pbs-4*) results in the ectopic expression of GLD-1. Thus, our working hypothesis is that the abrupt decrease in GLD-1 prior to oogenesis is a result of degradation by the proteasome; a large multi-protein complex that functions to break down damaged or unneeded proteins. We are using RNA Interference (RNAi) knockdown and chemical inhibition of the proteasome to determine if GLD-1 accumulation is affected. As part of this project we are screening small molecule derivatives of the bicyclic compound NP-0052 for their ability to inhibit the proteasome. In doing so, the GLD-1 level should rise and could possibly extend into the oocytes and even the embryos, causing abnormal differentiation and programmed cell death. The data from this project could be useful for generating proteasome inhibitors for human cancer research.

Personal Statement

The MUSE summer research program has provided me with the unique opportunity to collaborate with other students, while furthering my independent laboratory skills. Though I have spent time in the lab shadowing a research student during the past semester, that time was not sufficient enough to enable me to fully immerse myself in my project and understand its long-term goals. Over the course of this program, I have been given the opportunity to learn from my mistakes and was challenged to think critically about the problems associated with my project. Not only have I learned problem-solving skills, but I have also acquired invaluable lab techniques. Furthermore, I feel like I have been fine-tuning my ability to logically reason out potential problems and even prevent problems before they may occur. I was able to work with a wonderful group of peers that understood that teamwork was the key to our progress in both our collective and individual projects. As a result of this experience, I feel fortunate to have explored a field that I may pursue in graduate school. The skills and knowledge that I have acquired over this summer will help me in my independent research next semester, and I am truly grateful to have had this experience.

II. Treatment of *Caenorhabditis elegans* with Proteasome Inhibitors

Jessie Lo, Biology
Faculty Mentor: Dr. Sudhir Nayak

2008 MUSE Project

In the germ line of *Caenorhabditis elegans*, the protein GLD-1 (*defective in Germ Line Development*) is responsible for various cellular functions: initiation of oocyte development, male sex determination, and translational repression. GLD-1 is a RNA-binding protein that is targeted and ultimately degraded by a proteasome prior to oogenesis. The proteasome, a large multi-protein complex, is likely to be involved in eliminating GLD-1 protein in normal germ line development. Thus, we predicted that the inhibition of the proteasome would result in higher levels of GLD-1 in the germ line. The accumulation of GLD-1 is likely to disrupt normal cell cycle progression and differentiation. In order to determine the effects of proteasome inhibition on germ line development, the levels of GLD-1 expression were visually assessed; GLD-1 was tagged by green fluorescent protein (GFP) which allows for the detection of GLD-1 expression levels in real-time. To further measure the up-regulation of GLD-1 and other proteins when the proteasome is inhibited, two-dimensional electrophoresis gels will be employed. Proteosome inhibition assays are being conducted by treating *C. elegans* with known proteasome inhibitors Z-Leu-Leu-Leu-al (MG132), Z-Leu-Leu-Norvalinal (MG115), clasto-lactacystin β-lactone, and lactacystin. RNA interference (RNAi) will also be performed by disrupting PBS-4, an integral protein structure in the proteasome, as a control for results derived from the chemicals. Through the assay of *C. elegans* exposed to proteasome inhibitors and RNAi, we will determine the role of the proteasome in the germ line. These results will indicate if proteasome inhibitors can work effectively in a whole animal model. The use of proteasome inhibitors can then be considered as a potentially viable method of cancer treatment.

Personal Statement

Through the Mentored Undergraduate Summer Experience 2008 program, I had the opportunity to engage myself in a research environment that promoted a close association with colleagues working in the same field. I learned the value of developing my understanding of scientific literature, practicing proper laboratory technique, and using analytical reasoning to interpret data. MUSE has given me a chance to experience research involving molecular genetics that was far beyond anything I have learned in the classroom. In addition, this research experience has shown me how to algorithmically approach, troubleshoot, and resolve scientific problems that arise. The knowledge and skills that I gained while conducting my research project will help me not only in my future academic courses and laboratory work but also in my pursuit of a medical and/or research-based career. The MUSE program fostered a great sense of community and encouraged an understanding of the different types of research that are conducted in various disciplines. MUSE has helped me to grow and mature intellectually as a student and as an individual.

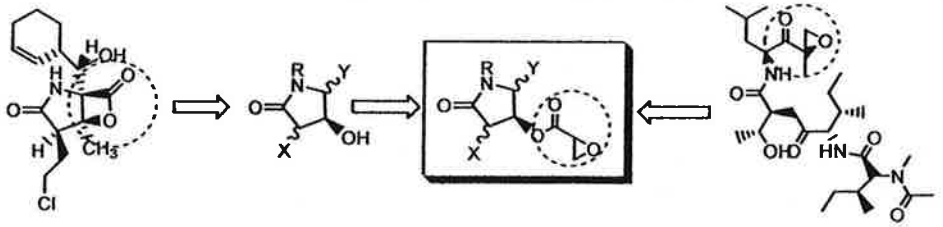
III. Development of Small Molecule Proteasome Inhibitors

Erica R. Tabakin, Chemistry
Faculty Mentor: Dr. David Hunt

2008 MUSE Project

Proteasomes are cellular organs which break down regulatory proteins that are no longer needed in a cell. However, in a cancerous cell, when the proteasome is blocked, the cell undergoes apoptosis, or programmed cell death, since it is poisoned by waste products which cannot be eliminated. This is a significant area of research because it could assist in the development of new cancer chemotherapeutic agents toward a relatively new biological target.

The strategy towards the development of synthetic proteasome inhibitors originates from the combination of specific functional groups located at pharmacophoric sites of naturally occurring proteasome inhibitors. More specifically, the target molecule utilizes the pyrrolidinone structure (circled) from NPI-0052 and the carbonyl adjacent to the epoxide from epoxomicin (circled).



NPI-0052 NPI-0052 core epoxomicin

Three of the seven compounds submitted to Dr. Sudhir Nayak's laboratory last summer showed biological activity utilizing *in vivo* screens in *C. elegans*. Results from the screen of the preliminary synthesis products indicated that the R-enantiomer was active, while its antipode was not. This guided the drug design to specifically target products of R-stereochemistry. It was determined that the ester functionality was a site for possible modification. Multiple Mitsunobu reactions were carried out this summer to synthesize compounds with various types of ester groups. The synthesized compounds were purified by flash chromatography and characterized by proton nuclear magnetic resonance, carbon nuclear magnetic resonance, infrared spectroscopy, and gas chromatography/ mass spectroscopy. This summer to date, three compounds have been submitted to Dr. Nayak's lab to test for proteasome inhibition on *C. elegans*. One compound is currently in preparation, with two in need of further purification.

Personal Statement

The Mentored Undergraduate Summer Experience (MUSE) has provided me the opportunity to further enhance my laboratory technique and to learn more about the process of designing medicinal compounds for biological screens. This summer, the direction of the project was placed in my hands, and I used previous results to design additional compounds for testing. Also, I increased my knowledge of organic synthesis and medical chemistry research methods. My ability to work independently and problem solve on my own has improved as well. I look forward to pursuing a career in medicine and hope to be involved in research and/or clinical trials in the future.

Regulation of Gene Expression: Protein-Protein Interactions of BAF
(funded by the American Association for the Advancement of Science and Merck & Co., Inc.)

I. Regulation of Gene Expression: Protein-Protein Interactions of BAF - Biology

Kimberly Parks, Biology
Faculty Mentor: Dr. Miriam Segura-Totten

2008 MUSE Project

A cell's genome, or its DNA, is organized within the nucleus to determine what genes will be "expressed" to produce proteins, the molecules that perform most of the work inside the cell. The complex formed by DNA and the proteins that attach to it is called chromatin. Barrier-to-Autointegration Factor (BAF) is a DNA-binding protein that helps to organize chromatin and regulate gene expression. BAF binds to histone H3, one of the proteins that bind to DNA and compact it to form chromatin. There are five types of histones: H2A, H2B, H3 and H4, which work together to wrap the DNA into a structure called a nucleosome, and H1, which "links" different nucleosomes to form the thick DNA fibers that make up chromatin. The specific region on BAF where histone H3 binds has not been clearly determined. Mapping where on BAF histone H3 attaches will shed light onto the nature of the interaction between these two proteins, and will help us form hypotheses about the implications of BAF binding to histones on chromatin structure and gene expression.

To determine where on BAF histone H3 binds, a marker called a spin label is attached to the amino acid cysteine in particular regions of BAF. This spin label rotates freely in solution but its movement is restricted if it is found near a protein. If the spin label is located in a region of BAF where histone H3 binds, then the spin label rotation will be slower than that of the free label in solution. To ensure that BAF only contains one site for spin label attachment, the DNA encoding for BAF must be changed (or mutated) to remove all the endogenous cysteines. Then, the BAF DNA is mutated once more to insert a cysteine amino acid at a particular region. This process is repeated to produce DNA encoding for different BAF proteins, each with a single cysteine in a different region of the protein. We then introduce each DNA into bacterial cells, which are induced to produce BAF protein. The BAF protein purified from bacteria is used in spin-label studies of BAF binding to histone H3. Currently, the necessary BAF mutations have been purified. Work is in progress to spin label these proteins and analyze the rotation of the attached label. Future research includes experiments to show the binding interaction between BAF and a control protein as well as between BAF and histone H3.

Personal Statement

Though textbooks are irrefutably one of the most important tools in education, the skills and knowledge essential in the laboratory can only be grasped through experience. I have learned lab techniques that I will be using throughout my career, from electrophoresis, to mutagenesis, to chromatography. Faculty and students alike have also enlightened the path that an undergraduate needs to take to prepare for graduate school. The summer research program has undoubtedly enabled me to familiarize myself with laboratory protocols and interact with faculty and peers in a manner far removed from the strict guidelines and limitations of a classroom.

II. Regulation of Gene Expression: Protein-Protein Interactions of BAF – Chemistry

Alexander W. Fuchs, Chemistry
Faculty Mentor: Dr. Donald Hirsh

2008 MUSE Project

Barrier-to-autointegration factor (BAF) is a protein found in the cell's nucleus. BAF's normal function is to assist in gene expression but it also helps integrate the genes of the HIV virus into the host genome. Its function requires binding to proteins in the nuclear membrane and to DNA. The near-term goal of this research is to characterize binding between BAF and Emerin, a protein present in the membrane surrounding the nucleus (Fig. 1). To do this, a stable radical or "spin-label" has been attached to BAF and its Electron Paramagnetic Resonance (EPR) spectrum was recorded (Fig. 2). When BAF and Emerin bind together, we expect the third peak of the EPR spectrum to broaden due to the restriction of the movement of the spin label. The spin-label forms a disulfide bonds to cysteine amino acid residues of proteins. Two mutants of the BAF protein were generated to contain cysteine at a location where it is thought to bind Emerin (A37C/C22S and L58C/C22S).

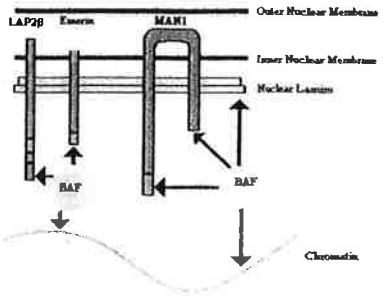


Figure 1. Typical BAF-protein and BAF-chromatin binding interactions. Based on Figure 1 of M. Segura-Totten. *Trends in Cell Biology* Vol. 14 No. 5. p. 261. 2004.

Several unsuccessful attempts were made to attach the spin-label to BAF in its native folded state. We found spin-labeling was accomplished by denaturing the protein mutants in Guanidine Hydrochloride (HEPES buffer), adding MTSL, and desalting using centrifugal filter devices to remove excess spin label and Guanidine Hydrochloride. The protein can be more readily spin-labeled when denatured (unfolded) because the cysteines are less sterically (spatially) hindered in this state. An EPR spectrum has been obtained of the L58C/C22S mutant bound to spin label that indicates that the spin of MTSL is restricted in solution by the broadening of the third peak (Figure 2). Future studies will include the incorporation of BAF's binding partners to examine the spectral changes that result. Emerin will first be used, as its binding to BAF has been characterized in other work. Then, Histone H3 will be bound to BAF mutants because this binding relationship is less understood. In these instances, the third peak of the EPR spectrum is also expected to broaden and will be used as one indicator of binding characteristics.

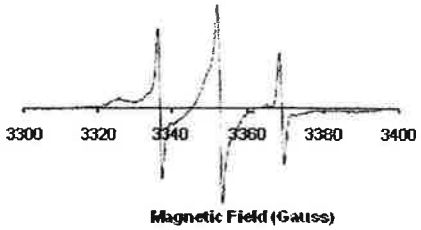


Figure 2. L58C/C22S EPR Spectrum

Personal Statement

The MUSE program has given me exposure to interdisciplinary research in the biological and chemical sciences. My fellow researchers and mentors have taught me much about instrumentation and laboratory techniques beyond what is covered in undergraduate coursework. Chemical and biological theory was also frequently discussed and added greatly to the scholarly dialogue. Moreover, through my research efforts, I have discovered much in the way of perseverance.

School of the Arts & Communication

Global Warming: The Diminishing Ice Caps in Solda, Italy

Katharine R. Straut, Art
Ryan Weber, Art
Faculty Mentor: Elizabeth Mackie, MFA

2008 MUSE Project

Throughout this summer, Elizabeth Mackie and her student collaborators, Ryan Weber, a senior Art Education major, and Katharine Straut, a senior Fine Arts major, have worked on an interdisciplinary project that combines scientific research and art. They began by researching the Ortler Mountain in Italy, and its neighboring village, Solda, which has been negatively affected by global warming. After finding a record of how much the Ortler ice cap melted each year over the last century, they began interpreting scientific data into plans for a large-scale sculpture and an artist book.

The sculpture traces the diminishing ice cap through the years, while the artist book takes the shape of the mountain as it creeps into the space the glacier used to inhabit. Both pieces are composed of multiple sheets of handmade paper. During a trip to Women's Studio Workshop in Rosendale, New York, Ryan and Katharine learned how to make the paper for the artist book. They also experimented with various large-scale papermaking techniques, and made enough paper pulp for the sculpture. Back at TCNJ, they began making 5' x 8' sheets of paper, which they manipulated to take the shape of the Ortler Mountain. Ryan worked extensively on the artist book, cutting intricate shapes out of the handmade paper, which Katharine screen-printed white.

The sculpture, entitled *King Ortler and Little Siberia,* will be on display from October 5 through November 15 in the Icebox, Crane Arts Center in Philadelphia, as one of ten pieces chosen for the Philadelphia Sculptor's sponsored juried international exhibition on Global Warming. In addition, Virginia Welsh, of The Ann Street Gallery in New York, has selected the piece for a Global Warming exhibition in Fall 2009. This September, the artist book will be exhibited in the TCNJ Art Gallery as part of the Faculty Exhibition.

Katharine Straut Personal Statement

My work with Ryan Weber and Elizabeth Mackie has taught me a great deal about collaboration. At the beginning of the summer, Ryan and I assisted Professor Mackie in her preliminary research. The data we collected made it necessary to reevaluate the original plan for the piece. Our professor encouraged us to voice our opinions during this process, and she listened to our thoughts eagerly. By taking our input seriously, she made it clear that we were collaborators, not mere assistants. As a result, I became completely invested in the project quickly, and felt a sense of ownership over the piece that would otherwise be lacking. I hope one day to be the kind of teacher who allows her students that much creative freedom.

Ryan Weber Personal Statement

In the arts, the processes of collaboration and research often fall by the wayside. They are, however, integral in the creation of successful artwork. Through the MUSE program, I have been presented with the opportunity to work alongside Katharine Straut as a junior collaborator to Elizabeth Mackie, in an effort to construct sculptural pieces as a commentary on global warming and its effect on Solda, Italy. By working through conceptual ideas, design problems, and the construction

process at this level, I was able to experience what life is like after graduation for an artist. Working at Women's Studio Workshop in New York and my future participation in installing this piece in various galleries will help me build a strong basis for networking and educational experiences. The MUSE Program has given me valuable experience that will enable me to stand out to graduate schools and other foundations, whether it is on paper or in my personal work.

School of Business

Underwriter Prestige in Initial Public Offerings for BRIC Countries (Brazil, Russia, India and China)

Venkat Ramamoorthi, Finance
Faculty Mentor: Dr. Susan R. Hume

2008 MUSE Project

During the Mentored Undergraduate Summer Experience, I have had the opportunity to work under Dr. Hume, conducting research in the Business Building of The College of New Jersey. We set out to examine the market for Initial Public Offerings in countries with developing economies like Russia, India, and China from the period of January 1, 2005 - January 1, 2008. To do this we utilized the vast array of information available to us through use of the Bloomberg terminal. After collecting this, we looked for supplemental information in scholarly journals to help us better understand the data that we collected.

With the data we collected, we are looking for relationships using regression analysis. We are particularly interested in examining if the company used to bring an initial public offering to market is any indicator of how well the shares do over time. The research and data collection for this project has taken much longer than originally expected. This is because many of the countries' markets have been so busy over the past three years that collecting the necessary data has been a very extensive project. As we continue our work, we look forward to analyzing our findings.

Personal Statement

The MUSE program has been a wonderful experience. It has been the first time that I have had the opportunity to conduct research in my field of study. It has been a challenging and beneficial experience. Through working on the research project with Dr. Hume, I have become proficient in using the Bloomberg terminal. I also learned what sources are beneficial to use when looking for supplemental information for a research project.

I have been greatly impressed by the level of detail that goes into working on a research project. It has been an intricate, sometimes humbling process. Working in the MUSE program has helped me begin to develop many beneficial skills that I hope to continue to develop in the future.

Assessing Whether Design Protection for the Fashion Industry is Necessary in the US

Michael Pudlowski, International Business (pre-law)
Faculty Mentor: Susanna Monseau, LLB

2008 MUSE Project

During the course of the MUSE program at The College of New Jersey, I worked with Susanna Monseau on a project which entailed intensive research on statutes and cases dealing with copyright, trademark, trade dress and design in the context of the fashion industry. We specifically focused on a Congressional bill which is intended to give the fashion industry design protection in the United States. I researched current and proposed copyright and design legislation in the United States and compared it to current European Union law. I read and briefed numerous US and European court cases, and I researched statistics about the fashion industry in the four major fashion markets (US, France, Italy and the UK) in order to compare them and decide whether design piracy legislation which exists in the European Union is necessary in the United States.

At this point we have finalized our thesis, which states that the proposed design protection for the US fashion industry is not necessary. We plan to support our thesis by an analysis of US and European law and also empirically with data suggesting that the fashion industry is performing better in the United States, where design protection is non-existent, than in many European countries where strict design protection legislation exists. We have also been working on an analysis which shows that this proposed legislation will provide a benefit to very few at the expense of many, including consumers of apparel. We believe that such industry-specific design protection is incompatible with US policy and law. We plan begin writing our article by the end of MUSE and finish it during an independent study in the Fall of 2008, at the end of which we will submit it for publication in a law review journal.

Personal Statement

The work I am doing with my mentor in the MUSE program is undoubtedly preparing me for law school (in ways that an internship could not). I am not only learning about fascinating areas of law such as copyright, trademark, and design law, but I am learning research techniques that will undoubtedly be vital to my success and give me an edge in the future. I have learned to effectively browse the Westlaw legal database for laws, court cases, and articles written by scholars on the subject, I am learning how to do proper legal citation, and I am now beginning to help put together an actual scholarly article. By the end of the Fall 2008 independent study, we hope that our article will appear in a recognized legal journal and will be searchable on Westlaw for others to read. Aside from my research, I have shared my research experiences with various other students in the MUSE community and have learned about their projects as well. The MUSE experience has truly been invaluable.

School of Culture and Society

Ten Years of 9/11 Narratives: The Interrelated Pressures of Genre and Theme

Susan Pedersen, English
Whitman, English
Faculty Mentor: Dr. Juda Bennett

2008 MUSE Project

The intersection of literature and society becomes incredibly clear when considering the literary responses to 9/11. Over the past eight weeks, we have been researching fictional representations of the terrorist attacks to explore how our society processes grief. One of the trends we have noticed is that writers often use the figure of the child to appeal to a sense of innocence, which was considered lost when New York and Washington D.C. were attacked. The child serves as a symbol of purity and freedom from suffering. Our research demonstrates that 9/11 writers often represent the younger members of our society as a refuge for adults as they deal with conflict. Illuminating and timely, our research offers insight into the way society responds to tragedy by imagining it as a child would. By reading primary and secondary texts, we have gained a better understanding of the books we have read as well as the society in which we live. More importantly, we have begun to discern patterns that highlight how a society responds to tragedy.

Susan Pederson Personal Statement

Last year, when discussing the process of writing a lengthy research paper with a class, one student said he had been working so hard that he actually dreamt about his topic. Slightly disappointed that I had not had the wondrous experience of dreaming about T.S. Eliot, I wondered whether I was not going in-depth enough, whether I had not quite earned the research dream.

Fast forward to this summer and Project MUSE. Not three weeks into the program, I had a dream that I was running through a library, searching for a book that would win me a wonderful prize upon discovery. When I woke up the next morning, I was immensely pleased that my studies had sufficiently infiltrated their way into my subconscious and allowed me to have a research dream of my own. Indeed, the past eight weeks have been just that: a research dream. Challenged through both the TCNJ and Mercer County libraries, I gained a glorious first taste of life as an academic. Doctoral programs, here I come!

Personal Statement- Katie Whitman

Researching literary responses to September 11 has compelled me to fully realize how much I love researching issues related to culture and identity. Examining literary responses to such a tragedy has helped me better understand how our society copes with grief and how the attacks affected our sense of identity. These subjects are so important to me because they are elements of society that I have been immersed in and therefore unaware of; it is almost surreal to think of how much more I understand those events and their implications now than I did seven years ago. I also have a strong interest in political activism and social justice and feel that objectively examining one's society is absolutely necessary for making progress in that society, so this project was personally as well as academically important to me. Since I've always had such a desire to understand how society functions, I've considered pursuing literary or anthropological studies for graduate school, and finding the MUSE program so rewarding has further strengthened my interest in such a path.

Wounding Black Men

Gabrielle Reed, English
Faculty Mentor: Dr. Cassandra Jackson

2008 MUSE Project

This summer I worked under the direction of Dr. Cassandra Jackson during the Mentored Undergraduate Summer Experience. The objective of my work was to research historical and contemporary visual representations of wounded African-American male bodies for the book *Wounding Black: Violence and Visual Culture* currently being written by my mentor. For my research I read, analyzed, and consolidated publications that theorized how these images related to and affected the constructs of race and masculinity in American society.

My work this summer started with research on race and masculinity in sports and sports advertising. I explored Nike advertisements that are often criticized for exploiting African-American culture. I also looked at Michael Jordan's career and the famous images of his body, which are considered crucial in defining his public "self". In relation to sports advertisement I explored the work of artist Hank Willis Thomas. His series of photographs entitled "Branded" includes images of the shaved head of an African-American man, literally branded with the Nike Swoosh symbol. The goal of Willis's art is to provoke questions about how today's advertisers "sell" and "brand" the African-American male body, and how the body was sold, wounded, and branded in slavery.

In addition to researching sports imagery, I have started research on the politics of looking, which explores how viewing an image of woundedness, such as lynching photographs, implicates the viewer. The publications on looking provide arguments for viewing and reproducing images of torture, and arguments against viewing the images.

The work I did this summer helped to define a comprehensive understanding of the progression of these images of black male woundedness; from a photograph of a whip-scarred slave with lash marks to an album cover of the shirtless rapper 50 cent behind bullet broken glass.

Personal Statement

The Mentored Undergraduate Summer Experience has helped me to develop my research abilities. I have become more familiar with the TCNJ library and the number of physical and electronic resources it offers. I am better able to navigate the numerous online databases and use them effectively. MUSE has also provided me with the experience of the mentor-mentee relationship, which has helped my academic confidence and inspired me to take personal initiative in my undergraduate career. I have met and talked to students in other disciplines and have been surprised to learn both how similar and different their projects and learning experience are from mine. I value the experience MUSE has provided me in developing my intellectual growth alongside students who I would otherwise not have met.

¡Americanas!: Autobiography and Diasporic Latina Subjectivity

Estephany Reyes, English
Faculty Mentor: Dr. Lisa Ortiz-Vilarelle

2008 MUSE Project

During the Mentored Undergraduate Summer Experience, I worked with Dr. Lisa Ortiz-Vilarelle on her proposed book project, *¡Americanas!: Autobiography and Diasporic Latina Subjectivity*. This book length study is focused on autobiography from the Latina Diaspora, and the innovative manner they create and engage in a larger body of Latina life writing practices. Additionally, this book project will argue that the variations in autobiographical works serve as a model for the construction of a collective Latina identity or specifically a *Latinidad* or Latinity. These terms attempt to describe a collective Latina identity read within and across Latina autobiographical writings, yet one that does not subsume the uniqueness of the autobiographers or the more than 27 Latin American nations and cultures they come from into one undistinguished group. Moreover, *¡Americanas!: Autobiography and Diasporic Latina Subjectivity* will attempt to address or define this *Latinidad* while not ignoring the problematic nature of constructing a singular identity between distinct yet similar Latin American cultures.

Throughout the summer research program, I was involved in the early stages of gathering materials that will be the foundation of my mentor's book project. This included mining through library and electronic database research to identify autobiographical texts written by Latinas from the United States and Latin America. Moreover, I gathered secondary sources in critical and theoretical studies of life writing in Latin America and the United States while at the same time compiling an annotated reading list/ bibliography which will assist Dr. Ortiz-Vilarelle in the later stages of her book project. As Dr. Ortiz-Vilarelle writes, this list continues to feed specific chapters of the work in progress.

Personal Statement

The undergraduate research program allowed me a chance to prepare for a more extensive research project required during my senior year. I became very adept at navigating the databases in the TCNJ Library site and using online resources that will assist me in any future research projects. Since this book project is centered on an idea that has not been written or spoken about by many authors, it is evident that when researching I encountered many roadblocks. While this was frustrating at times, it helped me be much more creative in seeking out texts that would be relevant to the book project. Most importantly, being part of this summer research experience allowed me the opportunity to observe and experience what I might encounter if I decide to continue on to graduate school.

Multiculturalism, the Essay Canon and Celebrity Writers:
Examining Multiculturalism in Higher Education English Programs
Elizabeth Seibert, English
Faculty Mentor: Dr. Nagesh Rao

2008 MUSE Project

During the Mentored Undergraduate Summer Experience I worked with Dr. Nagesh Rao of the English Department on a project studying the extent to which "multiculturalism" informs higher education English curricula. The project is part of a larger ongoing interest in the nature and teaching of the essay canon and of the use of celebrity writers as "multicultural" icons in college classrooms.

Dr. Rao and I worked with the Office of Institutional Research at the College to design a research method for our project, and evaluated the College's peer list to select several colleges and universities that compare with TCNJ. Before surveying the English programs of these selected schools, it became necessary to achieve a deeper understanding of how multiculturalism is approached in the broader community of higher education. To determine this, I conducted a review of the Association of American Colleges and Universities (AAC&U), a well-recognized resource in higher education, and created a comprehensive analysis of the Association's approach to multiculturalism in general education. "Multiculturalism" often encompasses various areas such as "diversity," "global learning," and "cultural pluralism," and by understanding the distinctions between these terms, the significance of their implementation in college curricula was easier to determine.

Based on these findings, Dr. Rao and I developed a series of factors to consider in surveying the selected colleges from TCNJ's peer list, and I began to study how notions of "multiculturalism" are implemented in English curricula. Throughout my research, I attained a more thorough understanding of the issues that surround multiculturalism in literary study and English pedagogy.

Personal Statement

Through my experience in the undergraduate research program, I learned about research methodology and became more familiar in working with research-based services on campus. By gathering and analyzing reading material, I became deft at navigating the TCNJ library website and online databases aimed at literary studies and education. I also gained a practical understanding of the intersections of English pedagogy, ideology, and cultural analysis. As an aspiring educator, this proved particularly beneficial.

This project has allowed me to explore in greater depth the issues facing multicultural literary studies, such as marginalization and colonialism, and has encouraged me to pursue my own research interests in sub-Saharan African women's literature and post-colonial studies. As such, the Mentored Undergraduate Summer Experience has not only given me the opportunity to gain hands-on research experience in a mentored setting, but has also motivated me to utilize this knowledge in my own academic endeavors.

Tracing the Trope of "Epiphanal Blackness" in African American Literature

JoLynn E. Stein, English

Faculty Mentor: Dr. Piper Williams

2008 MUSE Project

This summer I had the opportunity to work with Dr. Williams as she examined texts primarily within the African American canon for instances of what she's termed "epiphanal blackness." An "epiphany" refers to a moment of revelation; an "aha!" moment. However, this "aha" when experienced by an African American character is not the result of looking in the mirror for the first time. Instead, what is revelatory to this individual about their "blackness" is that their identity as a black American has distressing social implications.

Since Dr. Williams already had a working outline of moments in primary texts that would support her identification of "epiphanal blackness," she decided that secondary research would be most profitable for me to pursue. Reading Saidiya Hartman's *Scenes of Subjectivity* resulted in a slight adjustment or refocusing of the thesis as it became clear that moments of "epiphanal blackness" frequently occurred via incidents of violence or terror. Thus, I began reading literature on lynching/rape both prior to and after reconstruction. I also read criticism on primary texts that engaged the concept of terror. An annotated bibliography of all secondary materials was generated, and I also pulled relevant quotes from these texts so that Dr. Williams had a working understanding of how these texts could be useful to her project.

Over the course of our research this summer, Dr. Williams' analysis of the trope of "epiphanal blackness" was refined into four segments, prospective chapters in a future book project, each representative of a way in which epiphanal blackness is manifested in literature. In order to facilitate Dr. Williams' writing of an initial article, my attention turned to cataloguing quotes from primary texts into the four prospective chapters.

Personal Statement

My MUSE experience has left me with valuable research skills including the ability to navigate library websites and the Modern Languages Association bibliography. I even had the opportunity to explore Princeton's library. My summer research experience has also enhanced my ability to scan literature for relevant material and to annotate (summarize) texts, both invaluable skills, especially if I pursue a graduate degree. Aside from increasing my familiarity with the African American canon, this project is of personal worth to my scholarly goals. I've recently added a second major in sociology because of my interest in evaluating the dynamics of power and privilege in American society. Since literature provides valuable insight into human experience, it's been of special interest to me to witness the continuum of terror present at the moment of "epiphanal blackness" within African American literature, especially following Reconstruction. The tracing of this trope has allowed me insight into the elements inherent in chattel slavery (terror, violence, objectification, subjection) that have been horrifyingly resilient, and now profoundly present in the social construction of "blackness."

"It is God's Will, and also Deforestation"
Local Discourses and the Disappearance of Kilimanjaro's Glaciers
Beatrice S. Kwok, History and English
Tamra N. Wroblesky, History and Women and Gender Studies
Faculty Mentor: Dr. Matthew Bender

2008 MUSE Project (funded by a Roebling Grant and MUSE)

In the past decade, Mount Kilimanjaro has emerged as a focal point in debates over global warming. Scientists concur that the famous glaciers on its peak will disappear sometime, perhaps as early as 2015. While the fate of Africa's tallest peak undoubtedly has global implications, it is of most immediate importance to the nearly 800,000 Chagga-speaking peoples who live on its slopes. While these communities depend on the mountain's resources to sustain their livelihoods, they have virtually no voice in the scholarship on glacial recession.

The primary goal of our research is to discover how Chagga people interpret the melting of the glaciers and to situate this local knowledge in the context of broader discourses. We began by traveling to Tanzania for six weeks to conduct interviews and surveys. Through data collection as well as daily interactions, we began to learn how Chagga people interpret their lives in relationship to the landscape. Though the quantitative data we gathered provides valuable insights, the qualitative perspectives show the personal connection people feel with the mountain, as well as how they will likely respond to the impending crisis. After returning to TCNJ, we began reading about alternative perspectives in primary and secondary sources, to augment the data we gathered abroad.

Our preliminary results indicate that the mountain and its glaciers have long shaped local identity. While responses vary dramatically depending on level of education and life experience, it seems the vast majority believe the disappearance of glaciers will radically transform life and erode the basic foundations of their culture. To explain the phenomenon, Chagga have reached beyond global warming to focus on the significance of deforestation, a conclusion that scientists are only beginning to acknowledge. Thus it appears that Chagga have come to their understandings through observations over time and through the historical experience of living on the mountain.

Personal Statement

My participation in The Mentored Undergraduate Summer Experience program as a research assistant in Tanzania has been a life-changing experience. MUSE has given me the rare opportunity to practice the art of being a historian by conducting oral historical research in a field setting, which has promoted my personal and intellectual growth. I experienced first-hand the challenges of conducting research in a developing country and of engaging with people of different cultural and linguistic backgrounds. The sharing of stories with people from Mount Kilimanjaro has broadened my perception of history as an academic discipline and expanded the breadth of my life experiences. MUSE has provided me with a nurturing and vibrant community in which students and professors were able to focus on their respective projects while engaging themselves in a grander scheme of highly productive and scholarly work. The consistent interactive dialogues enhanced my understanding of the work from disciplines outside of the humanities. MUSE has given me a glimpse of what a graduate program will entail. As a result, I feel more prepared to pursue a Ph.D in history.

Personal Statement

The Mentored Undergraduate Summer Experience has allowed me to participate in a unique and unforgettable research opportunity. The program allowed me conduct research overseas, and then return to campus to collaborate with a multi-disciplinary community. While I lived in Tanzania for five weeks, I learned how to conduct interviews and successfully remove myself from my comfort zone. This research project has broadened my global vision and taught me to navigate an unfamiliar cultural landscape. Not only was I able to discuss with Chagga people firsthand the ice on top of Kilimanjaro, but also was able to culminate my experience by climbing to view the glaciers on the summit of the mountain. The MUSE program has strengthened my desire to continue studying history and women's and gender studies as an undergraduate. Through weekly lunches and discussions, I have also been encouraged to attend graduate school in the field of international studies. This research experience is the perfect stepping stone to prepare me for a career committed to accepting all cultures in this world.

Whose Vietnam? Public Memory, American Foreign Policy, and Iraq

Carolin Guentert, International Studies
Jessica Ho, International Studies
Faculty Mentor: Dr. Marianna P. Sullivan

2008 MUSE Project

Memory plays an important role in the way individuals and societies construct their identity. Memories of wars, particular the Vietnam War, are often used to shape public opinion about a current issue, to make decisions about future foreign policy, and to influence how the public views itself and its society. In recent years, politicians have used historical analogies of Vietnam to discuss foreign policy in Iraq. Memories of the Vietnam era have affected the way Americans think about Iraq, and similarly, the conflicts in Iraq have reshaped the public's perception of Vietnam, showing that public memory is constantly evolving and affects the way we view both past and present issues.

The research completed this summer is the preliminary stages of the research that Dr. Sullivan will continue in order to write her book. As collaborators, we were first responsible for compiling extensive bibliographies concerning various topics that corresponded to the book's prospective chapters. We then used these bibliographies to pursue different sources and contributed notes and reviews of these sources. In addition, our research has consisted of compiling statements made by politicians on the Vietnam War and other wars, searching the congressional record, and performing popular literature surveys to see how the media covered the Vietnam War. Finally, we transferred public opinion polls into graphic forms, so that one can understand how public perceptions of the presidency shapes administrative decisions, and wrote individual papers regarding the 1968 elections. While there is still more research to be done, our work has already shown the many sources of influence on collective memory and the subtle intricacies concerning how collective memory is developed. Our compilations have also shown the pervasive influence of the Vietnam War, and its pursuant controversy over the use of force, in political debates over the past three decades.

Carolin Guentert Personal Statement

The MUSE program was a wonderful opportunity for me to learn more about my area of interest. Ever since I began taking International Studies and Political Science courses, I have been interested in the way wars shape collective memory and social identity, and how these are constantly evolving. This project helped me understand more about memory, foreign policy, and political actions. I expanded both my knowledge and my research capabilities, and I was also able to observe the steps involved in writing a book, which is an invaluable experience. I greatly enjoyed working alongside Dr. Sullivan and collaborating with Jessica, and I believe that this summer program has prepared me for future opportunities.

Jessica Ho Personal Statement

This research experience has certainly been more than anything that I had expected. Whether it was writing a personal research paper, compiling data, or summarizing books, I have felt that I genuinely contributed to the project. I especially enjoyed the variety of tasks that I was given, as it gave me a chance to explore multiple facets of the larger Vietnam and Iraq issue. Moreover, the MUSE program gave me a chance to work with people equal to and above my own academic abilities,

so that I felt consistently challenged in my research. Finally, this experience has helped me improve on skills that I will use as a lawyer. I have learned to be more efficient and now know that I can tackle large quantities of reading within a limited amount of time. While I may not be pursuing a career in research, this experience has certainly helped to improve my personal abilities as a whole.

From Deliberation to Action

Jennifer Bennett, Political Science
German Rozencranc: Political Science
Faculty Mentor: Dr. Bill Ball

2008 MUSE Project

Deliberative democracy is a field of political thought and practice that grows from public deliberation on policy issues. Political scientists have largely oriented their studies towards research on traditional participatory democracy, leaving the deliberative alternative largely unexplored. This is especially true with regard to deliberation's implications for political practice. In an effort to explore deliberative democracy and better legitimize it as a field of study and practice, our action research project has been focused on deliberative political action.

Our research grew out of a political science seminar in the Spring '08 term where we conducted a deliberative forum on climate change that involved about 100 residents from Mercer County and The College of New Jersey. The people themselves were the speakers and active participants in this forum, giving tremendous insight into political thought on a micro level. Participants were asked to fill out surveys and develop issue statements within their respective groups in the forum. During the MUSE project we analyzed these responses and proceeded to quantify and categorize them as a means of isolating the common grounds of agreement within the forum as a whole. More importantly, we assessed the data and feedback gathered from the forum to see how we could facilitate moving from the deliberative discussions in the forum into deliberative political action. We largely found that people are in a search for a network on climate change to join where they do not have to proceed alone on this issue as they seek information and action opportunities in the personal, community, governmental, and economic spheres.

To respond to this finding and enable the move to action we have started two initiatives. We have created www.green31.net, where we are posting events as a comprehensive community calendar, are compiling a large data base of selected organizations within TCNJ, Mercer County, and New Jersey as a whole, and will be identifying key community leaders as critical nodes in a community-wide network (primarily highlighted as blog authors). Our data base consists of governmental, private, and small, grass-root organizations that have established initiatives against climate change. Our second initiative, designed to further assist participants from the forum in finding their place in a network, we are hosting a Networking Fair on July 24th that will allow attendees to learn more about active organizations in their immediate area and allow for opportunities for them to get involved. Furthermore, the networking fair will allow partnering organizations to interface with one another, therein creating a wider network of existing groups. We will be collecting data on the effectiveness of both of these initiatives in moving from deliberation to action, writing up evaluations in final reports, and continuing the work with the community beyond the end of the MUSE project.

German Rozencranc Personal Statement

The Mentored Undergraduate Summer Experience program allowed for an exciting opportunity to conduct field research within the sphere of my major. After studying about the theoretical aspects of deliberative democracy in the course of a semester long seminar, the MUSE program has permitted me to further my knowledge of the field through hands-on projects and research assignments. This summer I was able to learn more about the intricacies involved with designing a research project within the framework of guided instruction by my mentor. It has proven very challenging to create

and facilitate a new approach to deliberation within climate change, as we had to work through an existing system that is clouded with bureaucracy. Therein, the MUSE program has given me insight into operating a research project while assisting in the development of my research, analytical, and critical thinking capabilities.

Jennifer Bennett Personal Statement

The MUSE program functioned as a part of ongoing research that began in my Tutorial in Political Science class. In this program, I enhanced my communicative and social skills by contacting various organizations in New Jersey and inviting them to attend our Networking Fair, which will be our final research activity. I have learned a lot about organizing events and the difficulties associated with them. I have found that my persuasive skills have improved, as well as my researching techniques. I have learned how to navigate through websites and phone menus to reach the information I seek. By creating a website, I have been able to enhance my ability to maintain and run a website. I am lucky to have had this experience because interaction with the community has helped me to become more personable and patient. Therefore, my experience in the MUSE program will surely help my interaction with people and groups in the future, while the research aspect will prove to be a beneficial precursor for law school.

Working Memory Functioning in Older Adults

Suzanne E. Bates, Psychology
Robin Streit, Psychology
Faculty Mentor: Dr. Tamra J. Bireta

2008 MUSE Project

Working Memory theory (e.g., Baddeley, 1986) has been one of the most heavily researched models of memory. It is a short-term memory system originally consisting of three components responsible for controlling attention, maintaining visual information, and storing auditory information. A new component, the episodic buffer, was recently proposed to explain the ability to combine multiple dimensions of a stimulus, such as object and location. This phenomenon is known as binding. We are interested in examining whether the proposed episodic buffer decays with age. If it does, it may explain things like difficulty remembering where an object was placed and problems attaching names to faces. Studies on this component have been limited, and to date there is no published research examining the action of the episodic buffer in older adults. We intended to test this by replicating Allen, Baddeley, and Hitch (2006), who tested younger adults' ability to bind simple visual information (shape and color), and extending their study to include older adults.

We completed data collection with younger adults (148 TCNJ students) and are currently collecting data from older adults. Our findings with the younger adults mostly replicated those of Allen et al. (2006). Current analysis indicates that older adults show similar patterns of performance, suggesting that the episodic buffer does not show age-related impairment. We can tentatively conclude, then, that the episodic buffer is not the component that is responsible for the general memory decline found in older adults. The student collaborators were primarily responsible for researching the current literature available, running participants for data collection, analyzing the data, and composing a draft of the manuscript to be submitted to a peer-reviewed journal.

Suzanne Bates Personal Statement

I personally learned a lot about teamwork and communicating with your research team. There is a lot of work involved in conducting an empirical experiment, analyzing the data, researching the available literature, and writing a manuscript. For example, it took significantly longer than we anticipated to recruit participants from the community. I learned a great deal about APA style and improved my writing skills. I also learned about the process of submitting a manuscript to a peer-reviewed journal and their requirements. This study is still underway, and I am very excited to see how the data turn out. I feel that this program has been invaluable to me; it has enriched my education here at TCNJ and better prepared me for the rigorous world of graduate school. MUSE has also allowed me to become a more rounded student of psychology, as I had previously concentrated more on clinical/counseling and biological areas of psychology.

Robin Streit Personal Statement

While working as a student collaborator this summer I have gained pride in my achievements, appreciation for my mentor, and excitement about my role in the research process. The collaboration on this project has shown me how much my mentor trusts in my abilities, and this has provided me with greater confidence and determination. This program has been a wonderful experience.

Emotional and Behavioral Correlates

Jessica R. Sevecke, Psychology
Anjali Dutt, Psychology
Faculty Mentor: Dr. Chu Kim-Prieto

2008 MUSE Project – Jessica Sevecke

Previous research indicates that culture background can influence the expression or experience of emotions. Data collected through the Culture and Emotion Lab was analyzed using computations such as a two-way analysis of variance, alpha reliability analyses, factor analyses, and test-retest reliabilities through statistical software, SPSS 15.0. The surveys used assess self-esteem, acculturation, pride, personality, positive and negative affect, and a participant's quality of life. The analysis of data will evaluate a participant's race, ethnicity, and geographic location of influence to detect a difference in the expression of emotions, specifically pride, in comparison to the participant's demographic responses. Data was collected using participants from The College of New Jersey, an online survey module, and from California State University: East Bay to ensure a diverse sample population. The goal of this study is to expose the variation of emotion expression across cultures. Once the analysis of data is complete, a manuscript will be prepared, in collaboration with Dr. Kim-Prieto, for publication in a professional scientific journal. The results of this research will provide a foundation for future research, in the upcoming year, which will explore the expression of emotions related to memory and such differences across cultures.

Jessica Sevecke Personal Statement

The MUSE program is helping to foster my educational and career goals. Working with my faculty mentor allows me to collaborate in a setting similar to that of graduate school. My ability to communicate my research to others across various disciplines has been strengthened through the various activities, presentations, and exercises provided by the MUSE program. Additionally, I have had the opportunity to analyze data using SPSS 15.0. By using this statistical software package, I have been learning how to complete various statistical analyses procedures such as basic descriptive analyses to more advanced procedures like two-way analyses of variance, factor analyses, and mediation regression analyses. Since participating in an opportunity such as MUSE is so unique, I am certain that the skills I have acquired and strengthened this summer will certainly give me a competitive edge when applying to graduate schools in psychology.

2008 MUSE Project - Anjali Dutt

During the Mentored Undergraduate Summer Experience I worked in the Culture and Emotion Lab with Dr. Kim-Prieto, preparing several experimental studies to be conducted in the Fall of 2008. The goal of these studies is to develop a better understanding of the impact various images in the media have on both the experience and expression of different emotions. My work during the summer experience entailed researching various potential measures to examine different types and levels of emotion, as well as compiling numerous possible materials to be used to create different experimental conditions. After becoming more familiar with the topics to be examined, particularly focusing on recently a published study from this lab, which the present studies intend to build upon, I began the search for the various materials and methods. Doing so required searching through several

databases and reading numerous articles to eventually compile a list of over 30 possible ways to measure the desired emotions and cognitive processes. Particular attention was placed upon ensuring the validity and reliability of each measure, the feasibility of using each method, and accommodating the desire for behavioral measures, rather than self-report, which though more difficult to come across, may yield more authentic results. Additionally, I searched though several media sites to accumulate various materials to create the various different experimental conditions. Lastly, we began preparing the Institutional Review Board application to obtain official approval for conducting the studies, and evaluated all of the materials, processes, and procedures so that everything is ready to be used in the Fall.

Anjali Dutt Personal Statement

Being a part of the MUSE program has provided me with the opportunity to develop a much better understanding of the processes in conducting psychological research and furthermore, has equipped me with several valuable researching skills. I now have a much stronger ability to utilize various databases and software tools that will be both beneficial during my future research experiences at TCNJ and make me a stronger candidate when applying to graduate schools in social psychology. Additionally, the MUSE program has allowed me to develop a much more comprehensive understanding of specific topics in social psychology. Rather than merely reading and writing about the research that has been conducted in the field, I have had the opportunity to actually be a part of the research in areas in which I have developed an extreme interest. Finally, through the various activities involving all of the members of the MUSE program, I have gained useful information about various different sectors of academic research and have become more comfortable sharing my passion and knowledge in the areas with which I am more familiar.

School of Science

The Ecology of Exotic Crayfish in New Jersey

Sarah J. Wolfson, Biology
Faculty Mentor: Dr. Keith W. Pecor

2008 MUSE Project

Interactions between native and exotic crayfish in New Jersey provide an opportunity to study the ecological phenomenon of competition. When organisms compete for a limited common resource, one or both species may be adversely affected. For example, competition for food may reduce one species' food quantity and quality while the other thrives. In order to study competition, it is necessary to find habitats where two or more species occur together. The last comprehensive study of crayfish distributions in New Jersey was published in 1959 by Donald Francois and pre-dates the introduction of exotic species into the state. Thus, the construction of a contemporary map of crayfish distributions was needed.

Dr. Pecor and I surveyed lakes and streams in west-central New Jersey, focusing on tributaries of the Delaware River. We collected several species through trapping and hand netting- the common crayfish (*Cambarus bartonii*), the spinycheek crayfish (*Orconectes limosus*), and the virile crayfish (*Orconectes virilis*). The first two species are native to New Jersey, whereas the last crayfish is an exotic species native to the Midwestern United States. At sites with *C. bartonii*, it was always found alone. In contrast, we found *O. limosus* and *O. virilis* together at some sites and alone at other sites. Because *O. limosus* and *O. virilis* were found alone in some habitats and together in others, this species pair will allow us to test hypotheses about competition in future studies. Our focus will be on the foraging ecology of these crayfish. A comparison of foraging preferences and actual diet content in future experiments will help us understand the effects of competition with exotic crayfish on the ecology of native crayfish and vice versa.

Personal Statement

As a biology major aspiring for graduate school, the MUSE program has provided an invaluable opportunity to conduct research. Collaboration with my mentor, as opposed to the usual student-professor interaction, has allowed me to contribute to more phases of the project. Throughout the summer I have been a part of the conceptualization, execution, and future direction of the study, each aspect integral to our research and my personal familiarity with lab and field techniques. The MUSE program has dedicated time for a more comprehensive experience, allowing me to understand the progression of a complete study, from field surveys to designed experiments. Interdisciplinary discussions, presentations, and luncheons spark conversation among students and faculty of various academic backgrounds, while the barbeques, movies, and kayak trip ensure everyone has fun together while gaining incredible research experience.

Phylogenetic Analysis of Mitochondrial and Microsatellite DNA of *Elliptio complanata*

Liron Bendor, Biology
Kenneth Rapp, Biology
Faculty Mentor: Dr. Curt Elderkin

2008 MUSE Project

This summer, studies were conducted on the conservation genetics of mussels (specifically *Elliptio complanata*) from Massachusetts, New Jersey, Virginia and New York. The main goal of this project involved sequencing mussels' DNA in order to determine genetic similarities between populations. Genetic diversity is essential for the survival of a species, hence the results of this experiment provide an indication of whether conservation measures need to be taken.

A process involving purification of tissue removed from individual mussels was undertaken to sequence the DNA. The Cytochrome Oxidase Subunit 1 Gene from mitochondrial DNA (which is passed on from a mother to her offspring) was analyzed. Microsatellite DNA (nucleic DNA composed of two stable regions surrounding a highly variable region whose fragment length is indicative of the alleles that its gene codes for) was also studied to reinforce the results of these experiments. The Beckman Coulter 8000 Automated Sequencer was utilized to obtain the mussel DNA sequences. The mitochondrial DNA sequences were then aligned with ChromasPro software, and the microsatellite DNA was analyzed using the Fragment Analysis Section of the CEQ 8000 System.

In the first step of this process, freshwater mussels were collected from the Delaware River and its tributaries. After removing and storing a small sample of their tissue, the mussels were returned to their original locations. The tissue was frozen and brought back to lab for analysis. Procedures involved leading to analysis included: PCR (Polymerase Chain Reaction), gel electrophoresis, thermocycler sequencing and separation. Additional experiments for microsatellites were conducted with the purpose of optimizing the annealing temperatures using a gradient thermocycler. The DNA sequence analysis will indicate similarities between mussel populations and provide clues to reproductive isolation and evolutionary events among populations.

Liron Bendor Personal Statement

Participation in the Mentored Undergraduate Summer Experience has provided me with a valuable learning opportunity. These eight weeks have been crucial for my education, for they have provided me with the experience and confidence to work in a laboratory and apply techniques (including PCR, gel electrophoresis, sequencing and aligning DNA, etc.) which were previously only read about in books and vaguely understood. This program has given me the opportunity to work with my mentor, a professor who is well-versed in the project and the field of biology, to trouble-shoot and refine lab protocols, and to share ideas with my lab partners. Moreover, I have appreciated getting to communicate with other MUSE participants and learn about their exciting research projects being conducted on campus. The lab work that I have been a part of this summer directly correlates with my future career aspirations, and I feel very lucky to have had this opportunity in a fun-filled yet scholarly setting.

Kenneth Rapp-Personal Statement

The MUSE program has given me a unique opportunity to gain experience in my field of interest while learning skills and techniques which will be invaluable for my future studies and career. Unlike

working in a research lab during the semester with the pressures of exams or papers, MUSE provided an environment where research was the main focus of my time. With the guidance of my mentor, I was able to greatly improve my lab technique and gain hands-on experience in lab. Throughout these eight weeks I have come to a better understanding of how research in conservation genetics is important for the continued survival of the very diverse freshwater ecosystem. Working in lab with my research partners was an educational and enjoyable experience. Presentations during weekly MUSE lunches contributed to my overall comprehension of the research process and offered a look at how research is conducted outside of my discipline. I am very thankful to have had the opportunity to take part in the unique learning experience offered by MUSE.

Assessment of Autoresuscitation Capability Following Repetitive Hypoxia-Induced Apnea in Pet-1 Mutant Mice

Lauren M. Anllo, Biology
Faculty Mentor: Dr. Jeffery Erickson

2008 MUSE Project

Autoresuscitation is a critical survival-promoting mechanism in mammals that allows recovery of rhythmic breathing when breathing has stopped following prolonged exposure to low oxygen levels (hypoxia). A failure to autoresuscitate has long been suggested as a cause of Sudden Infant Death Syndrome (SIDS) in human infants. Several reports based on records from home monitoring systems indicate that gasping, a prerequisite for autoresuscitation, typically precedes SIDS but appears to be ineffective in producing a successful autoresuscitation response. Studies in neonatal rats and mice have shown that multiple exposures to low oxygen levels significantly impair subsequent attempts at autoresuscitation and the brain chemical serotonin has been implicated in the generation of gasps. Importantly, many human SIDS cases have been linked to abnormal development of the brain serotonin system.

The present study utilized the serotonin-deficient *Pet-1* mouse as a model system to further understand the relationship between serotonin, gasping, and autoresuscitation capability. Pet-1, a protein that controls the expression of other genes, is required for development of a full complement of serotonin neurons in the brain. Loss of *Pet-1* gene function, as in the *Pet-1* "knockout" mouse used in this study, eliminates Pet-1 production and results in a 70% loss of brain serotonin neurons. By comparing autoresuscitation responses in newborn "wild-type" and serotonin-deficient *Pet-1* mice following multiple exposures to low oxygen, we hoped to determine whether a full complement of serotonin neurons is required to maintain normal gasping behavior and/or autoresuscitation responses to repetitive hypoxia.

This work is ongoing, but it is hoped that the data generated may provide insight into the role of serotonin in the autoresuscitation response. In addition, these studies may be useful in understanding the underlying basis for SIDS, and may inform future experiments that explore potential causes of and develop preventative measures for this devastating human affliction.

Personal Statement

Participating in the MUSE program has introduced me to a whole world of science that extends beyond what a student can learn from a textbook. I've learned that with research, the best way to learn something is to do it. Grasping this concept has helped me to overcome my usual hesitance when performing a new task, and has enabled me to have more confidence in my capabilities as a student. After using live animals in research this summer, I've learned the responsibility of being available to complete an experiment even at inconvenient times. This lesson is exceedingly valuable to me as a pre-med because my future responsibilities in medical school will call me into work at all hours, but I will already have begun to develop the capability to handle these situations. Collaborating with a research team through the MUSE program has made me feel like an important part of the Biology department, which is a feeling I am sure will enrich the rest of my experience as a Biology major here at TCNJ.

Effects of Prenatal Nicotine Exposure on Resting Ventilation and Autoresuscitation Capability in Pet-1 Mutant Mice

Samantha Mecker, Biology
Faculty Mentor: Dr. Jeffery Erickson

2008 MUSE Project

Sudden Infant Death Syndrome (SIDS) is a major cause of death for infants under one year of age in America. The underlying basis for SIDS is not known. One leading hypothesis proposes that SIDS is due to abnormalities in respiratory and/or heart function and can occur when an environmental stressor acts on an infant with an underlying vulnerability within a critical period after birth. A number of stressors, including exposure to cigarette smoke, have been identified as risk factors for SIDS, and recent evidence indicates that a large proportion of infants dying of SIDS have abnormalities in brain cells that produce the neurochemical serotonin.

Recently, it was shown that loss of function of a specific gene (*Pet-1*) in mice results in a substantial (70%) loss of serotonin neurons in the brain. Interestingly, *Pet-1*-deficient mice have SIDS-like characteristics, including irregularities in breathing shortly after birth and increased early mortality. These breathing problems are sensitive to environmental conditions and appear to improve with increasing postnatal age, suggesting that the *Pet-1* mouse may provide a useful animal model for SIDS.

In this study we hypothesized that exposure to nicotine (a major component of cigarette smoke) during fetal development would exacerbate the already compromised breathing responses in newborn serotonin-deficient *Pet-1* mice. Using a technique known as plethysmography, we tested the ability of newborn *Pet-1* mice exposed to nicotine during fetal development to recover normal breathing patterns (autoresuscitate) from cessation of breathing (apnea) induced by low levels of environmental oxygen. We examined the autoresuscitation response since it has long been suggested that an inability to autoresuscitate from apnea is the proximate cause of many SIDS cases. To date, six litters have been studied. A complete analysis of these data, and additional experiments, will be performed in the upcoming academic year.

Personal Statement

The MUSE program has given me a unique opportunity to hone my laboratory skills and gain a more detailed knowledge and understanding of my area of interest. As a student who aspires to attend graduate school in the following year, this program has given me the chance to experience the graduate school atmosphere firsthand before making the plunge. Having a strong background in research has also given me more confidence in my abilities, as well as an edge for the upcoming application process. Interacting with students of all different disciplines has helped me acquire a new sense of community here at TCNJ that cannot be gained from sole interaction with students from my own field. The MUSE program has aided me in opening my horizons to new and different possibilities, having gained respect and interest for fields that I never before considered as a possibility for myself.

Role of the Anaphase-Promoting Complex in the Germ-line of *Caenorhabditis elegans*

Alex M. Arnouk, Biology
Faculty Mentor: Dr. Sudhir Nayak

2008 MUSE Project

The maintenance of appropriate protein levels requires an intricate balance between synthesis and degradation within a cell. Unwanted proteins are tagged with ubiquitin chains for degradation by the proteasome, via a mechanism known as the ubiquitin proteasome system (UPS). The anaphase-promoting complex (APC) is an ubiquitin ligase, which assists in the tagging and subsequent degradation of proteins no longer needed in the cell. The goal of this study is to determine the role of the APC in the germ-line of *Caenorhabditis elegans*.

This is currently being accomplished by monitoring the (mis)expression of a germ-line protein known as GLD-1 (*defective in Germ Line Development*). Preceding work using RNA mediated interference (RNAi) has shown that the proteasome is required for normal germ-line development, however, the role of the APC is not clear. GLD-1 is an RNA binding protein essential for germ-line development that is degraded prior to oocyte maturation. When GLD-1 is not degraded at the appropriate location or when expressed beyond its normal range, abnormal oocytes are produced. We are taking advantage of a *C. elegans* strain where GLD-1 is tagged with a GFP (Green Fluorescent Protein). This allows for the protein to fluoresce under a microscope; its levels can therefore be monitored and traced throughout its expression cycle.

By studying the germ-line of *C. elegans*, a better understanding of the nematode can be attained along with the potential for developing treatments for infections caused by parasitic nematodes. Targeting of the UPS is a relatively new drug discovery arena, and this research may prove significant in the development of novel therapeutic agents as well as anti-cancer drugs for clinical use.

Personal Statement

The Mentored Undergraduate Summer Research Program has provided me with an indispensable opportunity to further pursue my interest in the field of scientific research. Entering this program with prior research experience at a graduate institution, I can shed light on the importance of the valuable knowledge and expertise acquired from the MUSE program; individualized instruction and collaboration that cannot be offered at a graduate level. My colleagues and I were exposed to the application of theory and techniques that undergraduates only read about in textbooks. Furthermore, the program seminars and gatherings have proved very insightful, and I feel the MUSE program is a tremendous asset to The College. The program allowed for the development of lasting faculty-student relationships and the opportunity to connect on both professional and personal levels. I am certain that the experiences attained this summer will follow me throughout my academic endeavors and towards a career path.

Study of the Function of Barrier-to-Autointegration Factor in Nuclear Disassembly

Jessica Arias, Biology
Faculty Mentor: Dr. Miriam Segura-Totten

2008 MUSE Program

During cell division, the nucleus, which houses the cell's genetic material, is initially disassembled (taken apart), and later reassembled (put back together). We are interested in studying a specific nuclear protein called Barrier-to-Autointegration Factor, also known as BAF, in the process of nuclear disassembly. BAF is a DNA-binding protein involved in the process of nuclear assembly. BAF also binds to the LEM domain family of inner nuclear membrane proteins. Thus, BAF mediates the interaction between our genome and the nuclear periphery. We hypothesize that BAF is phosphorylated at the start of mitosis, resulting in the release of both chromatin (the complex of DNA and the proteins that package it) and LEM proteins. Furthermore, we propose that the release of DNA and LEM proteins by BAF facilitates the dismantling of the nucleus. To test this hypothesis we have used a *Xenopus laevis* cell-free nuclear assembly system. In the laboratory, we obtain *Xenopus laevis* frog extracts and in turn isolate membrane, soluble, and chromatin components. Our objective is to replicate what occurs in a living cell during nuclear disassembly. In order to perform this research, nuclei are assembled and monitored under a light microscope with the addition of different amounts of BAF protein.

Throughout the summer, I learned and implemented many different protocols. For example, I learned how to make nuclear extracts and how to assemble nuclei using these extracts. Also, I used the light microscope to monitor the effects of different amounts of BAF protein on nuclear assemblies. For my future research, I will be concentrating in more detail on the role of BAF during nuclear disassembly.

Personal Statement

From the Mentored Undergraduate Summer Experience I will take away knowledge of research, as well as relationships that I made with both faculty and peers. In many ways, it has opened my eyes to new aspects of my academic and personal life that without participating I may have never discovered. More than a program for students to learn the techniques of research, it exemplifies the rigor and dedication one needs to be successful. Being a rising sophomore, I am extremely fortunate to have been given the opportunity to participate in this program. The foundation that this program has given me will both aid me in the rest of my years here at TCNJ, and in my academic career. I would recommend this program to anyone who is interested in being involved with undergraduate research. Taking time to dedicate myself to a project over this summer program has paved the way to new experiences and enlightening ideas.

Determining the Biochemical Mechanism of Hormone Inactivation by Rice Cytochrome P450 Enzymes

Kristine M. Badin, Biology
Mark Massak, Biology
Faculty Mentor: Dr. Leeann E. Thornton

2008 MUSE Project

Plant growth and development occur in response to many factors, including internal signals from hormones. We set out to examine how brassinosteroid hormones (BRs) are regulated by a specific group of proteins, cytochrome P450 enzymes (P450s). These proteins are known to alter the BRs by changing their structure. We are studying several P450s from rice that inactivate BRs to slow plant growth.

This project began in the spring semester when we examined the individual rice P450s in a model plant, *Arabidopsis thaliana*. Data were collected providing a baseline for what these proteins' normal functions are in an experimental plant system. Also, three-dimensional structures of the proteins were generated using a computer modeling program.

Our main objective this summer was to examine the biochemical activity of the rice BR-inactivating P450s using various molecular biology techniques. We amplified three rice proteins' activity and identified one that consistently restricts plant growth in our test system. Using the computer three-dimensional structures of the proteins, we predicted how the hormone fits into the enzyme. This prediction identified several amino acids potentially important for hormone inactivation. Amino acids are the building blocks of proteins, and each has a unique property that contributes to the structure and function of the protein. We engineered modified proteins to test the function of two amino acids. Our project will continue in the Fall semester when we determine how the altered protein's activity would compare to the protein's normal activity. These changes in activity will be further explored in the Fall semester by observing how the plants with the modified proteins grow.

The findings of this project will provide more information about how hormone regulation effects plant growth and development. This information is useful because it offers an understanding of the growth of such an agriculturally important crop as rice.

Kristine Badin Personal Statement

The Mentored Undergraduate Summer Experience has been a very beneficial learning experience for me. It gave me the chance to continue a project I began in the spring and fully immerse myself in it, allowing me to gain a better understanding of it. I learned how to perform various molecular biology techniques as well as critically think about research and the question at hand. It was very rewarding to see concepts I had learned in textbooks being put to use every day in the lab. I learned from the mistakes I made and how to troubleshoot the problems that arose along the way. I came into this experience not knowing much about lab techniques and molecular biology research methods and feel I am leaving with a much greater knowledge. Being part of the MUSE community was also an important part of my learning experience here. It gave me chance to learn how to better verbalize my project to others as well as learn what other students outside my discipline were working on.

Mark Massak Personal Statement

Having the opportunity to be involved in MUSE has given me a better understanding of what it really means to be a scientist. This program has allowed me to utilize much of the information I

learned in my science textbooks and courses, further increasing my knowledge of biology. I was able to learn several biological techniques, mostly dealing with molecular biology, used by scientists all around the world. I feel that participation in this program has allowed me to learn how to take given information and look at it in as many ways as possible to get the whole picture, a skill that will benefit me greatly if I reach my occupational goal of becoming a physician. The many events hosted by MUSE has taught me about subjects and topics outside of the sciences that I may not have encountered from my normal coursework throughout my undergraduate studies.

Analysis of Colorants by Laser Desorption Mass Spectrometry: Forensic Applications

Shawn Donnelly, Chemistry
Josette Marrero, Chemistry
Kevin Fowler, Chemistry
Faculty Mentor: Dr. John Allison

2008 MUSE Project (funded by National Starch and Chemical Company and MUSE)

We use scientific instrumentation to analyze what is called in the forensic community "questioned documents" – which could include an altered check, a questioned will, or a signature. With a scanner and reasonable inkjet printer, anyone can make a fairly convincing reproduction of a photograph or paper currency. If a counterfeit bill is seized, what can we learn about it? Our goal is to be able, through chemical analysis, to relate it back to a specific type of inkjet printer. Was it a printer that uses dyes or pigments in the inks? What are their chemical structures? Was it a simple printer, using three colors, or a more expensive printer, that can have more than a dozen different ink cartridges? The work is largely done with an instrument that analyzes very small amounts of colorants that are vaporized from a sample by using an ultraviolet laser (Laser Desorption Mass Spectrometry). The National Institute of Justice has supported research in this area for the past several years in Dr. Allison's lab(s), and we are currently at the end of the funding cycle. MUSE support allowed continued work on the project, the writing of a manuscript for publication in the Journal of Forensic Sciences, and collection of new data that will be used in the next paper.

Personal Statement – Shawn Donnelly

During the summer of 2008, I studied the various components of ink jet inks with Josette Marrero and Kevin Fowler, under the supervision of Dr. John Allison. Using Laser Desorption Mass Spectrometry, we intend to show that any questioned document made with today's complex ink jet printers can be analyzed for particular combinations of components belonging to a specific manufacturer's blend of ink. Our group's initial assumption that the ink inside of ink jet printers would be similar to that of ink found in writing utensils was not the case. Instead, our group found that as the number of samples from the different printers increased, so did the number of components along with the complexity of the project. Currently, the research team is beginning the long journey of preparing for publication in The Journal of Forensic Sciences. Participating in MUSE at TCNJ was a really invaluable experience in that it has shown me two fields of chemistry that I have found to be not only immensely interesting, but are also viable possibilities as career paths.

Personal Statement - Josette Marrero

Being able to conduct research this summer has been a great learning experience. Thanks to the MUSE program, I have been able to get a better understanding of how to work in the laboratory setting and have developed stronger lab skills and techniques. Being a part of this program and working directly with my mentor on this project has enabled me to make a contribution to a field that is still growing, is exciting, and has very relevant applications. This summer has given me the confidence and the desire to pursue graduate school and hopefully carry out even more chemistry research, specifically in the field of Forensic Science. In all, the MUSE program has been a valuable experience that has helped me learn more about myself and my abilities, both academically and socially.

Personal Statement - Kevin Fowler

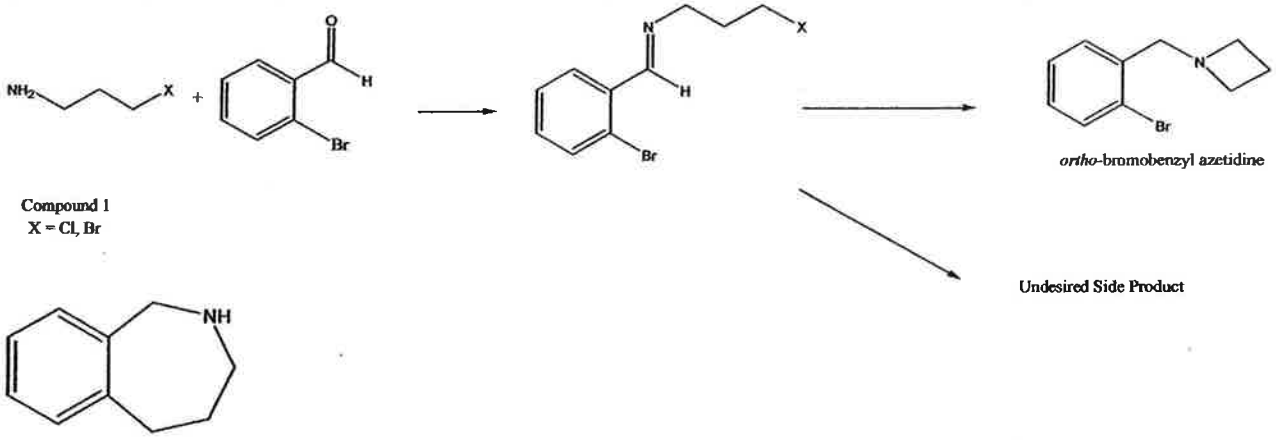
The MUSE program has been an outstanding undergraduate research experience for me. I have learned a great deal this summer, not only about my field of study, but also about the very diverse topics of others involved in the program. A true, interactive MUSE community has formed between faculty and students across the disciplines. I have gained invaluable knowledge and skills concerning my research topic of forensic chemistry, and I believe that this will benefit me immensely in the future. It has been an incredible feeling to be an integral part of such an amazing program. I wouldn't trade the time spent at TCNJ this summer for anything else, and I hope that many more will also receive the opportunity to experience the MUSE program in the summers to come.

Lewis Acid-Mediated Ring Expansions of Azetidines and Azeridines

Michael Nardone, Chemistry
Faculty Mentor: Dr. Lynn M. Bradley

2008 MUSE Project (Funded by National Starch and Chemical Company and MUSE)

The class of chemicals known as azetidines is defined as a four-membered ring system that contains a nitrogen. While azetidines are not new compounds and their syntheses have already been explored, the current research has focused on developing an effective and efficient procedure to synthesize and fully classify *ortho*-bromobenzylazetidine. The overall goal of the project is to convert these azetidine intermediates into benzazepines, ring structures that are found in many pharmaceutical compounds similar to valium, for example.



Benzazepine

Previously, studies in this lab group have yielded the azetidine product, however, the substance was found to be impure. The earlier methods used the chloroamine (Compound 1, where X = Cl) as a reagent and created the desired product in low percentages with a significant yield of undesired side product. A new method that uses the bromoamine (Compound 1, where X = Br) has been employed to produce the *ortho*-bromobenzylazetidine in high yields and 100% purity. The yields and purities of the this compound were confirmed through infrared spectroscopy, proton and carbon nuclear magnetic resonance, and gas chromatography mass spectrometry.

Personal Statement

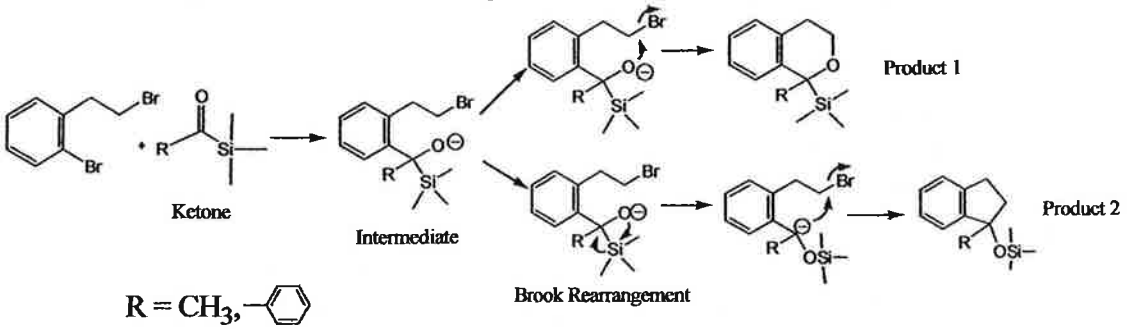
The MUSE program has provided me with my first opportunity to work in a research laboratory setting. During the past weeks I have gained knowledge in synthetic organic chemistry research methods and have learned new laboratory techniques; some of these included running reactions at cold temperatures (-78°C), running reactions under nitrogen gas to maintain dry conditions, and learning instrumentation procedures. Working in an independent laboratory setting has allowed me to become more confident in my work. This fall semester I plan continue to work on this project to study ways in which the azetidine intermediate can be converted into the desired benzazepine product.

Studies of the Rearrangement Reactions of Silyl Ketones

Dominique Sauro, Chemistry
Faculty Mentor: Dr. Lynn Bradley

2008 MUSE Project (funded by National Starch and Chemical Company and MUSE)

The Brook Rearrangement involves a silyl (silicon atom) migration from a carbon atom to an adjacent oxygen atom, and occurs because silicon-oxygen bonds are stronger and more stable. The goal of this research is to see which conditions and materials favor this rearrangement, and to explore the mechanism for this reaction. A mechanism is the way in which bonds are formed throughout a reaction, and explains the connectivity of atoms in the product. We reacted two different ketones with *o*-bromo-β-phenylethylbromide: acetyltrimethylsilane (where R = Methyl, CH_3) and phenyltrimethylsilylmethanone (R = Phenyl, C_6H_5). As shown, there are two potential paths for the reactions studied. The first path involves the oxygen atom of the intermediate attacking the carbon atom attached to the bromine (Br, leaving group), and forming a six-membered ring, in which no rearrangement occurs (product 1). The second path involves the rearrangement of oxygen and silicon atoms and puts a negative charge on carbon (carbanion). If this carbanion attacks the carbon attached to the bromine, a five-membered ring would be formed (product 2).



This summer we used a variety of instruments and techniques to create, analyze, and purify our products. Gas chromatography/mass spectroscopy was a very useful tool for analyzing the purity and molecular weights of our compounds. Proton nuclear magnetic resonance (NMR) and infrared spectroscopy (IR) were used to help determine the structure of the materials. Thin layer chromatography (TLC) and column chromatography were used to purify and isolate the products. To date we have found that both R groups in the ketone (Methyl, Phenyl) have produced the Brook rearrangement product (product 2), but very little or no un-rearranged product (product 1). We plan on continuing research in the fall semester, and will look at ways to improve the yield on the rearranged product, study the mechanisms of the reaction, and possibly determine ways to produce both types of products.

Personal Statement

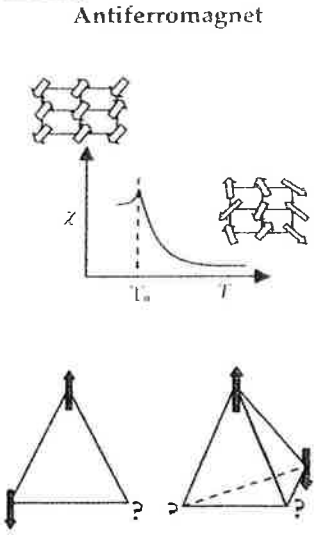
The Mentored Undergraduate Summer Experience has taught me an extraordinary amount. I have been able to develop my techniques in the lab, learn to operate the many instruments that the chemistry department has to offer, and broaden my knowledge of mechanistic organic chemistry. I believe this gave me excellent experience for graduate school, teaching me troubleshooting and problem solving skills. The weekly meetings were very helpful, and the presentations from the other students allowed me to learn about a variety of topics outside of my discipline.

A New Series of Frustrated Chalcogenide Materials

Sergio H. Pulido, Chemistry
Faculty Mentor, Dr. Benny Chan

2008 MUSE Project (funded by National Starch and Chemical Company and MUSE)

Unpaired electrons in a system give rise to a magnetic moment. Magnetization is used to measure how unpaired electrons interact with an induced field. In the figure to the right an example of an antiferromagnet is shown. In an antiferromagnet the electron spin align opposite to its nearest neighbors as the temperature of the system is lowered below the Neel temperature, Tn. Frustration arises in an antiferromagnet when the electron spins cannot align completely opposite to each other and therefore the compound cannot minimize the interaction energies between the electrons. The geometric shape of a triangular and tetrahedral metal ion lattices does not allow for the electrons to align, thus making the system frustrated. These properties are related to superconductors. By studying frustration, we can understand and begin to design superconducting materials.



We attempted to synthesize new chalcogenide materials with the formula, KM_2Se_6 (M = W, Nb). The target compounds were analogous to KU_2Se_6, which we recently discovered to be a frustrated magnet due to its triangular lattice. Different stoichiometric amounts of K_2Se_2, Se, and M were flame sealed in an evacuated fused silica ampoule, heated to 500° C for 120 hours, and then cooled at 5° C/hr. The reactions were analyzed by powder x-ray diffraction (PXRD) at Princeton University. When tungsten (W) containing reactions were analyzed, the PXRD pattern matched WSe_2, which concluded WSe_2 was the preferred product under the stated reaction conditions. The niobium (Nb) reactions yielded a PXRD pattern that did not match any known diffraction patterns, which indicates that a new compound was synthesized. The next focus of the research involves the analysis of the niobium compound by single crystal x-ray diffraction to characterize the lattice structure. The magnetic structure will be analyzed using magnetic susceptibility to determine whether the lattice structure is frustrated.

Personal Statement

The Mentored Undergraduate Summer Experience (MUSE) has given me the opportunity to study in a laboratory setting and develop a strong background in the field of solid state chemistry. Even though the laboratory setting has allowed me to be part of a team, it has also given me the opportunity to work on an independent project. Not only has the MUSE program broadened my chemistry knowledge, but it has also provided me with the opportunity to learn about other types of research that are currently being performed across other academic fields. The MUSE lunch meetings and fun activities brought students from other disciplines together which gave me the chance to communicate with my peers from other academic fields and learn other aspects of research.

Building Block Approach to Designing Thermoelectric Materials

Sarah Wehrhan, Chemistry
Faculty Mentor: Dr. Benny Chan

2008 MUSE Project

Our long range goal is to make thermoelectric materials. The material can be used to convert waste heat into electricity or use electricity to remove heat. The most popular application currently is the small coolers that operate from a cigarette lighter in vehicles. We hope to develop a novel building block synthetic method to design new thermoelectric materials.

This summer, we prepared ternary building block chalcogenide precursors, $K_4Ge_4S_{10}$ and $K_2P_2Se_6$ with a stoichiometric combination of high purity reactants.

(1) $2K_2S_{(s)} + 4Ge_{(s)} + 8S_{(s)} \rightarrow K_4Ge_4S_{10(s)}$, a supertetrahedron building block
(2) $P_2Se_{5(s)} + K_2Se_{(s)} \rightarrow K_2P_2Se_{6(s)}$, a polymeric ethane-like building block

$(Ge_4S_{10})^{4-}$ ∞-$[P_2Se_6]^{2-}$

The materials were characterized by X-ray diffraction to help determine the structure. The building block precursors were then reacted with $LaCl_3$ under solvothermal conditions to target new materials with unknown structures.

(3) $K_4Ge_4S_{10(s)} + LaCl_{3(s)} \rightarrow KLaGe_4S_{10(s)} + 3KCl_{(aq)}$
(4) $2K_2P_2Se_{6(s)} + LaCl_{3(s)} \rightarrow KLa(P_2Se_6)_{2(s)} + 3KCl_{(aq)}$

Solvothermal reactions are accomplished in a closed system at temperatures above the normal boiling point of the solvent, i.e. similar to a kitchen pressure cooker. The summer consisted of experimenting with a variety of solvents and reactants aiming to have a crystalline product. We used three solvents for the reactions, water, acetonitrile, and methanol at 125° C and 150° C. Optical microscopy has indicated we have clear yellow crystals from the germanium containing reactions. Powder X-ray diffraction results were inconclusive. We are analyzing our products using single crystal X-ray diffraction and will attempt full characterization in the fall semester.

Personal Statement

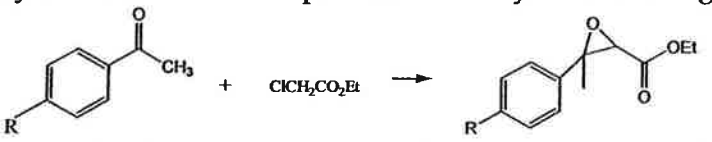
The Mentored Undergraduate Summer Experience provided an incredible opportunity to work in a laboratory and broadened my knowledge of chemistry. Having the experience to perform in the lab introduced new techniques and developed a new understanding in the field of solid-state chemistry. I was also fortunate to work with older and more experienced students, who guided me through my research. The MUSE program not only enhanced my interest in chemistry, but also did an excellent job of introducing different fields of research through the luncheons and other programs. I encountered many interesting people to make this very enjoyable and interesting experience.

Novel Synthesis of Styryl Ethers

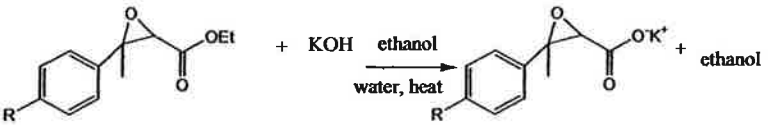
Katherine Davis, Chemistry
Faculty Mentor: Dr. David Hunt

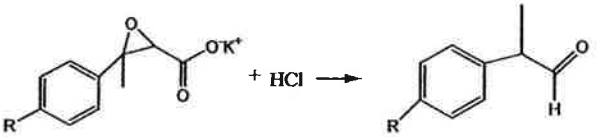
2008 MUSE Project (funded by National Starch and Chemical Company and MUSE)

I am researching a novel synthetic method for preparing styryl ethers, key intermediates for the synthesis of a variety of biologically active compounds. The goals of this research are to discover a method which involves a minimal number of steps while producing the desired product in high yield. Throughout the program, the primary goal was to optimize the final step of a four-step total synthesis. The first step converts an aryl ketone to a glycidic ester via a Darzen's condensation.



The ester is then hydrolyzed to form a carboxylate salt which, upon acidification, provides the penultimate aldehyde. An acid-catalyzed reaction with methanol affords the vinyl ether.





Five starting ketones have successfully been converted into their corresponding aldehydes. Working on a significantly larger scale than previously attempted, two vinyl ethers have been successfully prepared.

Personal Statement

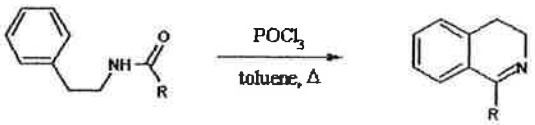
Participating in the Mentored Undergraduate Summer Experience program at TCNJ has been both enjoyable and meaningful. I decided to apply for the program in order to further perfect my laboratory techniques, become more immersed in the research, and move forward with my research project. Taking part in this program has made me more independent in my work and skilled at solving problems and determining improvements based on my results. Partaking in organic chemistry research has helped to confirm my decision to pursue a Ph.D. in organic chemistry after graduation. This program has brought me closer with the chemistry faculty and other students at TCNJ. I am continuing my research during the academic year with my faculty advisor, and I feel prepared and able to successfully move forward with my project.

Tandem Cyclization of Arylethylamino Acid Amides

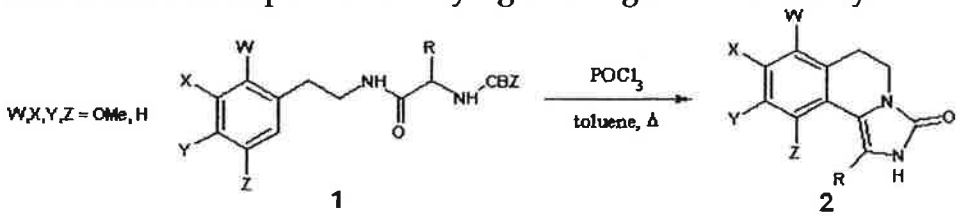
Joseph A. Macor, Chemistry
Faculty Mentor: Dr. David Hunt

2008 MUSE Project (funded by National Starch and Chemical Company and MUSE)

The Bischler-Napieralski Reaction is a ring-forming reaction whereby an arylethylamide is dehydrated to its corresponding heterocycle with a loss of water (see below). This is accomplished by using phosphorus oxychloride in a toluene reflux.



However, when an amino acid protected by the carbobenzyloxy group is coupled to a methoxy-substituted phenethylamine (as in **1**), compounds of type **2** are formed as a result of the dehydration process, the result of two successive ring-forming reactions occurring in a single processing step. Amino acid amides of the type **1** are known to possess antimycotic activity, and compounds of the type **2** would afford a unique structurally rigid analog for further study.



1 **2**

This summer, investigations centered on the nature of this reaction. Because Bischler-Napieralski cyclizations work best when there is high electron density at the point of ring attachment, five different methoxy-substituted phenethylamines (systems known to be electron rich) were coupled to various amino acids. The multitude of combinations synthesized (and subsequently refluxed with $POCl_3$) allowed for the acquisition of a large amount of analytical data, thereby shedding light on the overall nature of this unique process.

Personal Statement

The Mentored Undergraduate Summer Experience has given me the opportunity to further my intellectual growth and apply the concepts I have learned thus far to a real problem in chemistry. The answers I was seeking could not simply be looked up in the back of a textbook. For the first time in my life, rather, I was authoring them myself. The skills and knowledge I have gained this summer will undoubtedly aid me throughout all of my future educational and professional endeavors.

The community lunches were a great way to start off each week, and often provided useful information on life decisions. Thursday afternoon talks allowed me to delve into the scholarly thought of fields far different from my own, many of which I probably would never have experienced otherwise. Until this summer, I cannot recall ever being able to say "I have to wake up and go to work tomorrow" with a positive connotation. The MUSE program reminded me why I decided to come to college in the first place.

School of Engineering

Cardio-Respiratory Control Assessed Through the Quantification of the Variability of Breathing and Heart Rate

Erik Hage, Biomedical Engineering
Cory Hofmann, Biomedical Engineering
Faculty Mentor: Dr. Brett BuSha

2008 MUSE Project

The brain controls breathing and heart function (cardio-respiratory activity) by combining feedback from sensors in the body relaying information from previous beats and breaths and integrating this data to define the characteristics of each new heart beat and breath. The purpose of this study was to characterize the brain's control of cardio-respiratory activity by quantifying the variability of the intervals between successive breaths (BBI) and heart beats (RRI) under different breathing conditions. The hypothesis that breathing route and gender affect the brain's control of cardio-respiratory function was tested by recording breathing and heart rate data from 12 male and 12 female subjects while breathing only through the mouth and only through the nose. The variability of BBI and RRI was quantified using linear (standard deviation, coefficient of variability) and nonlinear (detrended fluctuation analysis, autocorrelation) techniques. Nonlinear techniques describe how the brain is controlling cardio-respiratory activity; a higher level of correlation (i.e. more self similar behavior) in the interval data implies a higher level of integration by the controller (the brain is relying more heavily on the past when processing information). A significant difference in correlation of breathing and heart rate occurred in females between mouth breathing and nasal breathing, while the same change was not evident in males. Therefore, we suspect that there is a fundamental difference in female cardio-respiratory control centers, such that female control centers rely on past information differently than males when producing each new breath or heart beat. During nose breathing, relative to mouth breathing, respiratory data from female subjects exhibited significantly greater amount of central processing. We speculate that this analysis will be an important tool in further noninvasive research and help the evolving understanding of the brain and cardio-respiratory activity.

Erik Hage Personal Statement

Being involved in the MUSE program at The College of New Jersey has been rewarding experience. I gained valuable design experience in procedures and techniques that could be used to improve the non-invasive practice of medicine. I have become more proficient at analyzing physiological signals, and using equipment and software that is standard throughout the industry. Working in the program improved my team working skills, my problem solving, my computer coding knowledge, and allowed me to network with students in other disciplines. Discussions led by faculty mentors on subjects such as authorship, ethics, and inter-disciplinary communication broadened my knowledge on the research process. I also was able to get to know my professors a lot better, as there was easier access to speak with them. However, I learned how frustrating research can be, and all the little things that need to be done before you can even start your experiment. But the feelings you have when you get good results make you realize it was worth all the trouble.

Cory Hofmann Personal Statement

The College of New Jersey's MUSE program has been a valuable educational experience. This research has provided exposure to the application of scientific, mathematical, and engineering control systems design aspects to physiological systems. It has also taught me to become more independent academically, a skill that cannot be underestimated when looking ahead to graduate school. Weekly discussions, led by faculty mentors, provided a chance to learn more about topics such as ethics in research, communication skills across disciplines, authorship and the publication process, and graduate school and employment strategies. These topics go beyond just research, and the resulting discussions have certainly left me better prepared for my future education and career. Most importantly, this program has introduced me to interesting topics of study in many fields outside of my major. Weekly presentations from fellow students in other programs have helped spark intellectual discussions and open a new world of educational topics. I am thankful for having the opportunity to participate in this program, as I now feel better prepared for all of my future endeavors.

Modeling and Characterization of Biopolymer Tissue Scaffold Degradation

Christina Roros, Biomedical Engineering
Faculty Mentor: Dr. Karen Chang Yan

2008 MUSE Project

Poly(ε-caprolactone) (PCL) is a biocompatible, biodegradable polymer which is strong yet flexible. Such characteristics make this material suitable to be used in scaffold-guided bone tissue engineering (a field that is exploring techniques for repairing and regenerating bone tissues damaged by illness or trauma). Scaffolds, 3D interconnected porous structures, are seeded with cells first, and then implanted into body to provide temporary support and guidance for tissue growth. While the scaffold degrades/erodes away over time, new tissue forms and replaces the scaffold. Therefore, it is important to understand the degradation rates and mechanisms of these polymers and resulting changes in scaffold behaviors.

Our objective is to characterize and model the degradation rates of biodegradable polymers and corresponding scaffold behaviors, with emphasis on material composition and scaffold design parameters. We began by conducting an experiment to characterize the degradation of two structurally different PCL scaffolds. These samples were placed in simulated body fluid (SBF) and kept at 37°C with 5% CO_2 concentration in a CO_2 incubator to mimic physiological conditions. Subsets of samples were removed at specific time points (week 1, 2, 3, etc.) and weighed first after being patted dry and then after being vacuumed dry. At this stage, we have calculated the percent weight loss and percent water uptake as a function of time; the data suggests that the samples are degrading slowly and that erosion is in initial stages. The samples will be further characterized in terms of molecular weight, crystallinity, and mechanical properties. We also developed a method to effectively make bulk samples of PCL and a PCL/Hydroxyapatite (HA) composite (25% HA). Similar degradation experiments on these bulk samples are on-going to address effects of material composition. Additionally, we began to explore possible mathematical modeling approaches to predict changes of scaffold behaviors during the degradation process.

Personal Statement

During the MUSE 2008 program, I've learned an immeasurable amount about my field, other fields, and scientific research. I had never realized how research is like a living organism that grows, adapts and evolves for the better. Instead of just following a list of procedures given in a textbook, we could develop our procedures and modify details when we thought of an improved way of doing a task. I loved how it was open-ended, that we were looking for something unknown. I learned so much from Dr. Yan on how to look at a situation and analyze it to discover how it is working and how it can be improved. Her encouragement and guidance were so helpful in my learning experience. Ultimately, from literary research to in lab experimentation to the weekly talks with the whole MUSE group, this entire experience has taught me so much of what awaits me after my first four years of college--that there are so many possibilities and they are within reach if one works hard enough.

Development of a High-Performance Hardware Architecture for HD Photo Image Compression

Graham Apgar, Computer Engineering
Faculty Mentor: Dr. Orlando Hernandez

2008 MUSE Project

Image compression algorithms apply frequency transform algorithms to extract spatial correlations within images, allowing them to be stored efficiently on digital computers. Compressed image data can be transferred faster, over the internet or in other digital broadcasting systems, and can allow devices such as digital cameras to store hundreds of images. Hence there has been an enormous amount of research on technologies for efficient image compression with minimal visual distortion. Microsoft's HD Photo technology is a recent state-of-the art approach to the problem which aims to improve on the long-standing JPEG standard.

During the MUSE research program, I explored the theory and mathematics behind HD Photo, with the ultimate goal of designing a hardware chip capable of performing the compression. Designing the architecture of the chip required studying the software and documentation available from Microsoft, deriving a comprehensive map of the algorithm. Following this, with the help of Dr. Hernandez, I was able to determine how such an algorithm could be optimized and implemented in hardware. The solution, currently in development, makes use of parallel operations, pipelining, and data caching to maximize performance.

Personal Statement

The Mentored Undergraduate Summer Experience provided me with the opportunity to work on an interesting engineering problem. Applying the knowledge taken from many classes to this project was a valuable learning experience, and I expect to continue with this research until graduation. I am confident that the development of many design skills during this experience will help me in future challenges. Most importantly the research has left me more interested in imaging technology, which I previously knew little about but will surely work with again.

Graphical Software Development Infrastructure

Theodore Moskalenko, Computer Engineering
Faculty Mentor: Dr. Orlando Hernandez

2008 MUSE Project

The Mentored Undergraduate Summer Experience involved working with Dr. Hernandez to design an interface for the C-Stamp Microprocessor. Dr. Hernandez provided me with the microprocessor, paired with the Board of Learning in order to be able to communicate via serial connection with a computer. The computer would be able to control the various input and output processes of the C-Stamp.

There were two major components to this project: the code that runs on the C-Stamp, and the graphical interface with the various controls on the computer. Using MPLab, I was able to write a program in the programming language "C" to run on the C-Stamp. The program was required to obtain input commands via the serial port on the Board of Learning, extract the necessary information from the various pins on the C-Stamp, then to output the gathered information via the serial port back to the computer. In order to test this part of the project, I implemented the use of the communications program Hyperterm. Once the C-Stamp program was complete, I began my work with Labview. Laboratory Virtual Instrumentation Engineering Workbench (Labview) is a platform and development environment for a visual programming. Essentially, Labview allows the programmer to design a user interface. Using Labview, I was able to design a serial communication interface to convey information to and from the C-Stamp.

The completed programs work together to provide useful information to the user via serial communication. The "C" program can be loaded on and C-Stamp, which can then be connected to any computer with Labview. The functionality of the user interface allows for both the testing of the C-Stamp, as well as direct control of I/O for the C-Stamp.

Personal Statement

The MUSE program gave me the opportunity to understand how program development is done. During my research, I had to gain an understanding of multiple programming languages, development tools, and serial communication principles. My greatest challenge was learning how to use the program Labview, and being able to use its functionality in order to complete the user interface for the control system. I found this program very intellectually challenging, and have enjoyed working with my mentor. I believe that the skills that I have obtained by participating in the Mentored Undergraduate Summer Experience at The College of New Jersey will be useful to me in the future, both with furthering my education, and when joining the workforce.

Aerodynamic Characteristics of Saccate Pollen

Chris Durando, Mechanical Engineering
Dennis O'Connell, Mechanical Engineering
Faculty Mentor: Dr. Lisa Grega

2008 MUSE Project

This study sought to investigate the aerodynamic characteristics of saccate pollen, through the testing and measuring of various factors that affect the coefficient of drag. The experiment builds upon previously acquired data, which suggests that the coefficient of drag is affected by the addition of air-filled sacs on the main body of pollen. This trial looked to further investigate various types of pollen taxa, as well as the coefficient of drag experienced by the various pollen models by incorporating the addition of surface texture to each of the models. All of the previous models had smooth surfaces; however, in actuality pollen is rough and may have one of several different pattern types. Therefore, in order to mimic the appearance of actual pollen, each genus was given a specific texture. A hemispherical pattern was added to the main body of the *Pinus* genus, while a "brain-like" pattern was added to the entirety of the *Falcatifolium* genus. To independently test the effects surface texture has on a sphere, three new models were created featuring different geometric patterns; a large and small sphere pattern as well as a spike pattern.

Preliminary testing was conducted in a drop tank full of 99% glycerin in order to observe the flow fields around both the smooth and rough models. This was done by dropping the models through a homogeneous mixture of small glass spheres and glycerin while a pulsating laser spread into a sheet illuminated the spheres as the model fell. After the flow field testing was complete, terminal velocities were measured by recording and analyzing the pollen models as they were freely falling through a predetermined test length of three inches. Preliminary results show that the surface textures do in fact reduce the coefficient of drag on the models, resulting in higher settling velocities on pollen grains.

Chris Durando Personal Statement

The Mentored Undergraduate Summer Experience has been just that, an experience. I have been given the opportunity to work side by side with one of my fellow classmates on current, relevant research, something which not everyone is privileged enough to experience. Over the course of the summer, I have been challenged to use my intellect to overcome any obstacles that have presented themselves. I have also been able to apply concepts learned over the course of my college career, as well as open myself up to new techniques and information. A very exciting fact to note about this summer is that I was able to use equipment that I otherwise would never have used. The MUSE program was a unique experience in that I was able to learn more, not only about my own major, but also about other projects and areas of interest in various majors. I have thoroughly enjoyed my time with the program, and hope to bring my experiences with me into future activities.

Dennis O'Connell Personal Statement

My personal experience with the MUSE program at The College of New Jersey is one I will not forget for a while. Having the privilege to work with the best faculty and staff in engineering made each day enjoyable and allowed to truly succeed with my research. What I have learned at this program will allow me to succeed that much more in my future endeavors. Now that I have gone through the research process, I can not only appreciate the world we live in more, but the work my professors had to endure to get to their position. Moreover, the experience of working towards a goal

every day, and overcoming large challenges to break new ground was an exciting and testing process; one that I truly enjoy. As the weeks passed, I was able to sharpen some old skills as well as start and perfect new ones. With the experience gained from MUSE, I look forward to graduate school research; becoming deeply immersed and passionate about my work as I am today about pollen aerodynamics.