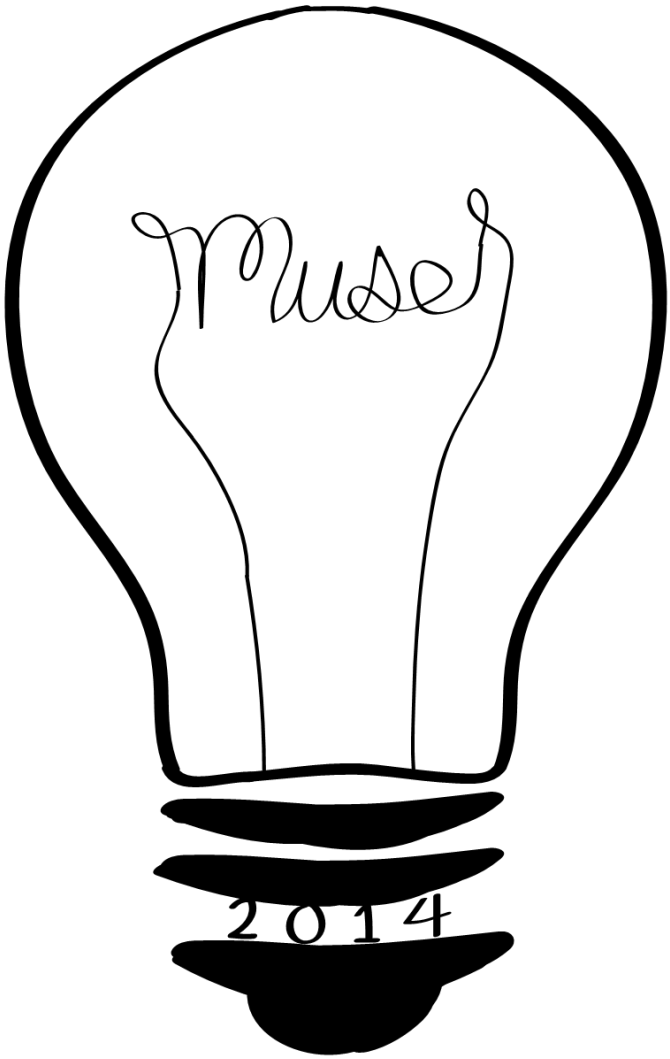

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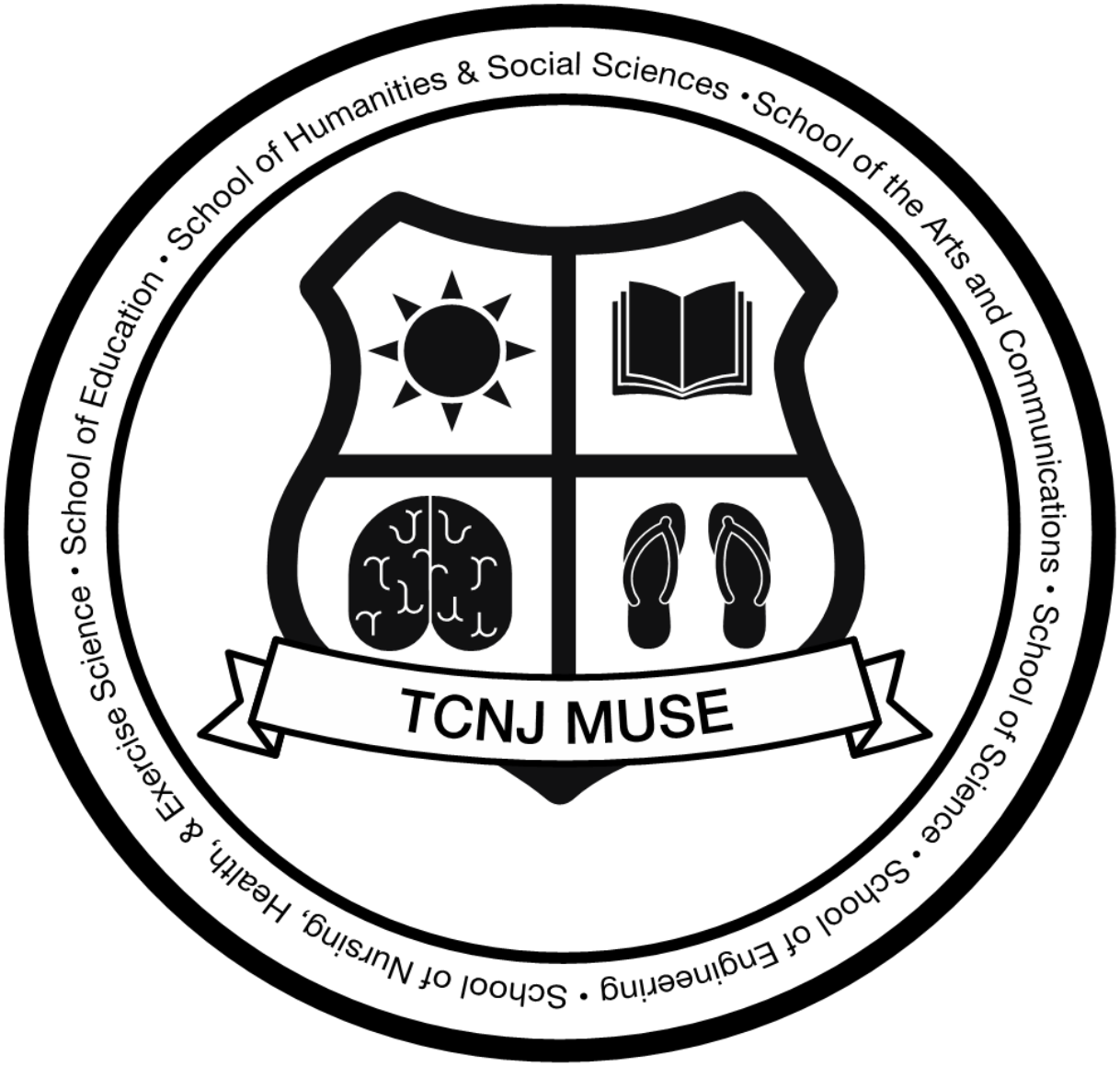

MUSE 2014

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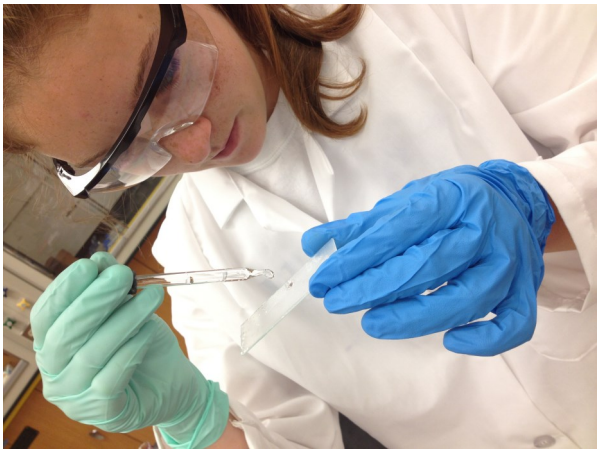

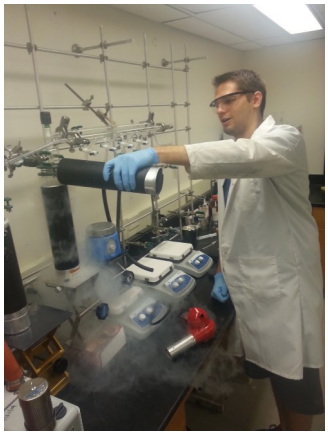


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TCNJ prides itself on the teacher scholar model where faculty are not only excellent instructors to our students, but also generate new knowledge or creative projects in their disciplines. TCNJ's 2014 MUSE (Mentored Undergraduate Summer Experience) is the apex of the teacher scholar model by fully integrating faculty scholarship/creative projects with student learning and training. The program brought together 42 faculty members and 76 students from across campus over the course of 8 weeks in the summer where faculty mentors created a transformative educational experience for students while pushing their scholarly agendas forward.

The key to the success of MUSE is that students study at the cutting edge of their faculty member's discipline to generate new knowledge without the confines of student class schedules. Students develop the scholarly questions and the processes to answer the scholarly questions with their mentor. Students learn the importance of the background and context of their mentor's project when pushing the boundaries of current knowledge. They quickly learn that big scholarly questions must be broken into achievable outcomes by limiting the scope based on their current resources. TCNJ's MUSE students are ready to continue to tackle world problems through their disciplines by finding smaller steps towards the overall goal.

This training to think like a scholar is important to the future workforce. These skills are critical to the workforce so that MUSE students can become leaders and problem solvers in their careers. The MUSE students learn excellent resilience and alternate strategies when projects do not proceed as planned. Students solve problems where the solution may never have been done before and many find out they may be the only person to ever try to solve this problem. Graduates will be ready to solve critical problems in their careers because they have already tried to solve a major problem.

This strategic priority to enrich our scholarly community on campus could not have been done without the financial and personnel support of many groups and people. The Director and all the students and faculty of MUSE thank the Office of Academic Affairs with leadership from Provost Jaqueline Taylor and Associate Provost Kit Murphy and invaluable administrative support from Norma Garza and Ann Guarnaccia and student program assistants Will McDermott and Lea Palacios. We thank the Offices of Residential Education and Housing, Conferences and Meeting Services, Catering Services, Finance and Business Services, and every School and Department office and Chair with MUSE students for their administrative support. We thank the Faculty Student Collaboration Program Council for guiding the vision of MUSE, reviewing proposals and recommending funding: Jarret Crawford, Annie Nicolosi, Donka Mirtcheva, Jerry Petroff, Carol Wells, Karen Yang, Angela Sgroi, Susan Ryan, and FSCPC Chair Curt Elderkin.

The development of our students would not be possible without the generous support of TCNJ and external organizations. We would like to thank the following organizations: Bristol-Myers Squibb, The National Science Foundation, Research Corporation for Scientific Advancement, Petroleum Research Fund, National Library of Medicine, TCNJ Academic Affairs, TCNJ Foundation, TCNJ School of Science, TCNJ School of Engineering. The support of these organizations

Benny C. Chan

Director of Faculty-Student Scholarly and Creative Collaborative Activity

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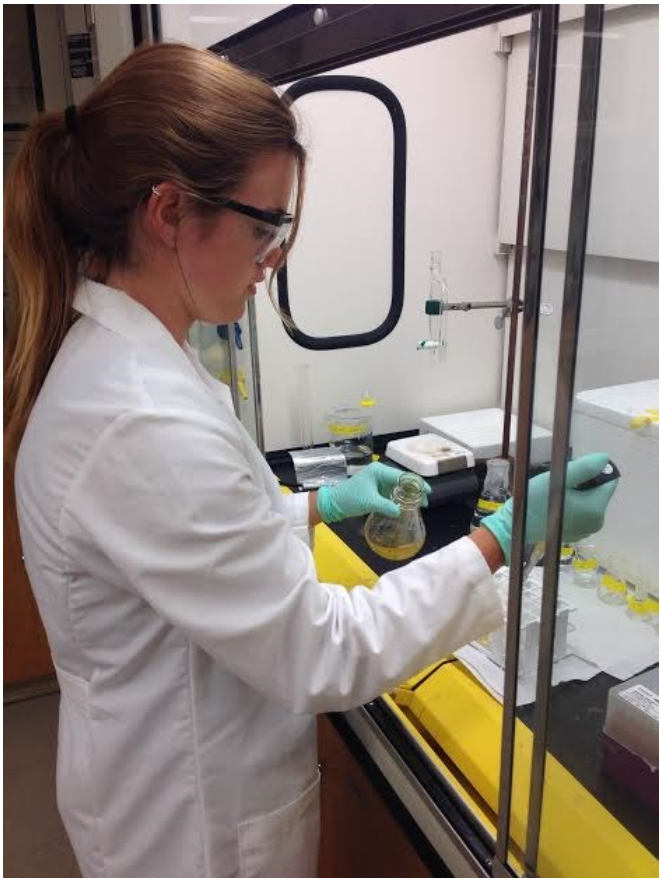
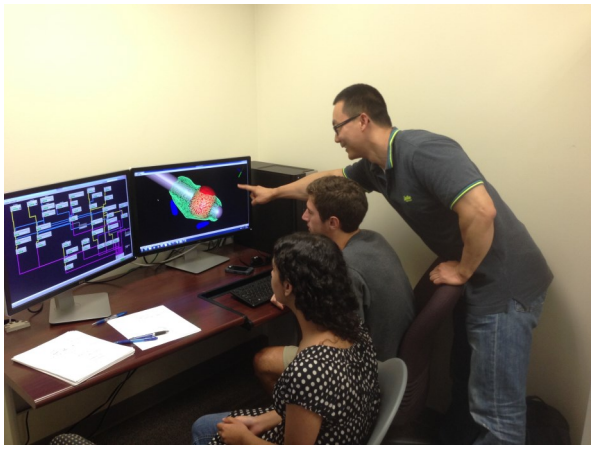
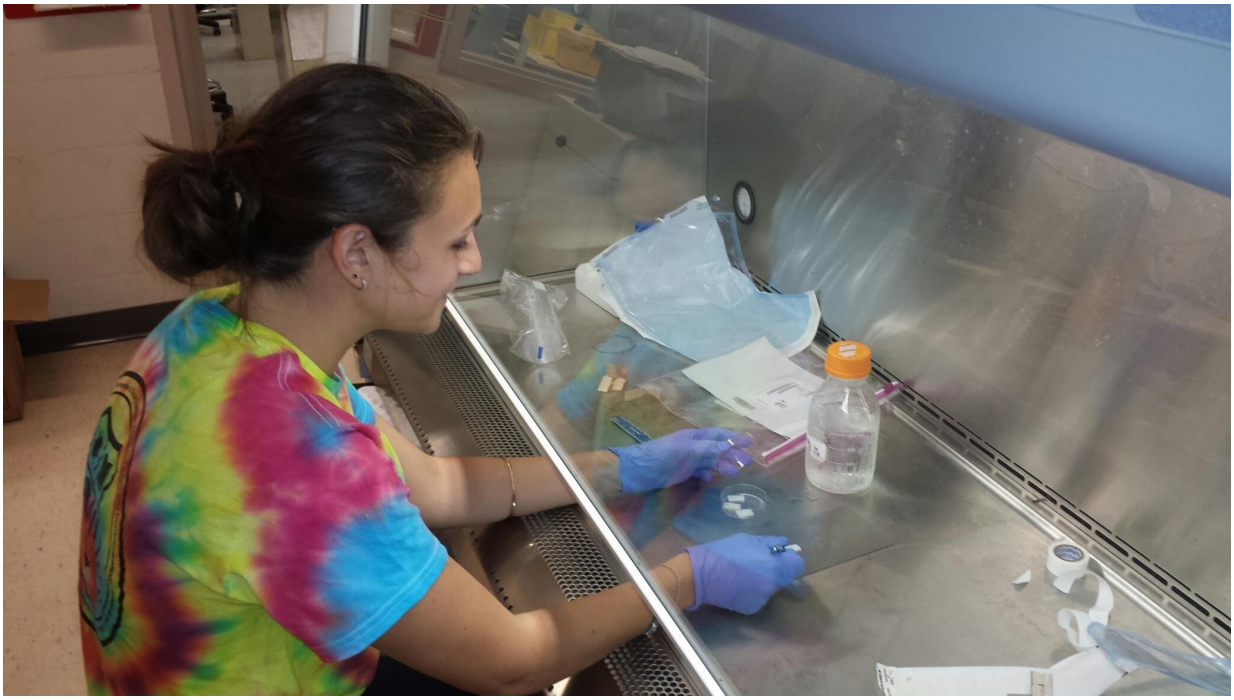
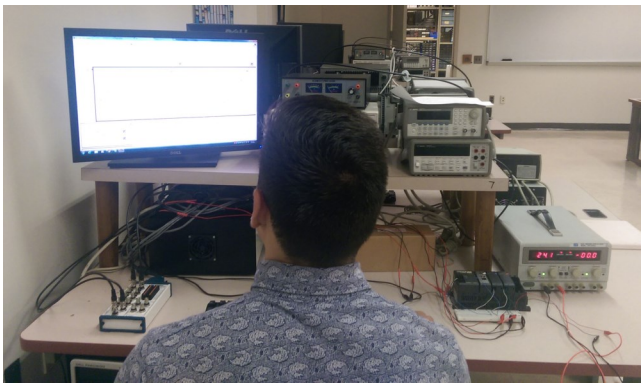
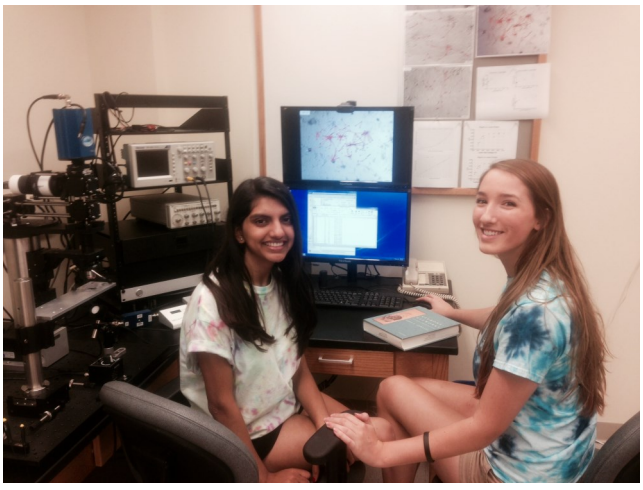
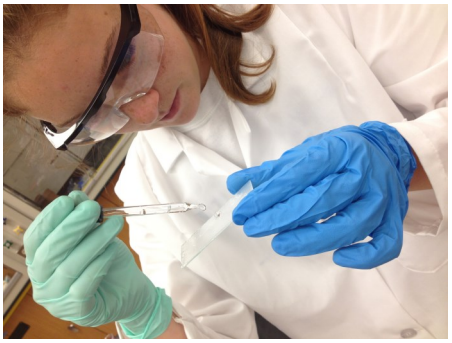


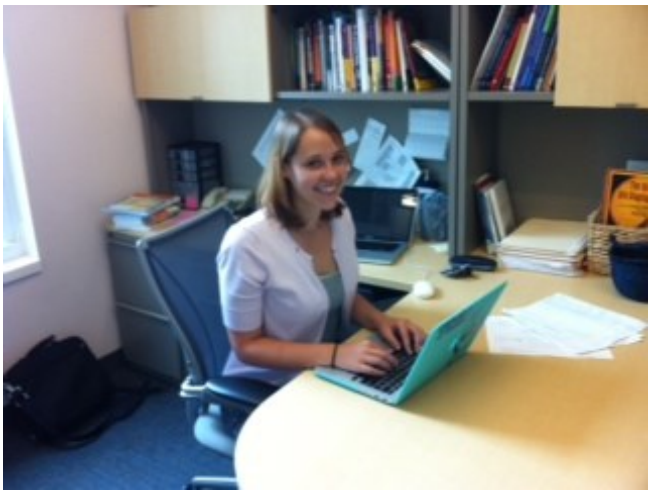












Accounting for the Decline in Entrepreneurship in the United States

Brandon Dubov, Economics
Faculty Mentor: Donald Vandegrift

2014 MUSE Project

A market economy, such as the United States, is driven in large part by entrepreneurial activity culminating in the formation of new firms. The reason for this is simple: New firms are, for a variety of reasons, more innovative than their incumbent counterparts, and this innovation contributes significantly to economic growth. Despite its importance in the development of the US Economy, however, beginning in the late 1970s, the rate of new business formation has been in decline in the United States. A plethora of studies have been conducted examining the effects of this decline, but none have successfully demonstrated any concrete casual factors. Rather, most studies have focused on isolated instances of the trend, and rarely in a way specific to the United States. For example, one study used panel data to examine the effect of the 2008 Financial Crisis on firm formation in a number of Western European Countries. Unfortunately, this and other studies like itâ€“â€“which are generally representative of the relevant literatureâ€“â€“fail to explain the general decline. To remedy this deficiency, we will utilize traditional econometric methodology (e.g. time series regression analysis) to attempt to isolate the casual factors of this phenomenon. We will provide measures to account for the changing age profile of the country, government regulation, tax policy, immigration, and financial indicators (e.g. availability of loans, interest rates, etc.), among others. / / (Source for Chart: Hathaway, Ian; Litan, Robert E. (2014) "Declining Business Dynamism in the United States: A Look at States and Metros", Brookings Institute)

Brandon Dubov Personal Statement

The goal of this project was to explain the decline in entrepreneurship in the United States since the late 1970s. To do this, I reviewed the relevant literature, collected panel data for a number of possible explanatory variables, and used statistical software to develop a regression explaining the phenomenon. Ultimately this endeavor proved fruitful, and I was able to identify several statistically significant variables responsible for this decline. / / Through this process, and with the advisement of my mentor, I learned a lot about the nature of empirical based economic research. First and foremost, I gained an understanding of the process of identifying, summarizing, and ultimately weaving together the relevant economic literature in order to motivate a project and provide a context for its contributions. I also learned several new econometric methods for analyzing data and interpreting statistical results. Together, these skills place me in a position apt to take on future research endeavors in my undergraduate academic career and graduate school.

Ortler Mountain Range
Erica Heaney, Art
Faculty Mentor: Elizabeth Mackie

2014 MUSE Project

The Ortler Mountain Range project is a continuation of a MUSE project that began in 2008; it consists of large sculptures, installations, and book works that are created in response to the effects global warming has had on Ortler mountain range in Italy. The project consists of a large sculptural-book made from handmade paper; the paper will be made through two different papermaking techniques. The focus of this project will be on the production of large paper, pigment research and the construction of an oversized sculptural book (4â€™ h x 16â€™w) on Kettle formation. In addition to making paper, this project also requires experimenting with different pigmentations in paper. Overall, this project combines artistic techniques and creativity with scientific research and experimentation to communicate the effects of a serious global issue.

Erica Heaney – Personal Statement

I am greatly appreciative for the opportunity I have had to work with Professor Elizabeth Mackie during the 2014 Mentored Undergraduate Summer Experience. I was introduced to fiber arts and the processes of papermaking, as our group constructed two large-scale sculptures from these art forms. Both sculptures are representative of Professor Mackieâ€™s research on global warmingâ€™s affects on the Ortler Mountain Range in Italy. The first project consisted of producing large, hand-made sheets of paper for the future creation of a large-scale book. This project provided our group with first-hand experience in various papermaking and paper-dying processes. The second project provided our group with skills in the fiber arts field. We completed a twenty-two and a half foot sculpture that represents the Ortler Mountain Range. It was constructed from chicken wire and sewn fabric, and it is suspended from the ceiling. Ultimately, both projects provided me with the knowledge and skills of two new art forms that I previously had no experience with. I also learned how to effectively collaborate with a team, create strategic systems of working, and how to efficiently manage time to complete the task at hand, which will be of benefit to me in my future career in the art field.

Identity (Fiber Arts)
Tracy Lee, Art
Faculty Mentor: Elizabeth Mackie
The second, Issues of Identity, investigates female sexuality, taboos, visual transformations and applies different approaches to art making that translate the subjects through their own unique visual languages. It will be a mostly fiber based piece. This project investigates clothing, particularly dresses and skirts, and ties in with female sexuality. To create this sculptural installation, fabric will be sewn, a metal armature to support the fabric will be welded, and video and sound will be incorporated. The combination of visual materials to make this sculptural installation will create an overall experience to communicate a story.

Tracy Lee—Personal Statement

This summer I was fortunate enough to participate in the Mentored Undergraduate Summer Experience with artist and Professor, Elizabeth Mackie. During the eight weeks we worked on two large scale sculptures that represent the effects of global warming on the King Ortler Mountain Range in Italy. This program has helped me develop as a student as well as an artist. I was able to experience how a working artist executes such a large project and along the way gained many new skills in color dyeing, fiber arts, and papermaking. Going into my senior year I feel confident in my abilities to create new and exciting work and to also be able to articulate my projects to those inside and outside of my field of study. I am extremely thankful to have been part of the MUSE 2014 family and to Professor Mackie for teaching me lessons that I will carry on in my practice as an artist and in life.

(Un)governed Spaces
Christina Behnan, Art
Jessica Cavanaugh, Art
Faculty Mentor: Gregory Thielker

2014 MUSE Project

The goal of our summer MUSE is to create artworks for "(Un)governed Spaces", a multidisciplinary art exhibition about Afghanistan today. Our main project is painting a large panorama of the Shomali Plain north of Kabul. To aid in this process, we will be learning more about Afghanistan through personal research and assigned readings. The painting that we are working on shows an on-the-ground perspective of a fertile valley, ringed by the Hindu Kush Mountains. A soundtrack that alternates ambient noise and interviews expressing different historical and modern accounts of the region will accompany the painting. The MUSE project will result in the exhibition scheduled for Bennington Collegeâ€™s Gallery in October 2014. Additionally, another goal of this summer will be creating side projects, such as a website that will include pictures, videos and blogs relating to the project. We will also be working on color study paintings and our own series of work to be included in a student exhibition show at TCNJ in the fall.

Pre-Service Art Teaching with Underserved Populations and
Amanda Intili
Faculty Mentor: Lisa LaJevic

2014 MUSE Project

The first project focuses on pre-service art teachersâ€™ experiences working with underserved populations. Recently, non-profit organizations and schools have reduced their art programs due to budget cuts. Wanting to provide

quality visual arts opportunities while increasing pre-service teachersâ€™ experiences working with underserved populations, TCNJâ€™s art education program designed workshops for local communities with limited funding and access to the arts. Pre-service art teachers traveled to a non-profit arts organization and an elementary school to offer free arts programming. The workshops were based on arts integration models that stimulated connections between art, self, and everyday life. This project weaves together the experiences of the coordinator and pre-service teachers with participantsâ€™ artwork. As action researchers, we engaged in self-reflective inquiry, an important component of teacher education. The findings hold implications for our teacher education program as we examine the relationship between the college and community, as well as the future of other arts and design education programs.

Contemporary Artmaking Practices
Amanda Intili
Faculty Mentor: Lisa LaJevic

2014 MUSE Project

The second project is designed to explore fresh curricular approaches in art education and promote an awareness of contemporary art. Personal experiences in the art classroom and current scholarship suggest many teachers are unfamiliar with contemporary art, and that art education lessons are often outdated and separate from student lives. Recent literature has suggested the importance of incorporating contemporary art in the classroom (Mayer, 2008; Walker, 2001). Often exploring conceptual and social issues, contemporary art investigates interdisciplinary themes that are prevalent in everyday life/culture, and challenges viewers/students to examine worldly issues and formulate their own beliefs. This qualitative research project explored past and current art education curricula, and focused on how contemporary art can be incorporated into the art classroom in order to update art education curriculum into the 21st century. It builds upon research about contemporary art and connects it to effective teaching practices that aim to push the traditional boundaries of art education by promoting student understandings of art, world, and self. Amanda will be focusing on documentation in artmaking and researching contemporary artmaking practices such as Robin Rhodeâ€™s chalk-drawing street performances and Sophe Calleâ€™s photography. She will also be researching the artist Adrian Piper and her work with identity. We will engage in historical and theoretical research and conduct an analysis of documents (e.g., journals, books, online databases, websites, artwork). Our research and ideas about updating art education, designing curriculum with contemporary art, and teaching underserved populations will be presented at upcoming academic conferences and published as scholarly articles

Amanda Intili—Personal Statement

Working with Dr. Lisa LaJevic this summer has not only broadened my views about the world of art education, but has also taught me skills I will use for the rest of my life. Her passion for art education and her dedication to her work is so inspiring to me. This experience has taught me how to be a better writer, the importance of art education, and has helped inform how I envision my future classroom. While reading and writing for 8 weeks may have been challenging at times, I am so thankful to have had this enriching experience with such a special professor. I will take what I learned this summer with me throughout my future endeavors!

The Role of Identity in Bystanders' Support for Protestors

Nina E. Ventresco, Psychology
Faculty Mentor: Shaun Wiley

2014 MUSE Project

People who feel psychologically attached to a disadvantaged group (i.e., ethnic and racial minority groups, women, the LGBT community) are more likely to act to improve that groupâ€™s position within society (van Zomeren, Postmes, & Spears, 2008). Research suggests that immigrants, however, may be more likely to protest perceived injustices against their group when they endorse a dual identity, or an identity as both a member of their ethnic group and a member of the larger national community in their country of residence (Simon & Grabow, 2010; Simon & Ruhs, 2008; Wiley, Figueroa, & Lauricella, 2014). This may be because immigrants with dual identities want to improve the status of their ethnic group, and, as members of the larger society, feel entitled to that status. / / While the psychological motivations behind Latino immigrantsâ€™ protest have been studied extensively, less research has focused on whether members of advantaged groups, such as White Americans, are likely to support Latino immigrants in light of their protests. This is an important oversight, because advantaged group members wield political influence that can help immigrantsâ€™ achieve their goals. In the present research, we examine one of the factors that may influence whether White Americansâ€™ support immigrantsâ€™ protest. / / Ironically, we expect that the same ethnic identities that in part, mobilize immigrants to protest will alienate them from White Americans. In particular, it will threaten those who adopt conservative social values. We will examine these ideas in two experiments in which we expose White American participants recruited from an online crowdsourcing database to examples of immigrants protesting, displaying either symbols of ethnic, American, or no identities. We will then measure their perceptions of threat from these immigrants, as well as their support and opposition for immigrant goals.

Nina E. Ventresco - Personaal Statement

The MUSE program allowed me to establish a great relationship with a faculty member who I truly admire and whose research interests align closely with mine. What I liked most about the experience was the individual attention that I received, as during the semester, it's simply not possible for students and faculty members to meet one-on-one so frequently. I also felt like I was held to higher standards than I might be during the semester, which was a great thing, because for the first time, I felt like an equal research collaborator with the freedom to take the lead on our project rather than an undergraduate research assistant, expected to do whatever is asked. Essentially, MUSE gave me a taste of the graduate school experience while still an undergradute, and assured me that I am making the right decision in applying to research-oriented PhD programs next year.

ACT, Left and Right

Stephanie Mallinas,
Faculty Mentor: Jarret Crawford

MUSE 2014 Project

This study will examine the relationship between the components of right-wing authoritarianism and political intolerance. Right-wing authoritarianism (RWA) is a social attitude dimension originally conceptualized unidimensionally (Altemeyer, 1981), but recent research has found support for it as a multidimensional concept (Duckitt, Bizumic, Krauss, & Heled, 2010). In this sense, RWA is comprised of three separate and distinct features, abbreviated as ACT: Authoritarianism, which is associated with aggression; Conservatism, which is characterized by submission to authority; and Traditionalism, which refers to support for traditional norms and values (Duckitt et al., 2010). We will be determining whether these different components of ACT differentially predict political intolerance in general, and specifically toward left-wing or right-wing groups. We are also interested in determining if different types of threat mediate the rela-

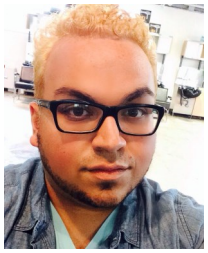
tionship between the ACT dimensions and political intolerance, as well as what conditions change these relationships (e.g., threat). In addition, we seek to examine whether different personality types predict political intolerance toward left -wing and right-wing groups. To accomplish this, we are analyzing some preexisting data and will be designing a new study to increase the sample size and include measures of the aforementioned concepts.

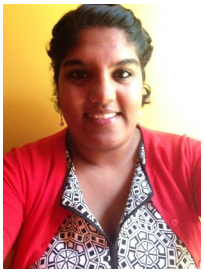
Stephanie Mallinas,- Personal Statement

Participating in MUSE has been one of the highlights of my experience at TCNJ. I learned an incredible amount about social psychological research and gained invaluable skills. Working full-time on multiple projects gave me a glimpse of how life in academia can be chaotic yet rewarding. I discovered the importance of flexibility and patience in the research process, and that while projects seldom go according to plan, they usually wind up working out in the end. Dr. Crawfordâ€™s guidance and valuable feedback allowed me to develop into a more competent researcher, and helped me to grow more confident in my ability to design studies, analyze data, and write scientifically. Additionally, this experience encouraged me to pursue a career in research. I enjoyed the balance between independent work and collaboration, as well as the critical thinking and analytical skills involved in the process. I am grateful to have been able to participate in MUSE and look forward to continuing to conduct research in the future.

Hakuna Kama Mama
David Sanchez
Aman Gill
Faculty Mentor: Marla Jaksch

2014 MUSE Project





We are taking a transnational feminist and postcolonial approach in addressing the historically and presently high rates of maternal mortality in East Africa, specifically Tanzania, despite years of considerable funding and attention. The foundation of the research is the material gathered from the digital photovoice workshop Dr. Jaksch and TCNJ students executed last summer in Nungwi, Zanzibar. The goal of our analysis is to collaborate and create a digital exhibition/archive using Omeka as a platform in order to create a space for typically silenced voices to be heard, and hopefully uncover why the rates of maternal mortality are still so high. We want to disrupt the dominant, highly medicalized narrative of maternal health in Tanzania by valuing the experienced-based knowledge gleaned from the workshops, and creating complicated social, historical, and political contexts to place it in. The digital exhibition of materials can be accessed on mobiles, which is key for creating an opportunity for critical conversations between community members, public health experts, activists, etc. This also allows for collaboration in creating an accurate representation of these women's experiences with maternal health in East Africa.

Popular Protests in the New Europe, 2000– 2012
Kristi Maricano, Political Science
Faculty Mentor: Nicholas Toloudis

MUSE 2014 Project

For the past year, Dr. Nicholas Toloudis has been developing a research project in order to study current trends in popular protest activity throughout the European Union. Continuing and building upon the work of political scientists Douglas Imig and Sidney Tarrow in their 2001 book Contentious Europeans, Dr. Toloudis has begun collecting primary data for his next book, which looks at the shifting nature of contentious politics in Europe. The working thesis of the book is that the financial crisis that struck Europe in 2009 greatly impacted the ways in which popular protest activity is carried out in Europe. As the financial crisis hit Europe, greater efforts by the institutions of the European Union were being made to combat the financial crisis through efforts to unify the individual nation states within its borders. As a result, popular protest in the European Union might become more â€œtransnationalizedâ€ meaning that actors from

different European nations would coordinate themselves through popular protest, and at the same time turn their attention to the European Union instead of individual nation states as the target of their grievances. As the European Union grows stronger and national boundaries begin to dissolve, it may be possible that citizens have begun, or are beginning to, target the European Union instead of their national governments. / Through a faculty-led research seminar in the fall of 2013 and through the TCNJ MUSE summer program, Dr. Toloudis and his research team have begun tracking and charting instances of popular protest within the European Union between the years 2005 and 2012. With a complete data set, the team hopes to find evidence that the instances of citizen protests being coordinated cross-nationally and which target the European Union will increase after the year 2009.

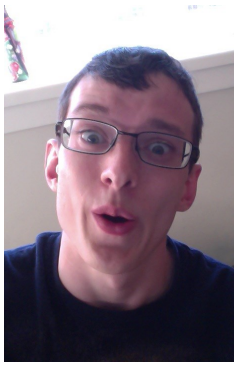
Kristi Maricano- Personal Statement

This summer, I was able to continue working with Dr. Nicholas Toloudis on research we began last fall semester in his group research seminar. Together, we worked on finishing a primary data set for Dr. Toloudis's next scholarly book which focuses on popular protest in the European Union after the financial crisis. I was very excited to work on this data set again, and finally begin to see different patterns and trends that were coming up in the data. While participating in this MUSE project taught me a lot about quantitative research, I think some of the more important lessons I learned had to deal with patience and time management. I now know how much dedication and hard work goes into a research project, and being a part of the process has taught me how to appreciate both the challenges and the rewards of scholarly work. Regardless of what field or line of work I choose to pursue after this experience, I have no doubt that what I learned through the TCNJ MUSE program will be of invaluable use to me.

Aging and the Isolation Effect

Steven Schwering, Psychology
Faculty Mentor: Tamra Bireta

2014 MUSE Project



The isolation effect, further identified as the Von Restorff Effect, states that an isolated item in a list of similar items will be recalled better than a non-isolated item. The isolation effect has been observed consistently throughout psychological studies no matter the isolate type (semantic or physical), the type of test (serial or free), the list length, the serial position of the isolate, or with other various factors considered. However, literature diverges on the presence of the isolation effect among older adults. Past studies have displayed either no isolation effect among older adults, a reduced isolation effect among older adults, or a lack of isolation effect among older adults. Paralleling the divergent results, the procedures of the various studies have also been different. Researchers have changed isolate types, list lengths, presentation rates, and other variables between experiments, making results difficult to compare. In the current study, we wish to examine the effect of test type upon the presence of the isolation effect in the older adult community. Particularly, we wish to examine the unique strains serial and free recall each place upon older adults and younger adults and how these two types of test influence how information is processed. This is an extension of previous research completed in the lab.

Steven Schwering- Personal Statement

This summer, I worked with Dr. Tamra Bireta in the Memory and Aging Lab examining the influences of test type upon aging and the isolation effect. Throughout the program, I developed the abilities necessary to work in a lab and manage the affairs of psychology research. By working with Dr. Bireta, I was able to develop or improve skills of data analysis, data interpretation, written and oral communication, and literature research. Furthermore, I gained a comprehensive view of the process of academic publication as well as the rigors involved in interaction with participants. Finally, the most important contribution of the MUSE program to my development as a student and a scholar came

through my sustained interaction with other students and my adviser. The environment of intense research allowed me the opportunity to focus upon research and discuss theories at a higher level than could be afforded anywhere else. I look forward to continue my research in the fall.

Interactive Effects of Emotional Labor and Occupational Identity on Job Attitudes

Kristin Schnatter, Psychology

Faculty Mentor: Jason Dahling

2014 MUSE Project

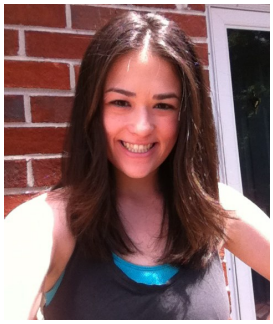
Our MUSE project focuses on the concept of emotional labor. Emotional labor is the process employees engage in throughout the workday to manage their emotional displays as part of a job role. Emotional labor is very effortful, and it has been found to lead to some detrimental effects for employees, like job burnout, low job satisfaction, feelings of inauthenticity, and negative affect. We are interested in investigating the potential role that occupational identity may play in relieving some of these negative effects. Some employees identify stronger with their work role than others. Employees who are said to have a strong occupational identity may perceive their work role as meaningful and central to how they define themselves. We expect that people with a strong occupational identity are less likely to experience negative effects from emotional labor because organizationally-desired emotional displays should be congruent with their authentic self. At the same time, we think that employees with weak a occupational identity are more vulnerable to negative effects from emotional labor because organizationally desired displays of emotion will feel fake and inauthentic. We plan to test these hypotheses by using an online data collection tool called Amazon Mechanical Turk, through which real employees all over the U.S. can respond to two online surveys we will post online. We intend to manipulate occupational identity, making it more salient for some of our respondents, and we are interested in seeing if doing so helps organizationally desired emotional display rules feel more authentic. Positive results will have significant implications for helping employees in service jobs and will demonstrate the importance of fostering strong occupational identity among employees.

Kristin Schnatter- Personal Statement

This summer, I worked with Dr. Dahling on a project that investigated the concepts of emotional labor and surface acting. We found that increasing the salience of occupational identity at work helps workers feel more authentic in their work roles, and this in turn influences them to feel more satisfied at work. Working on this project was a great opportunity. Not only did I get to participate in rewarding research that has significant implications for the workplace, I also got to develop my research interests in emotions, authenticity, and identity at work. Through this experience, I've become a more skilled researcher as I've learned to analyze some pretty complicated statistical relationships and write well in a professional, academic manner. I also became familiar with the process academics go through when they write articles to be published in academic journals. This experience will aid me in the future as I prepare to apply for graduate programs in industrial/organizational psychology. I am confident that participation in MUSE has made me a more well-rounded applicant and has equipped me with the research skills I need to be successful in graduate school.

Fathers of children with disabilities: Experiences, priorities, and partnerships in educational settings
Alyssa Mangel
Faculty Mentor: Nadya Pancsofar

2014 MUSE Project



Under the guidance and supervision of Dr. Nadya Pancsofar, Alyssa is working to explore the perspectives of fathers of children with disabilities in various educational settings. Alyssa had worked with Dr. Pancsofar on independent research in the Fall 2013 and Spring 2014 semesters, and this research indicated that fathers are often absent from literature that focuses on children with disabilities and parent interactions. In order to learn more about fathers of children with disabilities and their role in their childrenâ€™s education, Dr. Pancsofar and Alyssa developed a pilot study entitled â€œFathers of children with disabilities: Experiences, priorities, and partnerships in educational settings.â€ As a student researcher on the project, Alyssa is gaining an understanding of the needs and perspectives of a group of fathers, via interviews. The data collected will be taken through subsequent steps of the qualitative research process, including transcription, coding, and analysis. Ultimately, the research conducted aims to identify how fathers conceptualize their involvement in their childrenâ€™s educational settings, as well as determine their satisfaction with that involvement. Dr. Pancsofar plans to use the findings of this research to guide her future projects that focus on dads and their involvement with their children with disabilities.

Alyssa Mangel—Personal Statement

Through my involvement in MUSE, I had the opportunity to participate in the full arc of research. I assisted Dr. Pancsofar in the development of a pilot research study, collected and analyzed data. My work over the course of this project has helped me to acquire many foundational research skills. It has also fostered skills that will be beneficial in my career as a prospective educator. I have been able to enhance my ability to speak with parents, specifically fathers, and understand their perspectives on their childrenâ€™s education. The ability to communicate with parents/guardians is an integral component of being an effective teacher and creating a successful collaboration between home and school. Participation in MUSE has allowed me to garner new knowledge and skills in the field of qualitative research, and it has also given me the opportunity to develop skills that will be essential in my work as an educator.

Content Teacher's Perceptions of the Common Core Standards for Argument
Mali Syltevik, Special Education, Language and Literacy
Faculty Mentor: Anne Peel

2014 MUSE Abstract

This study aims to examine they ways in which content-area teachers are interpreting the new Common Core state standards regarding argumentation writing. These standards set benchmark levels of competency in argumentation for each grade level, and represent the ideal progress that a child would make within a school year. Studying the way that teachers react to this will allow us to learn more about teachers' pedagogical proficiency as they teach this literacy skill, and will ultimately allow us to create professional development targeted towards the issues that teachers face as they adjust to the standards. Conducted through focus groups and extensive review of the literature, the data of this study will represent a broad cross-section of New Jersey teachers, allowing us to gain insight into the areas in which the state needs to improve to meet these standards.

Mali Syltevik- Personal Statement

My project involved an enormous amount of coding, control, and linear algebra that I was initially a little unfamilar with. However, I dived right in and started working. There were a few roadblocks along the way, but I was eventually able to program my controller and get my simulations running successfully. After this summer, I feel like I have learned a ton of information that I will use in future courses and careers. I also feel like I gained a lot of experience with report and conference presentation, time management, and independent research. I have gained so many valuable skills through MUSE and will likely continue research in the future.

Service Learning

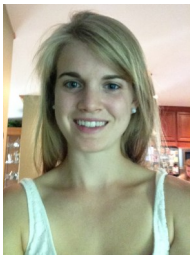
Brian Garsh, Educational Administration and Secondary Education
Alison Buske, Education
Faculty Advisor: Maureen Connolly

2014 MUSE Project

Our MUSE Research Project involves the implementation of service learning across New Jersey schools. It looks deeply into this methodology as a means to meet the Common Core State Standards for Literacy in the Content Areas. Through the surveys of New Jersey teachers, including follow-up interviews, we will better understand the best practices involving service learning and ways to improve the perception of the methodology itself. Using this data, combined with outside research into the theory and practice of service learning, our team hopes to identify strong models of service learning that will be shared in an article for publication and via an online implementation guide for those who intend to utilize this methodology.

Brian Garsh—Personal Statement

Participating in the MUSE program has definitely enhanced my educational experience at TCNJ. Working with Dr. Peel on both primary and secondary research has given me incredible insight into the field of Educational research and qualitative methodology. I believe that this kind of hands on work in Education is incredibly valuable as it allows future educators to gain insight into the theoretical and practical foundations of the profession. I greatly look forward to continuing my work in the Fall, and learning more as my project progresses.



Alison Buske—Personal Statement

The MUSE program has given me the opportunity to not only explore my own field but learn about many other avenues of the college experience. I have been able to witness the steady progression of my own project, as well as those of my peers, and can see the ways that people our generation will begin to impact our future. I am more than grateful to have been a part of the program, and I hope that I can continue with the work that I have begun.

Characterizing Motorist Cell Phone Use on Signalized Corridors

Jhenifer Almeida
Liliane Costa
Lucas Marinho
Pedro Furlanetto
Ricardo Alves
Yasmine Sampaio
Faculty Mentor: Thomas Brennan

2014 MUSE Project

This research proposes the development of an automated data collection methodology that determines if a cell phone is active within a defined range along an arterial roadway. Once activity is identified, it would trigger a time lapse camera to capture the moving vehicle, thus allowing an observation of the driver and potential cell phone use. This system is akin to the red light camera, where the movement of a vehicle through an intersection triggers a camera to document a red light violation. This collection will be conducted along with a vehicle count side fire radar detection device. By analyzing the number of drivers using cell phones compared to the total number of vehicles, the cell phone use can be characterized on a signalized corridor at a particular intersection. The frequencies range for the cell phones, along with directional antennae combinations will be evaluated along with different times of day for cell phone use. For this project, an example of US31 near the TCNJ campus will be used as a case study, along with probe vehicle speed data along the corridor. Visual representation of the travel times, volume along with cell phone use characterization will be developed using a combination of Excel, Geographic Information Systems, and SQL Database analysis. It is expected that the methodologies developed in this proposal can be used to evaluate the impact of state laws that deter cell phone use. This research is to be submitted for publication into the Transportation Research Boardâ€™s 2015 conference and has been accepted for presentation at the ITS World Congress in Detroit September 2014.

Nano fiber bioplymers for water remediation

Allyson Salmon
Faculty Mentor: Matthew Cathell

2014 MUSE Project

For our Mentored Undergraduate Summer Experience (MUSE) research project we created biopolymer fiber mats that successfully filtered toxic metals from water. These mats were formed from the biopolymer alginate, a water-soluble polymer found in the cell wall of brown algae and known for its ability to bind to heavy metals. The mats were formed through the process of electrospinning, in which nanoscale fibers are fabricated from polymer solutions using a high voltage electric field. These fibers were then treated with calcium chloride and glutaradehyde vapor to strengthen their structure, via the formation of crosslinkages, and made them suitable for water filtration. Once the fibers were created they were tested to determine their metal sorption capabilities. Through colorimetric testing with an infrared spectrophotometer, it was determined that the fibers successfully adsorbed lead, mercury, and cadmium ions from water. We will continue to refine our process of creating reusable nano fiber mats in order to optimize the fiberâ€™s sorption capabilities by looking at its affinity for heavy metals while in the presence of other solvents as well its environmental impacts. We will also be exploring the possibility of using the biopolymer chitosan (found in the shells of crustaceans) to create nano fiber mats and exploring its properties metal binding properties.

Modeling and Simulation of Petri nets: Implementing Digital Logic Circuits and Robotics Algorithms

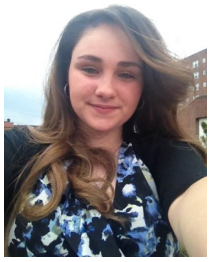
Sarah Dresher, Electrical and Computer Engineering
Yilin Yang, Electrical and Computer Engineering
Faculty Advisor: Seung-yun Kim

2014 MUSE Project

The objectives of our research is to conduct literature reviews in the fields of Petri nets (PNs), Timed Petri nets (TPNs), and Fuzzy Petri nets (FPNs), as well as, model and simulate the selected systems (e.g., digital logic circuits, fire-fighting robots, etc.) using different Petri net tools. A Petri net is a formal model of information flow and a weighted, bipartite-

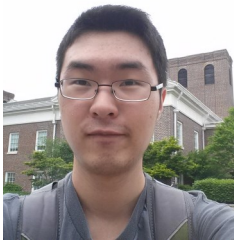
directed graph with two types of nodes: places and transitions. It is a great tool for the analysis of many behavioral properties. We hope to implement and test these algorithms using a mobile fire-fighting robot. Ms. Sarah Dresher and Mr. Yilin Yang will be proficient in this area by the conclusion of the MUSE program.

Sarah Dresher - Personal Statement



The MUSE Program has been the most rewarding experience of my undergraduate career. Working with Dr. Kim and Yilin was a privilege and the knowledge I have earned is invaluable. I discovered the applications of Petri nets (PNs), both Place/Transition Petri nets (PTPNs) and Time Petri nets (TPNs) models, and developed several algorithms to describe the course of action taken by an autonomous fire-fighting robot. I look forward to using the skills attained through this experience in my future endeavors in graduate school and/or industry.

Yilin Yang—Personal Statement



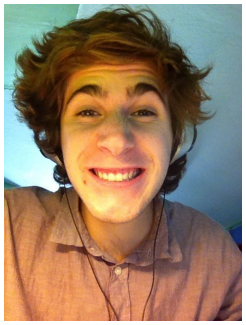
Working under MUSE with Dr. Kim and Sarah Dresher has been a great experience. Petri nets were an unfamiliar topic to me so it was fun to learn all about them and even more exciting to conduct original research on them. Imagine discovering and learning new things youâ€™ve never heard of before and then imagine discovering and learning about things no one has ever heard of before. Thatâ€™s the feeling MUSE really fosters over the summer. Being able to devote all your attention to a project like this, without the distractions of classwork, really makes the research more enjoyable and productive. It always feels like youâ€™re sitting on the edge of a breakthrough or revelation that will reveal more about yourself, your topic, and the future. Also, I got to build fire-fighting robots, which was nice.

Determination of Optimum Surface Profile for Bond of Fiber Reinforced Polymer to Concret

Alyssa DeSimone, Biomedical Engineering
Patrick Waite, Civil Engineering
Faculty Mentor: Andrew Bechtel

2014 MUSE Project

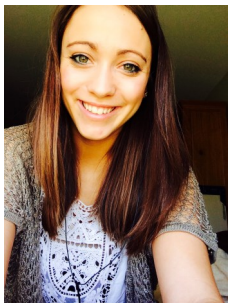
The goal of the research project is to determine the optimum surface profile for bond of fiber reinforced polymer (FRP) to concrete. The first step in experimental program is to make and cure the concrete beams. Once all the concrete beams are cured, their surface profiles will be altered. The surface profiles for concrete are measured on a scale from 1 to 9. CSP-1 (concrete surface profile specified by the International Concrete Repair Institute) is the smoothest concrete surface and CSP-9 is the roughest concrete surface. For the preliminary tests 12 of the concrete beams will be used. Beams will either have no surface preparation or be prepped to CSP-1, CSP-5 and CSP-9. Three beams will be tested at each surface preparation. FRP will then be bonded to the concrete surface. The average bond strength will be determined using the test set-up displayed in the figure. The data from these tests will then be analyzed to determine what surface profile showed the highest average bond strength. Based on the preliminary results 9 concrete beams with surface profiles adjacent to the preliminary surface profile showing the highest bond strength will be tested. The surface profile which displays the highest average bond strength will be determined the optimum surface profile.



Patrick Waite—Personal Statement

When Dr. Bechtel approached me about participating as his research assistant in the 2014 MUSE program, I was both excited and honored to accept. The program has given me a chance to apply what I've learned in the classroom and really gett my hands dirty in the lab. This summer I have achieved leaps and bounds more than I anticipated and I feel that I have never been in a better position to think about my future career as a Civil Engineer. My group and I took an idea that had not yet seen definitive results when tested by others. Together, we found an optimum surface profile for bonding carbon fiber reinforced polymer to concrete. This could potentially become an industry standard for the repair and strengthening of concrete in the future. The success

of the project was the result of careful work in the lab and extensive research outside of it. MUSE allowed me to carry responsibility and solve problems on my own as well as in a group with an amazing team of Civil Engineers. Aside from the experience I gained in my department of study, MUSE has gone to lengths to ensure that I am ready for the post graduate world in other ways. My networking and interviewing skills has seen improvement and I now have a resume that properly represents me and my accomplishments. I am very blessed to have been given this opportunity and I know it will continue to help me as I move forward.



Alyssa DeSimone—Personal Statement

MUSE was able to widely expand my knowledge. While performing the experiment, I learned how to run important lab tests and while analyzing the data, I was able improve my proficiency in computer programs. My group also started to write a paper on our study. My mentor's feedback on my work was able to improve my technical writing skills. MUSE has also shown me what research is like in my field of study and now I am considering furthering my education and going to graduate school. MUSE definitely provided me with experiences and knowledge I could not have received anywhere else. It was truly a rewarding experience.

Embedded Control for Real-time Application
Steven Brucato, Engineering
Abdoulaye Diallo, Electrical Engineering and Computer Engineering
Eric Mauro, Electrical and Computer Engineering
Faculty Mentor: Ambrose Adegbege

2014 MUSE Project

This project involves real-time implementation of control for embedded applications such as in autonomous systems. Usually, advanced control algorithms can be recast as the online solution of some convex optimization such as quadratic programming. This research seeks to implement such advanced control algorithms on low-end low-cost platforms including programmable logic controller (PLC), field programmable gate array (FPGA) and micro-controller (e.g. Raspberry Pi). One objective is to develop quadratic programming solution algorithms for efficient hardware implementation. Another objective is the evaluation for memory usage, speed, and efficiency of the different hardware solutions.

Eric Mauro -Personal Statement

The MUSE program has provided me with the opportunity to perform research within the My project involved an enormous amount of coding, control, and linear algebra that I was initially a little unfamilar with. However, I dived right in and started working. There were a few roadblocks along the way, but I was eventually able to program my controller and get my simulations running successfully. After this summer, I feel like I have learned a ton of information that I will use in future courses and careers. I also feel like I gained a lot of experience with report and conference presentation, time management, and independent research. I have gained so many valuable skills through MUSE and will likely continue research in the future.

Abdoulaye Diallo-Personal Statement

Being a part of the MUSE program this past summer gave invaluable experience that would be much different than experience obtained in an internship or a desk job. I was able to work with my professor and classmates to figure out new ways to implement control for embedded applications. I have learned so much about mathematical aspect of control algorithms and also learned a lot about programming languages. I plan on taking my experience obtained during the summer towards my career goal of becoming a telecommunications engineer.

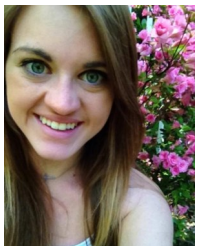
Developing a Nanoscience Curriculum for K-12 Educators

Jennifer Schablik, Technological Studies
Joyce Seifried, Technological Studies
Faculty Mentor: Manuel Figueroa

2014 MUSE Project

The United States currently spends $2 billion annually to fund nanotechnology related research. At the same time, other countries continue to make large investments in this sector. In order to stay competitive, it is necessary that the United States begin to invest in education to promote a new generation of students devoted to nanoscience. For our 2014 MUSE research project, we are focusing on developing an integrated STEM curricula for the K-12 classroom. The overall goal is to integrate the basic elements of nanoscience into the standard science curriculum used in the NJ Education System. To do this, we are designing lesson plans for teachers based on current research that introduces students to nanoscience through hands-on learning experiences. We are developing educational materials centered around the synthesis of silver nanoparticles. Our laboratory work involves optimizing the protocols so they can be incorporated into science classrooms. One of the lessons will teach students how to design hydrophobic surfaces that can be used for many purposes, such as self-cleaning glass, coatings for glasses and car windshields. The other lesson is based on the chemical properties of DNA bases and will teach students about aggregation in solutions as well as light scattering on the nanoscale. By integrating these new concepts into education, we hope to further enrich the minds of students and motivate them to pursue their education in the STEM fields.

Jennifer Schablik-Personal Statement



As an undergraduate student, I had the privilege to work alongside members of the / Technological Studies Department through the Mentored Undergraduate Summer Experience. I / have always had a passion for the sciences and as a biology major I hoped to test the skills I have / gained throughout my freshman year. Under the guidance of Dr. Manuel Figueroa and in / partnership with Joyce Seifried, I was introduced to the field of nanoscience and the reality of / research through our project focused on developing modules to incorporate nanotechnology into / the modern education system. These activities were developed to align with the Next Generation / Science Standards (NGSS) and highlight the major concepts of iSTEM (Integrated Science, / Technology, Engineering and Math). The laboratory development of these modules allowed me / to build upon and apply my skills as a scientific researcher while also challenging my / capabilities. Not only did I gain the knowledge of using new technology such as a UV-Visible / Spectrophotometer, but I also gained a new perspective on research. Persistence after failure is a / key factor in getting experimental results. I hope to continue supplementing my academic / achievements with challenging and applicable research projects throughout my undergraduate / career. I am grateful to MUSE as I now have a greater confidence in my scientific capabilities / and I am excited to see where the next few years lead me.

Joyce Seifried-Personal Statement

Through the Mentored Undergraduate Summer Experience, I was privileged to work under Dr. Manuel Figueroa, in corporation with Jennifer Schablik. Working with people of other disciplines I learned more about lab science, research, and collaboration than I could gain otherwise. I have always had an interest in the sciences, and as an iSTEM (integrated science, technology, engineering, and math) major I know I will not often get the chance to work in a lab, as I will be focusing on integrating STEM into lesson plans. This summer gave me the chance to learn about research in lab as well as prepare me for the upcoming years and designing lesson plans. I am very fortunate to be given the opportunity to focus on my interests in science and education by designing lesson plans that integrate aspects of chemistry and biology while aligning to the ideals of iSTEM and the Next Generation Science Standards (NGSS). I have gained skills in synthesizing silver nanoparticles, preparing self-assembled monolayers, as well as developing labs and detailed lesson plans. This experience has given me opportunities that I am more than grateful for, as it opened my eyes to what my future as an educator may look like.

Novel Electrode Designs for Efficient Neural Stimulation and Recording

Naina Iyengar, Biomedical Engineering
Andrew DeMaria, Biomedical Engineering
Faculty Mentor: Xuefeng Wei

2014 MUSE Project

The properties of novel electrodes for deep brain stimulation in the treatment of Parkinson's disease and essential tremor are currently being investigated. Specifically, we will be designing novel electrode geometries which reduce electrode power consumption, patient discomfort, and side effects. We will be testing the stimulation performance of these electrodes by visualizing the volume of tissue activated in a realistic, integrated field-nerve model. Furthermore, we will be probing their neural recording properties, which will allow clinicians to use feedback from brain signals to customize the electrical stimulation to the patient. Our project will utilize NEURON, COMSOL Multiphysics, and SolidWorks as computational tools for the construction of the electrode, field, and nerve models. We intend for our project to yield novel electrode designs which could potentially achieve optimal outcome in patients with neurological disorders.

Naina Iyengar -Personal Statement

The 2014 MUSE Program was the perfect platform for me to advance my scholarly, research, and career goals while learning about the current projects of other departments. Throughout the eight weeks, I was able to observe firsthand how designing unique fractal shapes on the circumference of a cylindrical deep-brain stimulation electrode could significantly increase the volume of neural tissue activated in the subthalamic nucleus of the brain. This increased efficiency can, in the future, reduce the number of surgical replacements for this battery-powered neural prosthetic in patients with Parkinsonâ€™s disease and essential tremor. Working with Dr. Wei, who has been a very helpful guide and instructor in a topic I had previously known little about, to make an impact which could one day improve the condition of someoneâ€™s life, has been a rewarding and fulfilling experience. The knowledge I have gained from this project has made me aware of the truly limitless scope of research and innovation in any field. I look forward to continuing our research and publicizing our results, and carrying the skills I have acquired onwards to graduate/professional school.

Andrew DeMaria- Personal Statement

Participating in the MUSE program at TCNJ has been a major influence in determining my plans for the future. Working with Dr. Wei on the effects of electrode geometries in deep brain stimulation has opened up a whole new world of options for me. I have become well-seasoned in various simulation programs which I feel will give me an edge over others. By spending quality time working on my project, I have become more knowledgeable in the field of neural engineering. Because of this, my goals have changed from wanting to go to medical school, to applying to graduate school for neural engineering. I was extremely fortunate to have been chosen to work with Dr. Wei in this program and the benefits gained from such an experience will help further my engineering career.

Mechanically-induced Mesenchymal Stem Cell Differentiation

Abigail Baldwin-LeClair, Biomedical Engineering
Christina Rabolli, Biomedical Engineering
Faculty Mentor: Christopher Wagner

2014 MUSE Project

Mesenchymal stem cells (MSCs) are adult progenitor cells that can differentiate into a variety of cells types, including bone, tendon, ligament, cartilage, and adipose cells and are commonly used for tissue engineering approaches to tissue replacement. It has been shown that MSCs can be induced to differentiate through the application of specific chemical signals. More recently, studies have demonstrated that MSCs embedded in a collagen-based gel can also be induced to differentiate into tenocytes (tendon cells) through the application of specific mechanical stimulation. However, the resulting constructs fail to achieve mechanical properties suitable for tendon/ligament replacement. In this study

we will use a porcine-derived acellular intact extracellular matrix (ECM) scaffold that has been used clinically to replace tissue deficits instead of traditional scaffolds having non-native composition and organization. The objectives of this work are to demonstrate MSC cultured on this intact ECM will differentiate in response to mechanical stimulation and exhibit tenocyte biological markers and to characterize the rate and degree of differentiation compared to purified collagen scaffolds. In addition, the same procedures will be performed utilizing mouse embryonic stem cells. The results of these experiments will be compared to MSC results to understand the effect of cell age (embryonic vs. adult) on differentiation potential. They will also be compared to results already generated by our collaborator, Dr. Jason Shearn at the University of Cincinnati, using gel-based scaffolds in order to explore the effect of scaffold composition. The ultimate goal of this work would be to apply tissue engineering approaches and specific bioreactor conditions to produce therapeutic grafts for tendon/ligament injuries, especially the anterior cruciate ligament, which does not heal after being injured.

Abigail Baldwin-LeClair- Personal Statement

My education at TCNJ was enriched by the MUSE program. The opportunity to apply abstract analytic skills to laboratory experiments has revealed to me the fullness of scientific research in biomedical engineering. I have been encouraged by this experience to explore biomedical engineering in research and industry, perhaps after a graduate degree.

Christina Rabolli -Personal Statement

The MUSE program has had a huge impact on my educational experience at TCNJ. I never considered doing research before this program, but now I'm extremely grateful for the experience. After working on this project for two summers, I have actually changed my career goal from prosthetic design to tissue engineering.

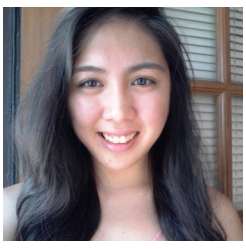
Transport and Adhesion Mechanisms of Microparticles

Jessica Gonzaga, Biomedical Engineering
Christine DeZerga, Biomedical Engineering
Faculty Mentor: Constance Hall

2014 MUSE Project

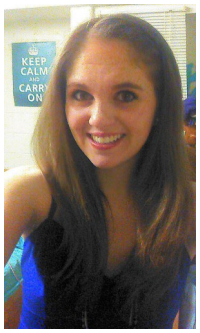
Thrombosis is the formation of a blood clot under pathological conditions such as a heart attack or stroke. Blood clots result from platelet adhesion and fibrin formation initiated by the exposure of a transmembrane protein, tissue factor (TF) to blood. Tissue factor is found in the outer layer of the blood vessel wall, but also on circulating cell-derived vesicles, termed, microparticles. Blood clots form on an injured vessel wall and may be exacerbated by the incorporation of TF-bearing microparticles that will contribute to additional fibrin formation. Blood flow and particle (cellular and protein) transport can impact thrombosis localization. Blood flow conditions can differentiate based on a number of variables including the rate of change in velocity and recirculation patterns. Transport and deposition of microparticles vary under these conditions and depend on microparticle size, density, and/or viscosity. The main focus of this study is to observe how different blood flow conditions affect the deposition of microparticles leading to blood clot formation. Experimental flow and computational models will be utilized to examine these effects. In the experimental flow model, the localization of subcellular fluorescent particle deposits under pulsatile and laminar fluid dynamic conditions in flow chambers will be studied microscopically. The objective is to establish a preliminary model system that can be extended to human blood cells in the future. Computational results obtained for a range of microparticle properties will be compared to experimental results to better elucidate the transport mechanisms.

Jessica Gonzaga-Personal Statement



The MUSE program has provided me with a unique learning experience as an undergraduate. I had the privilege of working with Dr. Hall and gaining insight in her focus of study, thrombosis. Working in her lab has given me the opportunity to practice various laboratory techniques that I otherwise would not have experienced in a regular classroom/laboratory setting. Aside from conducting perfusion chamber experiments, I was also introduced to computer solver software to develop computational simulations of fluid dynamics and particle trajectories to compare to our experimental results. Each day has brought new challenges in all aspects of our research encouraging discussion

and application of critical thinking skills to find reasons behind the results and how to best present them. From this experience, I have learned to be more articulate in writing and speaking, to be persistent when conducting experiments and running simulations, and to be able to work both independently and in a team. The scholarly environment that MUSE established helped me become a better scientist and to develop practical skills that will undoubtedly be advantageous for the rest of my academic career and future endeavors.



Christine DeZerga-Personal Statement

The MUSE program has allowed me to utilize skills learned in the classroom and during labs on a research project. I have learned so much that a classroom simply could not provide. This experience has given me insight on what it is like to pursue a career in research. It was also interesting to hear about the many projects that other students and faculty were working on throughout the summer as well. My mentor, Dr.Hall, is very knowledgeable in her field of study and offered guidance about my future after TCNJ. She taught me to not be discouraged when experiments do not go as planned, and that with hard work and dedication, research can be a fun and rewarding opportunity.

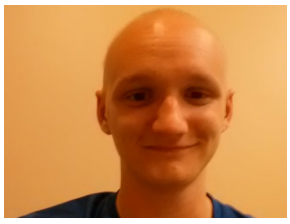
Automation and Optimization of Residential Load Behavior Using Wireless Networking

Tim Kindervatter, Electrical Engineering

Faculty Member: Anthony Deese

2014 MUSE Project

The goal of this project is to optimize residential load behavior through automation and intelligent reaction to environmental variables. We plan to achieve this through wireless networking of multiple sensors and Smart Plugs with a programmable IP gateway. This will allow us to receive quantitative data about environmental variables such as amount of light, sound level, and even nearby motion. Through finding patterns in this data, we can create programs that, under certain circumstances, automatically turn on and off any appliance that is plugged into a networked Smart Plug. / / For example, we can use the programming language Python to write a program that periodically pings a light sensor to get a reading from it. If the light in the room falls below a certain point, we can have the program activate all the Smart Plugs connected to lamps. We could put a small temperature sensor in the refrigerator that could turn it off for a few minutes at a time to save energy, and turn it back on if the temperature rises beyond a certain point. / / Applications like this not only allow us to save energy, but also allows us to build a more accurate load profile. This is important so that we can optimize electric power generation. Many sources of power are slow to react, so if there is a sudden, unexpected spike in power being drawn, it can cause problems if there are no fast-reacting power sources on the grid. We have fast-reacting power sources called spinning reserves to solve this problem. However, these spinning reserves run off of fossil fuels, which is a non-renewable energy source, and creates greenhouse gas emissions. As such, we want to minimize the number of spinning reserves that we need to use, and this can be done by creating an accurate and predictable load profile.



Tim Kindervatter- Personal Statement

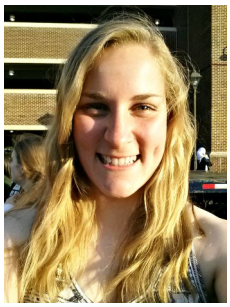
MUSE has been an educational experience in many ways. I have gained a variety of technical skills that I may have never learned by just taking courses, and I often had to teach them to myself, which forced me to think more deeply about what I was learning. My education was not strictly academic however, as I also strengthened my ability to work independently, make my own schedule, and communicate regularly with my advisor. Perhaps the most important thing I gained from MUSE was a reality check. I had a very idealistic vision of research before I participated in MUSE, and I learned very quickly that it can be extremely frustrating, even demoralizing at times. It forced me to really consider whether research was the correct path for me. Conversely, it also taught me how rewarding it can be when I succeed, and ultimately I have decided to pursue research in graduate school, although I will progress with more realistic expectations.

Determining Shape Factor Coefficients for the Creation of Soil Conservation Service Synthetic Unit Hydrographs in New Jersey Watersheds

Emily Hennessy, Civil Engineering
Stella Karcnik, Civil Engineering
Faculty Mentor: Michael Horst

2014 MUSE Project

Synthetic unit hydrographs use the physical characteristics of a watershed to predict the response of a watershed to a rain event when historical data is not available. Synthetic unit hydrographs are based on the physical characteristics of each watershed, namely, area, soil composition, land use, slope, and longest hydraulic length. Among many methods, the Soil Conservation Service method is used most frequently and, unfortunately, incorrectly. The main formula used in this method is Qp=(C*A)/Tp where the flow in the hydrograph â€œQpâ€ is equal to the area of the watershed in square miles â€œAâ€ multiplied by a shape factor â€œCâ€ and divided by the time to peak of the hydrograph â€œTpâ€. When this method was introduced, an example was given in the text that used a shape factor of 484 and this value is



now widely used though it was intended to change based on the watershed. The research being performed by The College of New Jersey this summer is working to find acceptable and accurate shape factor values for each of the major watersheds in New Jersey. Historical data will be gathered, graphed, and compared to synthetic data obtained through the use of the Soil Conservation Service method. An iterative process will be employed, which will yield the shape factor for each watershed. The knowledge obtained in this research can be applied in the future with any hydrologic assessments involving the watersheds being studied. Correlations may also be made between shape factors and the land use, which could allow for better estimations of shape factors in any number of different locations nationwide.

Emily Hennessy—Personal Statement

I am so incredibly fortunate to have been able to participate in the Mentored Undergraduate Summer Experience. I had the chance to work with the engineering department chair on a research project that not only gave me a glimpse into the career possibilities of hydrologic engineering, but also yielded results that can really make a difference in both academia and practical applications. I am very grateful for this experience, and I will carry what I have learned into my last year as a student and further as a working engineer.

Musical Performance Applications for Expression Monitoring System

Meghan McEneaney
Faculty Mentors: Teresa Nakra (Arts and Communication) and Brett BuSha (Engineering)

2014 MUSE Project

Prior studies have investigated the relationship between musical preference and personality traits, revealing correlations between music and psychological phenomena such as social cognition and emotion. One important linking factor is physiology -- for example, heavy metal fans tend to experience higher resting sympathetic physiological arousals than country fans, and heavy metal increases sympathetic arousal levels more than country music. Similarly, preference for highly arousing music (e.g., rock, alternative, rap, and dance) appears to correlate with resting arousal, sensation seeking, and antisocial personality. This study expands upon prior work by examining the relationship between personality type, physiological response, and music preference. We will administer two written surveys (self-report measures): the Big-Five personality inventory and the Short Test of Music Preference (STOMP). Afterwards, our subjects will select, explore, and manipulate musical styles in real-time with an interactive music system called the Affective Musical Instrument (AMI). This system includes a Kinect motion sensor, an analysis engine (Max), and sound output applications (Max for Live, Ableton). While subjects experience AMI, their physiological responses will be recorded using a wearable data acquisition system. Electrical activity of the heart will be measured using surface electrodes attached across the chest; Galvanic Skin Response will be measured with an electrode on the back of the hand. Subjects will complete a final survey describing their emotional valence. All data will be stored digitally, without identifying markers. We hypothesize that the musical preferences of our subjects will correlate with their personalities and physiological responses.

Meghan McEneaney– Personal Statement

The Mentored Undergraduate Summer Experience (MUSE) research program has been the most significant and rewarding learning experience of my undergraduate career. Collaborating with Dr. Teresa Nakra and Dr. Brett BuSha has contributed significantly to my educational development in many ways. This summer, I was granted the opportunity to generate my own personal, creative ideas and develop them into a scientific research experiment. The MUSE program provided me the chance to participate in every step of the research process and learn a variety of both qualitative and quantitative research skills. Our project challenged me to become more confident in my ability to analyze data, understand academic papers, and write and communicate with clarity. Through the MUSE program I learned how to apply what I have learned from my mentors, properly execute different testing protocols, statistically analyze the data gathered, and present the justifications for our findings. These skills will provide the essential foundation necessary for the graduate schools that I will apply to in the upcoming year. I am so appreciative for all that I have learned during MUSE, and I look forward to the fall where I will continue to conduct independent research for my capstone.

Assessing the Impact of Ocean Acidification on Alaskan King Crabs and Tanner Crabs

Shai Bejerano, Biology
Aparna Yarram, Biology
Faculty Mentor: Dr. Gary Dickinson

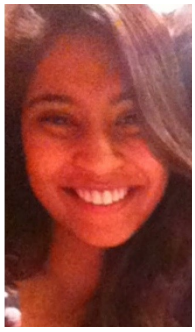
MUSE 2014 Project

Our group is studying the effects of ocean acidification on marine invertebrates. Rising levels of carbon dioxide in the atmosphere lead to a shift in ocean chemistry, making it more acidic. These changes in seawater chemistry have been shown to be detrimental to the physiology of marine animals. Our MUSE work focuses on the effects of ocean acidification on crabs, specifically Tanner and King crabs. These species are of great importance both to their ecosystems and for the seafood industry. The crabs were exposed by collaborators at NOAA Alaska Fisheries to different seawater conditions (pH of 8, 7.8, and 7.5) for 1-2 years to mimic future ocean conditions. We will be testing mechanical, chemical and structural properties of the exoskeletons of these crabs in order to assess the impact of ocean acidification on these species. We hypothesize that a lower pH will result in diminished mechanical properties, as well as altered chemical content of the shell, which may jeopardize survival of these species.

Shai Bejerano—Personal Statement

Ever since setting foot at TCNJ, I have been captivated by the opportunity to do research in a professional setting and the ability to discover whether that path is something I would like to pursue as a full-time career. MUSE has been instrumental in helping me achieve that realization, more so than doing research during the academic year, because for two months it has allowed me to become a full-time researcher. In those two months I have learned new lab techniques and improved upon the old, became more independent in the lab, and was exposed to different aspects of research that I may not have otherwise been fully immersed with. Those include the inconvenient aspects of trouble-shooting and setbacks, but also the greatly rewarding aspects of collaboration with fellow researchers and the pride of accomplishment that one gets when finally finishing a big piece of the project. Those experiences and more have made me realize that I would like to continue pursuing research as a career in the future. I am very grateful to have been part of the MUSE program not just for what it taught me about myself, but also what it taught me about others. I met many different people of various disciplines and majors throughout MUSE and it has fostered in me a deeper appreciation for all fields of scholarly work. I am very happy to have had the chance to do MUSE, and look forward to continuing my own research and learning about othersâ€™ work in the future.

Aparna Yarram—Personal Statement



The Mentored Undergraduate Summer Experience has provided me with a tremendous opportunity that has shaped both my college academic career as well as helped me formulate a decision regarding my future career pursuits. Working closely with Dr. Dickinson the entire summer has allowed me to see research not merely as a course during the semester but as a possible career. I was able to learn about numerous techniques in testing for hardness and mechanical properties of our model organisms but beyond this, I was able to observe first hand the significance of running experiments that might not produce the desired results. Ultimately, MUSE has both provided me with the technical skills I hope to use in my near future and has allowed me to see the benefits and difficulties of research as a career.

Investigation of a bacterial protein predicted to untangle knots in DNA

Dylan McClung, Biology
Mackenzie Mosera, Biology
Faculty Mentor: Dr. KT Elliott

2014 MUSE Project

An organism's DNA contains the genetic information that tells the organism how to grow, develop and function. As this information is replicated and passed down to new cells. The DNA can get tangled and knots can form. Such knots can be

cleaved by proteins called resolvases. However, when a resolvase is not present or working correctly, these knots can cause DNA damage. Many bacteria possess a predicted resolvase called YqgF. However, the function of YqgF in bacterial cells remains poorly characterized. During MUSE, we will take two different approaches to studying the function of YqgF. First, we will analyze the building blocks of the protein, known as the amino acids, and identify critical amino acids for normal YqgF function. We will do so by comparing proteins containing altered amino acids with normal proteins by measuring the effect of each alteration on how bacteria grow, respond to antibiotics and repair errors in DNA. Second, we will use genetic and biochemical approaches to identify other proteins that may cooperate with YqgF. These experiments will help us further define the role of YqgF in untangling knotted DNA.

Mackenzie Mosera--Personal Statement

The MUSE program has provided a great opportunity for a full-time intensive research experiences while also continuing the research and project I had started during the academic year in Dr. Elliottâ€™s lab. Therefore, MUSE not only allowed me to make substantial progress in the project I have been working on and prepare myself well for continuing research this fall, but also allowed for insight into the culture of a scientific community. It was a great joy and privilege to work with other motivated students and faculty this summer who continually challenged me to think about my research in different ways and with new approaches. Through this supportive community, I have grown to be more independent in the lab and now possess a greater understanding of our research. Overall, the experience I had through MUSE this summer has been a journey of both scientific and self-discovery as I grew in understanding of our research and gained valuable lab skills while additionally learning more about myself, my interests and how research plays a role in my future career goals.

Dylan McClung-Personal Statement

The MUSE program was integral to advancing my research at TCNJ. I continued working on a project that I have been pursuing for the past three semesters, and I collected more data this summer than I have during the academic year. The data my lab partner (Mackenzie Mosera) and I collected will set the foundation for a publication by our mentor, Dr. KT Elliott. Learning how to troubleshoot new protocols in the lab and how to deal with setbacks has strengthened my independence and confidence. The MUSE program solidified my desire to pursue a Ph.D. in microbial genetics. Working full-time days improved my time management skills and taught me what lab rotations in graduate school will entail. I will return to the lab in the fall with a new perspective on what I can accomplish within a week, while still juggling classes, activities, and my work in Residential Education. In case Mackenzie and I get too eager for results of an experiment, we will remind each other that 90% of molecular biology experiments do not work, so we must remain â€œneutral on hope.â€

Investigating the coordination between two critical steps in the cellular gene expression "assembly line": Can transcription regulatory complexes regulate downstream RNA splicing?

Nikita Paripati, Biology
Faculty Mentor: Dr. Tracy Kress

2014 MUSE Project

Gene expression, a highly regulated and efficient process, is the activation of genes that result in the synthesis of proteins that carry out specific functions inside of cells. This process occurs universally and gives rise to the versatility and flexibility of multi-cellular organisms. Mistakes in gene expression underlie many human diseases, including cancer. This summer, I am working with Dr. Kress to study the regulation of gene expression by looking specifically at two key steps in gene expression, transcription and RNA splicing, in the eukaryote, Saccharomyces cerevisiae, more commonly known as bakers yeast. Transcription is the process that makes an RNA copy of the DNA encoded in a gene and RNA splicing is a process that removes the non-protein-coding pieces of an RNA molecule and fuses together the protein-coding portions that serve as the recipe to direct protein synthesis. RNA splicing and transcription occur simultaneously inside of cells and these processes are known to regulate each others activity, but the proteins that help coordinate these two processes are not known. It is likely that there are interactions between the specific proteins known to be involved with both the transcription and RNA splicing machinery and we are using genetic techniques to test for interac-

tions between these proteins. In particular, I am testing whether the transcription regulation complex NuA4 can interact with specific RNA splicing proteins. If a genetic interaction is identified, we then use molecular biology and biochemistry to determine the specific role of the transcription complex NuA4 in regulating RNA splicing. This work will help to advance our understanding of the regulation of gene expression and can help to provide insight into the molecular mechanism implicated in human disease.

Nikita Paripati-Personal Statement

Participating in the MUSE program this summer has been a truly memorable experience through which I have gained a deeper understanding and appreciation for biological research. In addition to developing technical skills in the laboratory, I have strengthened my understanding of gene expression, specifically the coordination between transcription and RNA splicing. By working with my faculty mentor, Dr. Tracy Kress, I have received guidance, valuable feedback and encouragement that will aid me in my future endeavors. I want to thank both Dr. Kress and the MUSE program for this incredible opportunity!

Effect of Salinity on Gene Expression and Enzyme Activity in the Mandibular Organ of Crabs

Dale Oommen, Biology
Christine Weng, Biology
Faculty Mentor: Dr. Donald Lovett

2014 MUSE Project

The green crab Carcinus maenus is a strong osmoregulatory organism, meaning that the crab can adjust to varying salinities quickly and efficiently. The long-term goal of research in our lab is to understand how the crab can accomplish this task. In previous studies, high levels of the hormone, methyl farnesoate (MF), have been found in the blood of crabs acclimated to low salinity. This suggests that MF may play a key role in osmoregulation. This summer, the Lovett lab is studying the effects of changing salinities on the levels of MF found in the blood of crabs. Specifically, we will be examining changes in gene expression for enzymes in the MF synthesis pathway. Changes in gene expression will be detected by measuring changes in levels of messenger RNA (mRNA) for the enzymes using a qPCR instrument. In order to accomplish this, the DNA sequences of the enzyme genes need to be determined. This requires that we first develop primers-- small single-stranded nucleic acid fragments that can initiate synthesis for specific segments of DNA. After determining the DNA sequence of each enzyme, optimal primers can be selected for use in qPCR. If we can measure changes in mRNA levels for specific enzymes when the crab is exposed to low salinity, then we could describe how gene expression in the crab changes in response to salinity change.

Dale Oommen-Personal Statement

This summer, for the first time, I was able to acquire hands on experience working in a research lab. To going from simply watching techniques as a shadow to being completely immersed in a 40 hour work week dedicated to research, I learned a lot all at once. This gave me an overall feel for how research operated, as well as an education in a variety lab techniques and procedures. Additionally, I learned soft skills that are integral to doing good research such as learning to deal with setbacks and being a good communicator. All in all, MUSE is a great program and made me a better student of science.

Christine Weng-Personal Statement

I am truly grateful for the opportunity to be a part of MUSE this summer under the guidance of Dr. Lovett. Although I had done research in the previous year, MUSE allowed me to focus all my attention on my project without the diversions of school work and extracurricular activities. Spending 40+ hours each week in lab has also allowed me to make strides on my project that would not have been possible during the school year. Working full time on my project not only allowed me to hone the techniques I had acquired during the previous semesters, but also gain new lab techniques which enabled my partner and me to progress further in our research project. I look forward to using these skills in the upcoming semesters and become a better scientist.

Deer x (Invasives)2: The Ecology of Species Interactions in Suburban Forests

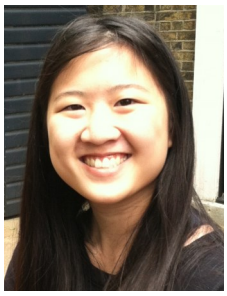
Shane Wilkins, Biology
Cynthia Timko, Biology
Danielle Leng, Biology
Priya Dala, Biology
Faculty Mentor: Dr. Janet Morrison

Shane Wilkins—Project Description

I am a team member in the Deer X (Invasives)2 study, and also am pursuing a side project on the changes of spring ephemeral wildflower abundance in deer-ridden suburban forests. The effect that deer herbivory can have on plant communities is complex in that it not only directly impacts some species, but also influences interspecific plant competition. By analyzing changes in wildflower population dynamics and deer herbivory over time, I hope to develop a way to predict how wildflower populations will react to deer herbivory, in order to improve current conservation methods.

Cynthia Timko– Project Description

Our research focuses on the process and effects of non-native plant invasions in the herb layer of suburban forests, particularly in the context of overabundant white-tailed deer. Ultimately, our goal is to understand the major factors that drive community structure in these forests. This summer, our team of four students and our faculty are collecting data from a five-year field experiment that will be used in structural equation modeling to illustrate how two invasive plant species, Microstegium vimineum (Japanese stilt-grass) and Alliaria petiolata (garlic mustard) interact with each other and deer to influence community structure and plant diversity. We also will measure other variables, such as earthworm abundance, leaf litter, sunlight level, and soil moisture, to better understand the forestsâ€™ ecology. Our work will test some important hypotheses about the cause of biological invasion, such as the â€œpassenger and driverâ€ hypotheses and the â€œinvasional meltdownâ€ process. In addition, our results will have implications for how best to manage suburban forests to maximize native plant biodiversity. I will work as part of the team and also start to develop my own side project, to be conducted over the next few semesters.



Danielle Leng—Project Description

This summer I am part of the Deer x (Invasive)2 team, as well as conducting my side project. I am studying the relationship between a native tree seedling, Liriodendron tulipifera, and an invasive shrub, Rosa multiflora. Also, I am looking at the effects of the inclusion and exclusion of deer herbivory on this relationship. The results of this study will provide better understanding of the impacts invasive species have on tree seedling survival and future forest canopy composition.

Priya Dala– Project Description

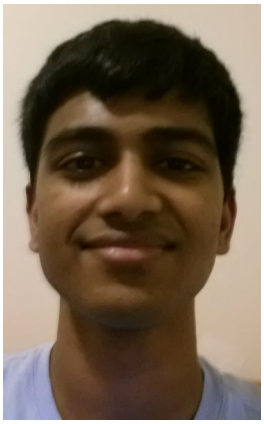
This summer I am part of the Deer x (Invasives)2 team, and I also have a side project that focuses on the effect that earthworm abundance has on plant diversity in local suburban forests. Local forests contain many Asiatic and European invasive earthworm species, which may affect community structures of those forests. I am investigating the relationship between soil nitrogen content, leaf litter and earthworm abundance, since soil nitrogen is essential to plant growth and leaf litter is the main source of nutrients to earthworms. Hopefully, this study will provide a model for the relationship between earthworms and plant diversity.

Effect of Chemically Induced Hypoxia in C. Elegan

Surya Chinta, Biology
Faculty Mentor: Sudhir Nayak

2014 MUSE Statement

We will be conducting a follow up study on the effect of hypoxia inducing compounds on the lifespan of Caenorhabditis elegans (C. elegans). Previous work has suggested that hypoxic conditions tend to increase the lifespan of C. elegans; however, in this study we will be observing the effects of chemicals that mimic hypoxic conditions. The hypoxia inducing chemicals which will be used in this study are cobalt chloride, sodium sulfite, and deferoxamine. The three chemicals are used to eliminate the possibility that the changes in lifespan are due to an undocumented effect of an individual chemical. Cobalt chloride and sodium sulfite are used first due to their cost, stability, and availability. Deferoxamine, on the other hand, is fairly expensive but is used at the end since it is believed to be highly specific hypoxia inducer without any associated heavy metal toxicity. In addition to measuring lifespan, the activity of hif -1 (hypoxia inducible factor - 1), a gene which induces proteins which are required for survival in hypoxic conditions, will be observed. The use of hypoxia inducing chemicals allows for artificial up regulation of hif-1 which has been associated with transcriptional activation of telomerase. To ensure that the chemicals are indeed causing upregulation of hif-1, fluorescent imaging will be used with the nhr-57::gfp strain, a strain containing a gene which codes for a nuclear hormone receptor and which is also upregulated under hypoxic conditions, to indirectly measure hif-1 expression. In addition, the hif-1::gfp strain will be used to directly measure hif-1 activity. Both of the strains contain a fused gene in which the gene of interest is fused with gfp, which produces green fluorescent protein which allows for analysis with fluorescent imaging. In order to associate the observed lifespan changes with hif-1, the Î”hif-1 (ia04) strain which contains a deletion in hif-1 will also be used. We hypothesize that by exposing C. elegans with hif-1 to hypoxia inducing chemicals, a general increase in lifespan will be seen due to the up regulation of hif-1 activity which in turn will increase telomerase activity.



Surya Chinta-Personal Statement

Although I have shadowed for over a year in Dr. Nayak's lab, MUSE has allowed me to take part in full-time research. Not having classes alongside the research allowed me to concentrate fully on my project and learn many lab techniques that will be useful in the future. This complete immersion has allowed me to master many of the lab techniques involved in my project and gain a better understand of my project. Not only was I able to understand what had to be done but I started to understand the reasoning behind the various methods. Due to this I have been able solve problems independently as they arise. In addition, being a part of MUSE has improved my ability to work in collaboration with professionals. Overall, the MUSE program was very rewarding as it allowed me to develop as a person and has improved my ability to think scientifically.

The Role of Squid in Germ Line Stem Cell Renewal

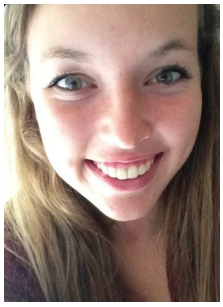
Kristen Randolph, Biology
Faculty Mentor: Dr. Amanda Norvell

2014 MUSE project

Our research uses the model organism Drosophila melanogaster, commonly known as fruit flies. Dr. Norvellâ€™s general research focus has been pattern formation during oogenesis and mRNA localization during development. The primary concentration of our summer research will be the role of Squid, an RNA binding protein, in germ line stem cell renewal. We will be exploring how Squid interacts with other RNA binding proteins and gene products to influence the localization and translation of cell signals that control cell fate in germ line stem cells. Squid

is believed to interact with another RNA binding protein, Twin, which deadenylates their target RNAs. This deadenylation prevents the translation of the transcripts and stops the stem cell from differentiating, thus leading to germ line stem cell renewal. In order to investigate this, we will be comparing single and double mutants of squid, twin, and genes encoding other proteins that are believed to be involved in germ line stem cell renewal to determine the significance of each protein in the stem cell renewal process. We will be harvesting and staining ovaries to observe the germ line stem cells, as well as examining the production of eggs in the various mutants. We also aim to confirm the suspected target of Squid and Twin in germ line stem cells, Mei-p26.

Kristen Randolph- Personal Statement



The MUSE program has given me the opportunity to grow as a student and researcher in a way that is unique to this program. By working full-time in the lab, I have not only gained mastery of lab techniques and procedures, but have been able to fully immerse myself in the content of our research and truly grapple with the questions we are investigating. I have gained an immensely greater understanding and appreciation for the magnitude of our research and the research of other student-faculty teams. One of the best things about MUSE is that it gives you the ability to continue work on the project into the semester with a faculty member that you have already established a strong connection. Aside from the many educational and scientific benefits of MUSE, I have met some amazing professors and students that have become great friends.

Regulation and cytoplasmic polaydenylation of maternally provided mRNA during early embryogenesis in zebrafish
Natella Maglakelidze, Biology
Faculty Mentor: Dr. Marcia O'Connell

2014 MUSE Project

In Dr. O'Connell's lab we study the early development of zebrafish. In particular, we have been studying the maternal regulation of polyadenylation during embryogenesis as well as the regulation of specific genes in the zebrafish embryos. This summer I will be working on two different projects. One of my projects involves researching how the expression of ElrA, a maternally inherited mRNA, is regulated throughout zebrafish development. Previous research has shown that ElrA codes for a cytoplasmic polyadenylation element binding protein, CPEB, which activates the polyadenylation of other mRNAs in the embryo so that they can be translated. Furthermore, ElrA has two mRNA variants that are present in the embryo during all stages of development in zebrafish. The two variants, ElrA-001 and ElrA-002 are the products of alternative polyadenylation, and possibly splicing within the cell. Both ElrA-001 and ElrA-002 have small sequences that are unique to their transcript making them vary in size. Their unique sequences allow me to detect them separately through gel electrophoresis. I will also be looking at the polyadenylation of both transcripts throughout early development, before zygotic transcription turns on. Looking at these mechanism will allow us to further understand why the two variants of the same mRNA exist as well as how they are regulated.

Using microinjection and polysome profiling to study the regulation and detect the expression of zsquidA mRNA during zebrafish development
Natella Maglakelidze, Biology
Faculty Mentor: Marcia O'Connell

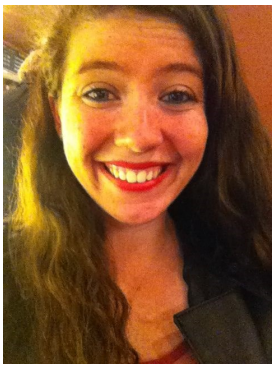
2014 MUSE Project

For my other project in the lab, I will be working with a gene called zsquidA. During zebrafish development, an embryo does not turn on its own genes (called zygotic transcription) for a while until what is called the mid-blastula transition, which occurs when they are at the 1000-cell stage. Therefore, maternal RNAs provided in the egg are the only source of new gene products in a developing zebrafish embryo. The synthesis of maternal proteins from these maternal RNAs via translation is tightly regulated to achieve precise and efficient synthesis of proteins, and to control the protein products. Cytoplasmic polyadenylation is one of the ways by which the translation of maternal RNAs is regulated in early embryos. Our lab has identified an interesting gene whose mRNA is maternally provided, and appears to be regulated by this mechanism, called zsquidA. The two questions I am addressing in my experiments are a) can we obtain additional evidence for the proposal that maternal zsquidA is regulated by cytoplasmic polyadenylation, and b) can we

gain evidence for the hypothesis that zsquidA translation is correlated with the change in polyadenylation status. I have already started doing some of the preliminary work to answer the first question by performing microinjections using a drug called Actinomicin D to inhibit all transcription in zebrafish embryos. After my first injection I found promising results. The embryos that had the Actinomicin D injection early in development all stopped development around the

dome cell stage and exhibited smaller blastoderms than my uninjected controls. This is what was expected since transcription was inhibited in the cells. Since development was stopped for these early embryos, it means that the Actinomicin D did inhibit transcription, and so we are now poised to ask the question of whether this inhibition of transcription will alter the profile of zsquidA expression. / In order to figure out the cell stage during which zsquidA is translated, sucrose gradients and polysome profiles will be utilized. I will initiate these experiments this summer, following a protocol that has been successfully carried out in the lab. I will make cell extracts from collected fertilized embryos both before and after the 1000-cell stage, which is when zygotic transcription turns on. I will then isolate RNA from the cell extracts in order to perform a reverse transcriptase PCR, in order to verify the presence of RNA. These cell extracts can then be run through a sucrose gradient to pellet the polysomes and the translated mRNA molecules coupled to them. The presence of the mRNA coupled with the polysome pellet would allow us to determine that the zsquidA protein product was present in the cell extract we were testing at the different stages of embryogenesis. Taken together, the experiments with zsquidA will further our understanding of the mechanisms embryos use to regulate the synthesis of key proteins during development. /

Natella Maglakelidze– Personal Statement



Performing professional academic research at TCNJ through the MUSE program has been a remarkable experience. I have gained new knowledge about biological concepts and become a more intuitive, ambitious, and well-rounded student. I have grown to love working independently in the lab, running my own experiments, and testing new hypotheses without the pressure of classes. I believe my passion towards my research demonstrates how committed I have become to my work. Being a part of MUSE has allowed me to fully submerge myself in research. It has helped me develop better problem solving and critical thinking skills. I have gained a lot of respect for scientific literature and the importance of staying up-to-date with your field of study. Furthermore, I have learned a key lesson through my research experience and that is the importance of troubleshooting. Research can be unpredictable and, more often then not, you will get negative results. However, a negative result can still be a positive experience. Even though it may not be a result you have predicted, it is critical to be flexible, to learn from your mistakes, come up with a new experiment, and move on. Most importantly, research has taught me about patience and perseverance, characteristics that comprise both a successful researcher and doctor. The discipline and techniques I gained through the program will definitely help me in my future career in medicine. I look forward to continuing my research next year after making significant progress this summer.

Studying the Folding Pathway of Human Serum Albumin via FCS

Ryan Chin, Chemistry

Faculty Mentor: Dr. Michelle Bunagan

2014 MUSE Project

The field of protein folding focuses on understanding how proteins go from the unfolded, unstructured state to a folded, functional form. Knowledge of how proteins fold will enable better prediction of the folding pathway of other proteins, the design of more efficient proteins with medicinal application, and avoidance of aggregation or misfolding. Our study is focused on the folding of Human Serum Albumin (HSA), with the goal of identifying intermediate structures that populate the folding pathway. This is done using Fluorescence Correlation Spectroscopy (FCS). In this technique, after a laser excites fluorophores attached to the HSA, photons are emitted and observed in the confocal volume, a defined space that is comparable to the observation area of a microscope. The observed emission is analyzed to determine the time is takes for the protein to diffuse across the confocal volume, and this can be used to determine the radius of the protein. In order to observe HSA at different points in its unfolding pathway, various concentrations of denatur-

ants are used. Since HSA is increasingly unfolded as denaturant concentration increases, different intermediate states can be observed by comparing the distribution of protein radii in each solution. The information gleaned from the unfolded conformations of HSA will help to further our understanding of the dynamics of protein folding.

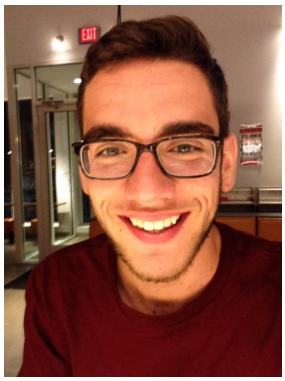
Ryan Chin— Personal Statement

Participating in the MUSE program this summer has provided me with valuable experience in the field of biophysical chemistry. The consistent schedule of research during the summer allowed me to hone my laboratory skills and gain a deeper understanding of the material. Working on the project everyday without any of the distractions present during the semester greatly increased the amount of work I was able to do since the previous dayâ€™s research was still fresh in my mind. Additionally, the one-on-one mentoring helped me connect with Dr. Bunagan on a more personal level, something that was more difficult to do during the semester. With all of the experience I gained this summer, I feel like I am more prepared for research in graduate school and beyond.

Synthesis of New Potential Thermoelectric Materials
William McDermott, Chemistry
Lea Palacios, Chemistry
Faculty Mentor: Dr. Benny Chan

2014 MUSE Project

The goal of this summer's MUSE program is to investigate the synthesis of inorganic materials with special magnetic, superconducting, and thermoelectric properties. An example of such a compound is bismuth telluride, Bi2Te3, which is a known thermoelectric material. Thermoelectric compounds can convert electricity to thermal energy or thermal energy to electricity with greater efficiency than most other materials. Quaternary metal compounds containing potassium, tellurium, bismuth and a transition may have some of the properties that are desired. Time in the laboratory will be used to synthesize and characterize the compounds consisting of these elements and their analogs. A possible compound that shows promise is KNbBiTe. Composition ratios of reactant metals in addition to the temperature to which the reactants are to be heated will be adjusted in hopes of successfully synthesizing such a compound. Characterization will be performed with the use of an X-ray Diffractometer to determine the crystal structure of the product compounds.



William McDermott—Personal Statement

Over the course of the MUSE program this summer, I worked with Dr. Benny Chan and my partner Lea Palacios in the area of solid-state chemistry with the goal of synthesizing new thermoelectric materials. This project has fostered some growth within me. The synthesis of these compounds involves a great deal of planning and careful preparation, and because of this, I became even more efficient at managing my priorities and allocating my time effectively. Another effect of this project upon me is the development of presentation skills due to the need to be able to articulate my research to those who may not fully understand what I do in my lab. Additionally, the MUSE program has exposed me to the research projects of students in many fields, and I have been opened up to new ways of thinking and looking at the issues that I face in my own research. All of these benefits of the MUSE program have helped me further refined the tools that would be necessary for me to succeed in the remainder of my undergraduate career and my future graduate school experience.

Lea Palacios– Personal Statement

During the MUSE program I collaborated with both my research advisor, Dr. Benny Chan, and my partner, Will McDermott in an effort to synthesize new thermoelectric materials. The process of making these compounds requires much forethought and can be tedious. This experience has increased my efficiency in the lab which will be of use in my continued research during the academic year. The MUSE program challenged me to be able to explain my research to those with little to no experience in the field of solid state chemistry. Another benefit of the MUSE program was that

I was exposed to projects from a wide range of fields. This experience has made me more comfortable in a lab setting and working as a team which will be vital to my success in graduate school.

Development of Artificial Peptides that Bind Collagen as Potential Anti-Thrombosis Agents

Kayla Gentile, Chemistry
Dylan Nguyen, Chemistry
Mentor: Dr. Danielle Guarracino

2014 MUSE Project

The Guarracino research group focuses on peptidomimetics, synthetic molecules that mimic proteins found naturally in biological systems. The van Willebrand factor (vWF) is a protein responsible for blood clotting. It achieves this by binding platelets to the collagen of blood vessels. Excessive blood clotting via the vWF mechanism can lead to arterial thrombosis, the complete obstruction of an artery. A synthetic protein could inhibit the vWF and reduce clotting by competitively binding to collagen. The peptidomimetic should contain a region that resembles the binding portion of the vWF, allowing it to behave similarly. Ideally, the synthetic protein will also be stable and resistant to degradation while in the body. The protein can be made resistant to proteases â€“ protein-digesting enzymes â€“ by making it a cyclic molecule. In addition to cyclization, the use of Î²3-amino acids will make the peptide less susceptible to proteolysis. Î²3-amino acids are not found naturally in living organisms and must be synthesized in the laboratory from their corresponding Îą-amino acids. Over the course of the summer, the necessary Î²3-amino acids will be synthesized and coupled together to form the desired cyclic peptide. The product will be analyzed to verify its structure and assess its capability to disrupt the vWF-collagen interaction.

Kayla Gentile— Personal Statement

During the summer, I had the privilege of working with Dr. Guarracino in the field of biochemistry. We studied peptidomimetics and worked to synthesize a protein that mimicked the von Willebrand factor in an effort to produce a drug that works to stop excessive blood clotting. I learned a great deal this summer, not only about chemistry and research but also about myself. MUSE gave me the opportunity to immerse myself in the research experience so that I fully understood the goals, processes and equipment used in our research project. I also discovered how to be independent in a lab setting while continually being aware of when I needed guidance. Overall, it was an excellent opportunity that gave me significant insight into the life of a research chemist while also enhancing my confidence and independence.

Dylan Nguyen—Personal Statement

Shall I compare MUSE to a summerâ€™s day? While not quite as lovely and temperate (and any rough winds do very little shaking, weâ€™ve got machines for that sort of thing), there was a bounty of experience to be gained from within the slightly refrigerated halls of the chemistry building. So how can I begin to describe these past two months? Engaging, challenging. Enlightening and intriguing. Frustrating, heartbreaking, and maddening. But despite meager results, unforeseen shortfalls, and inevasible setbacks, I was guided to realize that nothing is ever an utter failure in the pursuit of knowledge, that there is always something to gleaned from each adversity, that things worth doing are rarely easy. Thus humbled, I could then continue to work efficiently and diligently towards some far-off goal that one day can be achieved through patience and progress. MUSE fostered an immersive research environment in which I was able to focus solely on my work in the laboratory in the absence of the regular pressures of the school term. Outside of lab skills and protocols, I acquired and refined the abilities to think broadly, to parcel out a weekâ€™s worth of time, and to articulate my ideas and knowledge. Though I may not pursue a strictly research-based career, I am certain that MUSE will prove to be an inestimable resource in whatever field I end up in. Summerâ€™s lease hath all too short a date, but I couldnâ€™t imagine a more fulfilling way to spend it.

Evaluating the Reactivity of New Palladium Complexes for use as Catalysts in Norbornene Polymerization

Mia Kunitomo, Chemistry
Catherine Lee, Chemistry
Andrew Ruff, Chemistry
Hussnain Sajjad, Chemistry
Faculty Mentor: Dr. Abby O'Connor

Mia Kunitomo—Project Description

Polymerization of nonpolar monomers using early and late metal catalysts has been studied extensively and is performed on a very large scale every year. However, there are few metal-catalyzed polymerization reactions involving norbornenes, dienes, and olefins with polar monomers, which increase the value of the polymer. This portion of the project will focus on evaluating the reactivity of new palladium complexes with polar monomers and norbornene, in hopes to find a more active and selective catalyst. A number of palladium complexes containing various dialkyl biaryl phosphine ligands have been synthesized and characterized by NMR and X-ray crystallography in the O'Connor group. The binding strength of the arene fragments to the palladium, donor ability of the phosphine ligands to the allyl palladium fragment, and mechanistic studies evaluating the insertion chemistry will be investigated.

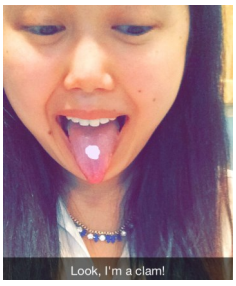
Mia Kunitomo—Personal Statement

Conducting research full-time allowed me to apply the knowledge I gained in the classroom over the last three years in a more practical setting. The intensive 40-hour work week during MUSE allowed me to focus on my research without the stress of classes. Over the summer, we were able to finally figure out a potential mechanism of the catalytic reaction we have been looking at for the past year. In addition to the progress in research, MUSE was great in that I was able to get closer to professors and other students. Overall, MUSE has been an incredible experience that will help me in the real world.

Catherine Lee—Project Description

The polymerization of alkenes and dienes has been previously investigated using a variety of nickel catalysts. However, the polymerization of non-polar and polar monomers and living / / polymerization have remained as challenges. Living polymerization is particularly important in / / order to control polymer molecular weight and chain length. Previous work in the Oâ€™Connor lab / / has focused on the synthesis and characterization of new nickel complexes to be used as catalysts / / for norbornene polymerization. Polynorbornene exhibits special properties including high / / optical transparency, good mechanical strength and good heat resistivity. Some applications / / of polynorbornene include coatings for optical disks and binder resins used in photoresist / / formulations. This project focuses on screening the nickel complexes made in this lab for / / polymerization activity and developing the optimal conditions to maximize polymer yield. / / Additionally, experiments exploring the living polymerization characteristics of the nickel / / catalysts will be evaluated.

Catherine Lee—Personal Statement



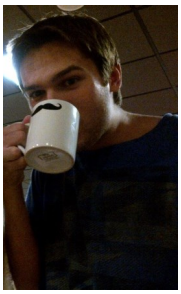
As someone who is new to working in a research lab, familiarizing myself with instrumentation and the lab would have been difficult with classes and other responsibilities during the school year. The 40+ hour weeks that MUSE provided allowed me to do this and more in two months. Not only did I expand my laboratory skills, I have also sharpened my research, communication, and time management skills, and I am looking forward to using everything that I have learned to continue my research in the fall. During MUSE, I was also able to create lasting friendships and build stronger relationships with many professors in my department, including my faculty mentor. By working closely with my mentor, Dr. O'Connor, I was able to learn a lot about my field from the abundance of knowledge and experience she has, and I am excited to learn more from her in the future.

Andrew Ruff—Project Description

Iridium complexes have been utilized to catalyze a wide variety of organic transformations. A reaction of particular interest is the reduction of carbonyl containing / / substrates to alcohols, as this is a fundamental transformation in

organic chemistry. / / Previous reports in the literature highlight the use of half-sandwich iridium complexes that / / contain bidendate-nitrogen based ligands to catalyze the reduction of aldehydes and / / carboxylic acids to alcohols. The primary focus of this project is to synthesize and / / characterize new half-sandwich complex of iridium containing different pyridine / / sulfonamide ligands (A). Once the synthesis and characterization of the iridium complex / / has been completed, the complexâ€™s catalytic capabilities will be explored. Ideally, this / / catalyst would provide a water -tolerant method of reducing carbonyl compounds to / / alcohols. Mechanistic studies will be performed on the reduction reaction to determine / / how the reaction progresses by identifying intermediates and catalysts resting states.

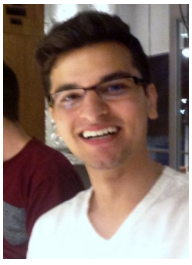
Andrew Ruff—Personal Statement



The MUSE Program has greatly advanced all of my skills, not only in the lab, but as a scientist in general. It gave me practical knowledge of how to deal with setbacks and conduct research in an effective manner. My mentor really stressed scientific journal comprehension and presentation, so I learned how to coherently and confidently present scientific data, whether it is my own or not. Furthermore, I gained leadership experience by heading my own project, while simultaneously learning how to cooperate with others since we all used the same space. Even outside of the lab, MUSE introduced me to some people that I probably would not have met otherwise. It was a truly wonderful experience and I am grateful that I could be apart of it. It could not have been possible without my mentor, so I would like to thank Dr. O'Connor for everything she has done!

Hussnain Sajjad—Project Description

Transition metal complexes that can mediate the cleavage of otherwise strong, inseparable / / bonds are highly sought after for the purposes of use in synthetic processes. C-H bond functionalization / / is an important transformation in organic chemistry. In this project, we aim to create a novel, / / electrophilic iridium complex that is capable of catalytically activating strong C-H bonds, which could / / then be functionalized. We also will exploit the stabilizing effects of a chelating, electronically rich ligand / / scaffolds in attempts to stabilize high oxidations states on iridium. Synthesis of the new ligand, iridium / / complex, and catalytic studies involving C-H bond activation will be evaluated in hopes to develop a / / more active and selective catalyst for this transformation.



Hussnain Sajjad—Personal Statement

I set out at the start of this summer to attempt synthesis of a new iridium-pincer complex that is capable of catalytically performing C-H bond activation while supporting higher oxidation states of the metal. Although I have not yet met my end goal, I am on track to create the complex as I continue this project throughout the upcoming year. Being a full-time researcher during MUSE provided me with a lot of experience in the lab and gave me an insight into what it takes to become an organometallic chemist- knowledge that I will value as I continue with my education and career.

Investigating the Juvenile Hormone in the Tobacco Hornworm and its Potential for Insecticide Development

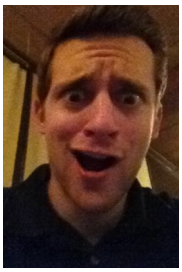
Taylor Horsfield, Chemistry
Alexis Jones, Chemistry
Faculty Mentor: Dr. Stephanie Sen

2014 MUSE Project

This summer we will be working towards developing a more selective insecticide that targets juvenile hormone (JH) in lepidopteron insects, using the tobacco hornworm (M. sexta) as our insect model. At first, we will develop a computational model of the enzyme farnesyl diphosphate synthase type II (FPPS II) that is responsible for the biosynthesis of JH in lepidopteran insects and compare this model to FPPSs of other insects and animals, to fully understand its normal properties. Using this knowledge, we will make educated decisions moving forward on how to develop second generation insecticides that selectively target and inhibit FPPS II. Inhibition of JH biosynthesis will cause the insect to not develop properly and it will prevent agriculturally harmful pest species from destroying crops. Once we complete the modeling, we will perform in vivo studies with various inhibitors to test their effectiveness in killing the hornworm. Additionally, we will develop a procedure to extract the enzyme farnesyl diphosphate synthase type I (FPPS I) from the tobacco hornworm. This enzyme is only produced in lepidopteran insects, but its activity as an FPPS has not yet been

demonstrated because it is inactive when produced in the laboratory. Using antibodies, we hope to isolate and purify the enzyme from insect tissues. To develop this procedure we will first research how similar experiments are done in other systems.

Taylor Horsfield - Personal Statement



The MUSE program has provided me a great opportunity to continue my research from last semester into the summer. Being able to devout all my time to research has allowed me to progress much further than I would have during a normal semesterâ€™s work. During the first few weeks I worked with the computer program Molecular Operating Environment (MOE) and successfully modeled farnesyl diphosphate synthase in humans and two different types of insects. Using these models, for the rest of the summer I calculated and compared the effectiveness of different potential inhibitors. Additionally, during the entire summer our group constantly monitored and maintained a colony of tobacco hornworms from eggs to their adult forms. During the time some were tested with various compounds and their weights were tracked for analysis. This experience has not only expanded my knowledge in the laboratory but it has ultimately helped me in choosing what field of work I want to enter once I graduate next spring.

Alexis Jones—Personal Statement

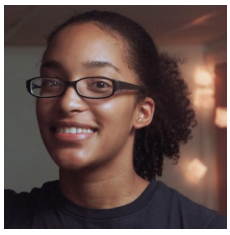
The MUSE program has given me a unique and rewarding experience. I was able to gain a better understanding of what it takes to work in the lab, on a full time basis. It was nice to have the ability to fully devote myself to my research, without worrying about other class work. I also learned new skills working in the lab this summer, such as molecular modeling and energy analysis. After MUSE, I hope to utilize the tools and knowledge I have acquired this summer to expand on my research project at TCNJ in the fall, as well as other research endeavors in the future.

Advancing Computational Phylogenetic Stemmatics
Dylan Wulf, Cimputer Science
Joie Murphy, Computer Science
Faculty Mentor: Dimitris Papamichail

2014 MUSE Project

Our project aims to develop algorithms and tools that can be used in computational textual criticism of Latin texts. Our objective is to create methods for the accurate representation of the relationships of various manuscripts from different time periods, which have been copied from an original seminal work. Manuscript relationships are often depicted as trees, called stemmata, in which branches represent derivations of new versions. We will pursue our aim by adapting tested phylogenetic methods from evolutionary biology to support stemma specific features, such as branch multifurcation, extant manuscripts in internal tree nodes, and incorporation of external evidence in the trees.

Joie Murphy—Personal Statement



I believe the MUSE program has been a great experience as I am going into my sophomore year at The College of New Jersey. I think the best part of the program for me was experiencing how computer science can be applied to a variety of subjects. Getting to research fields outside of computer science, for our project this was phylogeny and stemmatics, and then using what I have researched and also what I have learned in my computer science courses to create programs was very rewarding. Phylogeny and stemmatics are both subjects I would have never thought to look into on my own so MUSE has allowed me to open my mind to the possibilities of what I can do with computer science. I believe the time spent doing research in the MUSE program early in my undergraduate studies has allowed me to gain a better perspective of the possibilities of my future endeavors.

Tools and Algorithms for Synthetic Gene Design

Nathan Gould, Computer Science
Oliver Hendy, Computer Science
Faculty Mentor: Dimitris Papamichail

2014 MUSE Project

Advances in DNA synthesis have enabled the construction of artificial genes, gene circuits, and even genomes of bacterial scale. Freedom in designing artificial constructs provides significant power in studying the impact of changes in sequence features, and verifying hypotheses on the functional information that is encoded in nucleic and amino acids. At the same time, a large number of software tools of variable sophistication have emerged to aid the re-design of synthetic genes for sequence optimization based on rationally defined properties. The first generation of tools dealt predominantly with singular objectives, such as codon optimization, RNA secondary structure manipulation, codon context optimization, etc. Recent years have seen the emergence of sequence design tools aiming to evolve sequences towards a combination of objectives. The design of optimal sequences adhering to multiple objectives is computationally hard, and most tools rely on heuristics to sample the vast sequence space. Our project aims to study some of the algorithmic issues behind sequence optimization and the approaches that different tools have adopted to redesign gene sequences and maximize desired coding features. We will utilize test cases to demonstrate the efficiency of each approach, as well as identify their strengths and limitations.

Nathan Gould-Personal Statement

Being a part of MUSE has given me the opportunity to experience more specific facets of computer science, and get a better sense of what applications of computer science interest me. Having only just finished my freshman year, there are still many options for me to explore, and MUSE has been a chance for me to learn more about computational biology. Dr. Papamichail has been a great mentor, and I am grateful that I had the opportunity to work with him.

Saccade Distributions in Birds of Prey

Raimundo Cardoso De Oliveira Neto, Mathematics
Gustavo Gomes, Mathematics
Faculty Mentor: Michael Ochs

2014 MUSE Project

The behavior displayed by birds of prey, including falcons, hawks, eagles, and owls, during search for prey animals involves the stochastic movement of the head to move different parts of the landscape into view. This movement is related to saccade eye movements in mammals, and the distribution of the timing of these movements in birds is referred to as the saccade distribution. The study here will digitize movies of bird saccades and generate empirical distributions for different species. We will determine if these can be parameterized and also whether different species show different saccade distributions.

Raimundo Cardoso De Oliveira Neto—Personal Statement

During the 2014 summer MUSE I have been working along with Prof. Dr. Michael Ochs and Prof Dr. Suzanne Amador, from Haverford College, on her project. This project briefly speaking, consists in analyzing latency of birds of prey when they are on hunting mode specially. Latency in this case is defined as the lapse time between the start of a saccade and the start of next one, with saccade defined as abrupt and stochastic head movements which is related to saccade eye movements in mammals. This behavior also relates to neural processing once it, for example, defines the time the birdâ€™s brain takes to decide whether is time to look at another direction. For the study we digitized movies of bird saccades, generated empirical distributions for different species and determined whether the latency distribution differs on specie. This eight weeks project has such importance to my academic background due the real world experience that I have had and new things I have learned such as how statistics can somehow be used in any field.

Implementing Priors on Cell Signaling in Cancer

Conor Kelton, Computer Science and Applied Mathematics
John Stansfield, Mathematics
Faculty Mentor: Michael Ochs

2014 MUSE Project

Most cancers rely on errors in the cell signaling processes that govern cell growth and movement. These errors can be driven by a number of molecular changes, including gene mutation, loss of genes, amplification of genes, and methylation of gene promoter elements. This study will leverage our growing body of molecular measurements of the ~20,000 human genes to build a statistical prior model of the probability that a transcription factor is active in a given cancer patient based on our knowledge of cell signaling pathways and measurements of gene copy number, mutation, and methylation. We have previously created a computational inferential model of transcription factor activity based on downstream transcription of target genes. The combination of the prior model with the previous inferential code will create a full probability model of the activity of signaling pathways and transcription factors in individual tumors.

Conor Kelton- Personal Statement

As a double major in Computer Science and Applied Mathematics, I am always seeking ways to / / apply my knowledge of both fields on unique projects that require these combined experiences. / / Participating in Dr. Ochsâ€™ research group through the MUSE program truly maximized the / / potential of my skill set. The first part of the summer was spent gaining deep understanding / / of Bayesian Decomposition and how this could be used to interpret distinct patterns in DNA / / microarray data taken from cancer cells. These first weeks tested my mathematical capabilities / / and gave me a greater sense of devotion to the project as I knew my work was centered on, / / and could potentially impact, one of medical scienceâ€™s foremost issues. When the time came to / / learn the algorithm that implemented the statistical analysis on the microarray data, the burden / / of transition from theory to practice was mitigated by my Computer Science knowledge. By / / understanding the code, as well as the theory behind it, I was able to successfully integrate / / the existing algorithm into the statistical language R and the mathematical language MATLAB, / / use these tools to create a variety of useful statistical visualizations, and open up the potential / / for a parallelization project on the algorithm for the coming semester. Overall this summer has / / been a bounteous opportunity where I was not only able to expand my research experience in / / preparation for graduate studies, but was able to learn how closely my two fields of study work / / together in a professional academic setting.

John Stansfield—Personal Statement

MUSE has been a very valuable experience that has introduced me to biostatistics research. I have learned many valuable skills during the eight weeks of the program, including improving my programming skills in the R language, learning how to navigate and use various protein interaction databases and working to construct cell signaling networks. I have also learned more statistical techniques and how to better analyze data. Working with Dr. Ochs on the CoGAPS project has exposed me to how research really takes place and has been a great experience. I look forward to continuing my research with Dr. Ochs in the fall. During the semester we will work to incorporate the cell signaling networks as a prior into the CoGAPS algorithm. MUSE has shown me that I enjoy research and would like to continue into biostatistics for graduate school and as a career.

Development of Laser Photostimulation and Calcium Imaging System to Investigate Network Properties from a Large Population of Neurons

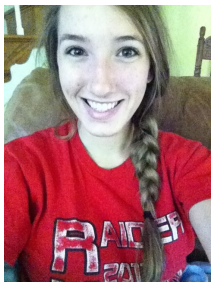
Kelly O'Connor, Physics
Krishna Sheth, Physics
Faculty Mentor: Tuan Nguyen

2014 MUSE Project:

Whether it's Facebook, the food web, or our brains, networks are everywhere. The overarching goal of this research is to investigate the physics of networks formed by neurons. Kelly O'Connor and Krishna Sheth will be working together this summer to develop an apparatus that combines two techniques, calcium imaging and laser photostimula-

tion, to allow the reading of activity from and the writing of activity to a large population of neurons. Connections from each neuron will first be measured to produce a connectivity map of the entire network. Neuronal activity will then be recorded and, based on the connectivity structure, various models of information processing will be tested. In particular, they will work to develop software to control the laser, optimize image acquisition protocols, and analyze imaging data. In addition, both students will learn how to produce and maintain primary neuronal cultures.

Kelly O'Connor- Personal Statement



Working with Krishna Sheth and Dr. Nguyen this summer allowed me to fully immerse myself in the experience of research. This summer was a continuation of the independent research we conducted this past spring. Due to the full-time nature of the MUSE program, we were able to make a great deal of progress on the project, ultimately mapping large neuronal networks efficiently. We intend to continue our work in the lab this fall and write a paper. The MUSE program reinforced my intent to make research a part of my future. As a physics major, I am happy to know that I can combine my love of neuroscience with my love of physics to attempt to understand the complexity of the human brain. I hope that, upon graduation, I can continue to work in the fascinating field of biophysics.

Krishna Sheth-Personal Statement

During the MUSE program I collaborated with Kelly Oâ€™Connor and Dr. Tuan Nguyen to investigate the physics of networks formed by growing neurons. The primary goal of this project was to use the techniques of calcium imaging and laser photostimulation to investigate neuronal network connectivity. After producing neuronal cultures and optimizing measurement parameters, we conducted experiments to generate neuronal connectivity maps. Analyses of these maps allowed us to determine various network properties including the degree at which neurons are connected to each other and identification of network communities. / / Working in Dr. Nguyenâ€™s lab this summer has given me the opportunity to improve my research skills because I was able to work as an independent researcher and learned the intricacies of lab research. These eight weeks have not only allowed me to gain valuable laboratory skills but they have also helped me develop the ability to work collaboratively as well as independently. Participating in MUSE this summer has truly been an unparalleled, enriching experience. /

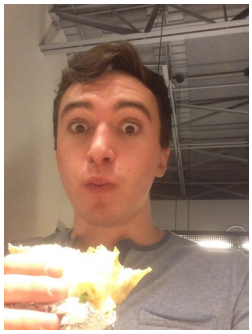
Modeling Turbulent Emission in Relativistic Jets Using the Athena Code

Maxwell Pollack, Physics
David Pauls, Physics
Faculty Mentor: Paul Wiita

2014 MUSE Project

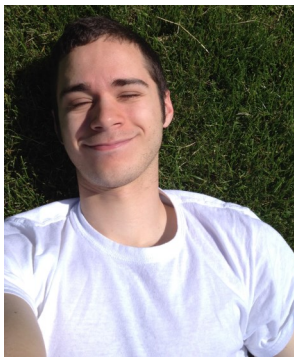
Active Galactic Nuclei (AGN) are the brightest known objects in the universe. At the center of active galaxies are supermassive black holes, which sometimes transform a portion of the infalling accretion disk of matter into twin bipolar jets of relativistic particles. These relativistic electrons emit synchrotron radiation from radio to X-ray frequencies. These jets can form gigantic radio galaxies with emission lobes extending millions of light years. Last year, Victoria Calafut wrote codes in Mathematica and Fortran that served to model the light curves and Power Spectral Densities (PSDs) of turbulent eddies within the inner portions of radio jets. Our intention is to combine those codes with Maxwell Pollackâ€™s work last fall that simulated relativistic jets using the magnetohydrodynamical code Athena, developed at Princeton. We will use the Athena model to provide a realistic distribution of bulk velocities across the jet that would allow better simulations of the variations produced by turbulence within. By this, we hope to create a more accurate model of the expected PSDs and light curves from radio galaxies.

Maxwell Pollack—Personal Statement



The MUSE program is an indispensable opportunity for students looking for a solid background in research. It allowed me time to dedicate myself completely to my research, free from the workloads of other classes, and so I was able to accomplish more during these 8 short weeks than I had in a 1/2 credit research course the previous year. With our results, we will be traveling to San Francisco this Fall to present at the APS Division of Fluid Dynamics conference, and we will be submitting a paper of our findings to a reputable journal. I consider myself very fortunate to have participated in MUSE, and would do it again in a heartbeat.

David Pauls—Personal Statement



The Mentored Undergraduate Summer Experience (MUSE) program at TCNJ turned what would have been a generally unproductive summer into another step forward toward figuring out which path I will take in my career. My faculty mentor, Dr. Wiita, was a treasure-trove of information on the topics of astrophysics, graduate school, and the general workings of academia. I learned so many things both relating to my research on numerically modeling relativistic jets in active galactic nuclei, and also what options are available to me as I approach the â€œreal worldâ€ of jobs and independence. The MUSE program has provided me with opportunities I would never have obtained otherwise. For example, my partner Maxwell Pollack and I will be presenting posters this fall at a meeting of the Division of Fluid Dynamics of the American Physical Society in San Francisco. I also learned additional programming skills in Mathematica, and how to use the Athena hydrodynamics code.

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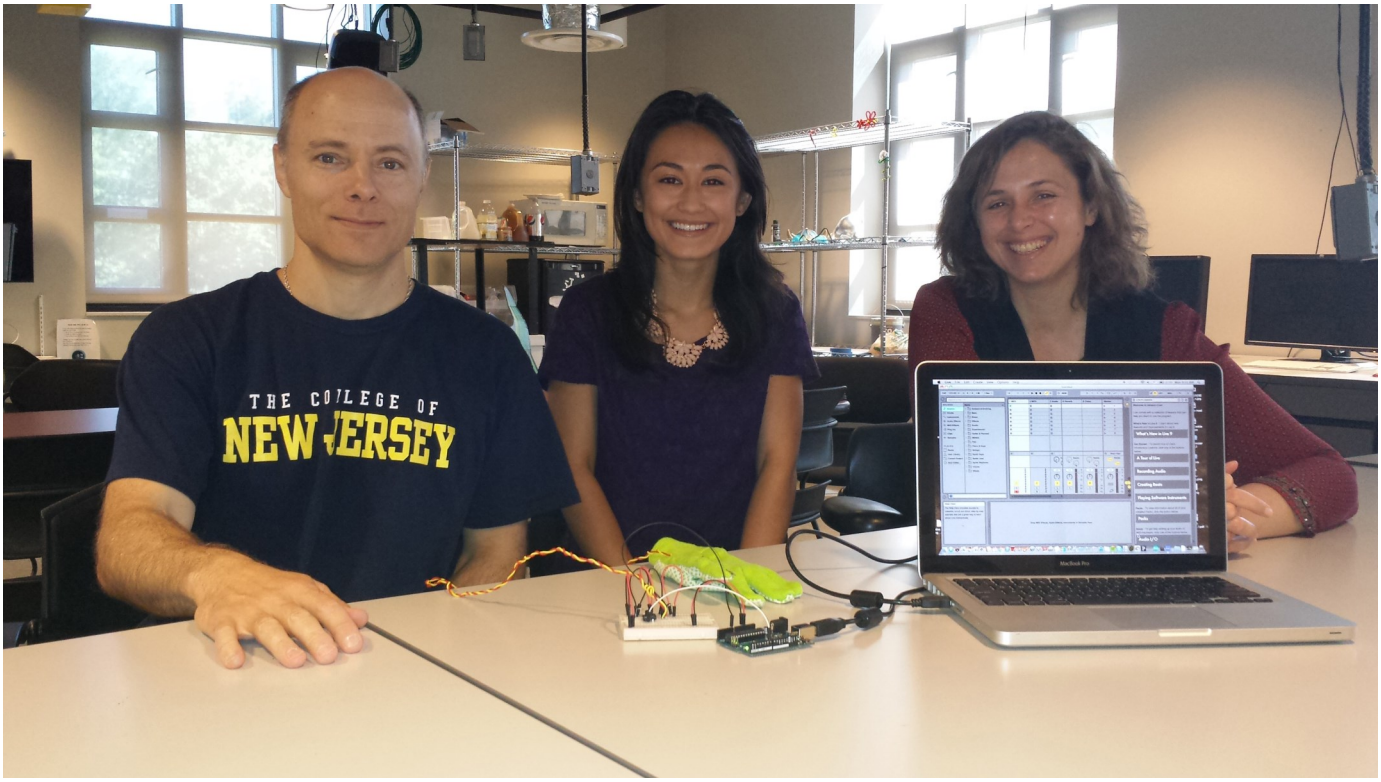

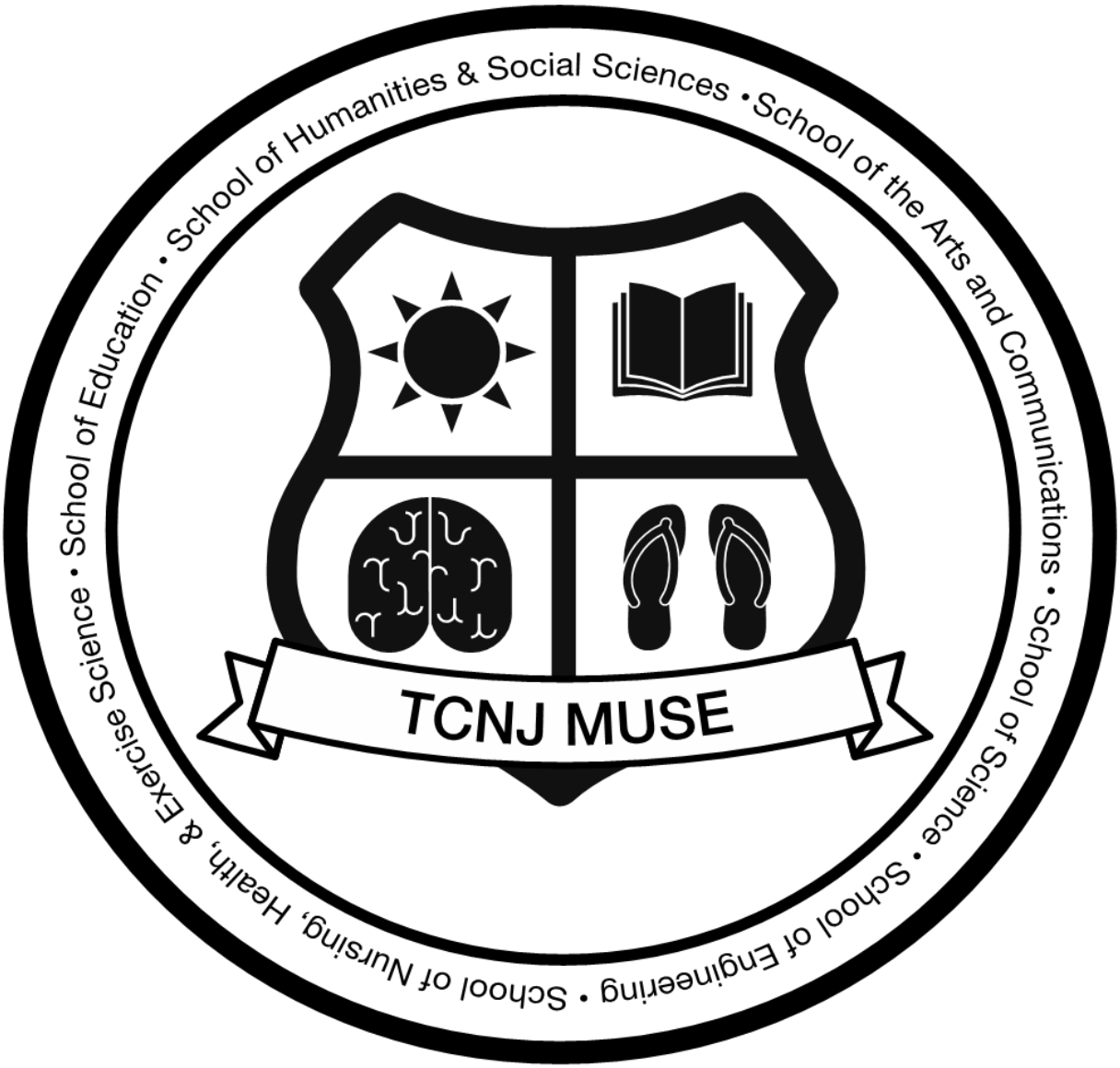
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