Undergraduate Research 2012 – 2013

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Uvonne Andoh, Management of Aging Services
"3D Modeling for Older Adults"

Vision impairment and cognitive disabilities (such as Alzheimer's disease and dementia) are common within the older population. These problems create higher risks of disability among older adults and limits functional independence. We believe that providing older adults with the ability to design and build 3D prototypes has the potential to assist and support their everyday tasks and help them regain independence. Our team's research goal is to examine how older adults use 3D printers and if they design and build their own objects right in their home without going out to buy them. The objective of my project is to design 3D models attached to a calendar that will assist older disabled adults with their daily schedule. By building various 3D objects representing biological, societal, interpersonal, creative and symbolic needs, we will enable older individuals to determine their day-to-day tasks. We are now preparing materials for a focus group with older adults to introduce these concepts.

What research have you been doing this summer?
I have been learning fundamentals of Assistive Technology and getting experience working with older adults. I have been learning how to design and build 3D prototypes for a 3D printer to explore the possibility of older adults building their own assistive technologies.

How did you find out about this opportunity? Was there a formal application process?
Last semester I was in an independent studies class doing research with my professor and advisor, Ms. Galina Madjaroff. Through this I met Dr. Amy Hurst who offered me a summer internship to do research with her.

Who did you work with on this project?
My supervisors are Dr. Hurst and UMBC undergraduate student Syed Rahman, a chemical engineering major.

Was this your first independent research project?
This is my second research project; my first research project was during the spring with Ms. Madjaroff and Dr. Shaun Kane on a touchscreen projector for older adults also known as Bonfire.

Do you get course credit for this work or get paid? How much time do you put into it?
I get paid during this summer project. This summer I am working on my project and do research over 30 hours a week which is Monday through Friday and sometimes Saturday.

What academic background did you have before you started?
I am majoring in Management in Aging Services alongside taking pre-physical therapy courses. The knowledge I have acquired over the past semesters about older helped me to understand the needs of the older population especially in using assistive technology and making them independent.

How did you learn what you needed to know to be successful in this summer project?
Dr. Hurst assisted me and gave me the necessary tools. If I had any questions she was more than willing to help. I also learned to use and care for the Makerbot tool for this project.

What has been the hardest part about your work this summer?
I believe the hardest part about my work was trying to come up with ideas and brainstorming potential projects to design and print to present to the older adults.

How does this research experience relate to your course work?

I am majoring in Aging Studies and the primary focus of this research is providing older adults with assistive technology. Already having some background knowledge of the older population made it easier for me to tackle this project.

What is your advice to other students about getting involved in research?
My advice is once you hear about a research opportunity take the initiative of getting involved. Don't be shy and let an opportunity pass you by. Don't wait for an opportunity to come to you; be willing to go after opportunities. Learn everything you can, anytime you can, from anyone you can. There will always come a time when you will be grateful you did.

Being involved in research takes you far into your career and looks great on resume. It also helps you to network and meet people. I was nervous and shy doing research for the first time but I knew it would help me with my career. Not only has it given me the hands-on experience it has helped me to meet a lot of people.

What are your career goals?
I plan on doing my master's in aging or a Master's of Science in gerontology and going to a physical therapy school and/or a Ph.D. program. Hopefully one day I will own my own physical therapy practice and be able to travel all over the world to explain about the needs of older adults.

What else can you share?
I have enjoyed learning 3D modeling and how to use a 3D printer, preparing materials for a focus group with older adults on rapid prototyping and helping run a focus group. I have also enjoyed the assistance and direction of my supervisor Dr. Hurst and other students and working as a team. One of my favorite quotes is "Never let the hands that hold you, hold you down". I am also a member of the African Student Association and planning on joining the pre-physical therapy club.

Kathleen Algire-Fedarcyk, Social Work
"Promoting Social Change through Service-Learning"

A basic component of social work is understanding the challenges faced by society and local communities. Using the Social Learning Theory and the Social Change Model, this research explores the process in which college students become civic-minded during the progression of a semester-long course. During the fall 2012 semester, 27 students were enrolled in Social Work 200 and spent the semester engaged in a service-learning placement at a local agency or organization. Students enrolled in the course were encouraged to develop their own ideas on social issues and to connect those ideas with action across levels of influence in relation to the practice of social work. We used three aspects of the Social Change Model: Consciousness of Self, Collaboration, and Citizenship, to theme and code the students' reflective writings which enabled a qualitative research study on students' increased awareness and knowledge of civic-mindedness. This research posits that encouragement and exposure to a service-learning activity increases the likelihood that students will become more civic-minded and will have the opportunity to create positive social change. Findings will be presented.

How did you find your research opportunity?
Dr. Guzman-Rea sent a listing for a teaching assistant/research assistant and I jumped at the opportunity.

Who did you work with on this project?
I worked with Dr. Guzman-Rea for this project. Dr Guzman-Rea had applied for a Breaking Ground grant to change the current Social Work 200 course and an extension of the grant was performing research.

What academic background did you have before you started?

I have taken research courses but did not have any research experience. Within my social work classes, we read a lot about the necessity of social work research so I was actively looking for opportunities.

What was the hardest part about your research?

The hardest part about the research was understanding the qualitative process. Until my social work research class, I did not fully understand how to perform qualitative research.

What was the most unexpected thing?

I did not expect to actually be able to recognize the change in students but it was observable. It was really interesting to see students change the words they used or change the connotations of a word over the course of the semester. It was also interesting to see how the themes could be applied to any involvement activities, especially student organizations.

How does this research experience relate to your work in other classes?

Within social work, we are always talking about the change process and it was very interesting to see people go through part of that process in a short amount of time.

What is your advice to other students about getting involved in research?

Talk to your professors and express your interest in research, even in fields where there doesn't seem to be a lot happening in research, like social work.

What are your career goals?

I plan to pursue a MSW in macro social work. I would like to work in Baltimore City to pursue change based on social justice and economic equality. Currently, my interest is in forensic social work.

What are you doing next for research?

I am working with another social work professor to look at the effectiveness of advocacy within social agencies. Advocacy is a cornerstone of social work and yet it seems to lack a common definition and practice.

What else are you involved in on campus?

I am the president of SWSA and I have a grant writing internship at the Women's Center through the Honors College.

Christina Animashaun, Visual Arts
"My Gray Life: Performing for the Spectator"

Since the rise of performance art in the 1960s, artists began to use their bodies as a medium to transmit cultural commentary, creative expression, and sequential narrative. In the documentation of those performances the artists often took the main focus, overlooking an essential entity that is crucial to existence of performance as a whole. This past year, I executed a piece utilizing my body in order to critically analyze audience spectatorship and participation in Baltimore City, Washington D.C., New York and Philadelphia. After painting my skin gray and wearing only black and white clothing, I walked in these cities as a pedestrian with a sound recorder embedded on my person and with a photographer taking pictures of my interactions. Though these works sought to challenge the focus often kept on the performing artist, this project highlighted the inseparable dynamics of the artist and witness and the wide range of artistic interpretation held by spectators of performance.

Photographs of the performances and video response to the overall performance experience can be viewed on the web site: **My Gray Life**.

How did you find your mentor for year research, scholarship, or artistic project?

My freshman year I took Introduction to Art and Media Studies, taught by Professor Mark Durant. It was one of the best classes I had ever taken at UMBC because he thoroughly revealed the relationship between art objects and their reception in the media which enriched my studies in visual arts and media and communications. When I began to contemplate my own project, I knew that I wanted Professor Durant's furthered guidance and knowledge.

How did you know this was the project you wanted to do?

The idea to walk in public as a different color had been sweltering in my head for a long time. I had done a similar piece for my Linehan Artists Scholars Seminar, and wanted to further expand coloring my body and using myself as an art object. I think what finally pushed me to do performance was when I read a discussion post on myUMBC about a student who had performed an artistic piece on an elevator which received a lot of commentary. What particularly struck me were variety of interactions the individuals critiqued the piece. Some people came very close and interpreted the piece very differently than the artists intent while others did not see the piece at all yet judged the work based on what others had to say. I wanted my performance to fully challenge how the audience interacts with a performance. We are often comfortable watching spectacles online or on television, but I want to explore what spectators would do when they can no longer rely on being distant from a performance.

Is this your first independent artistic project?

This is my first artistic performance grounded in research. I have done performance art on a small scale once before. My freshmen year, I took a Linehan Scholars Artist seminar required that every student had to conduct an art piece in an unusual space on campus. My project, which was a precursor to my current one and involved covering my body in gray body paint, wearing only black white clothes and being tied to a chair in the commons for several hours while people walked in and out of the building.

Do you get course credit for this work?

This project is also the focus of my Senior Projects class, a capstone seminar for Visual Arts majors, and will be displayed in the Center of Art, Design, and Visual Culture's Senior Exit Exhibition which will open in May.

How did you hear about the Undergraduate Research Award (URA) program?

I actually started considered the award the summer before junior year working as an Orientation Peer Advisor. Prospective students have a session with a faculty member on their academic expectations at UMBC. Working that summer, I was fortunate enough to attend Dr. Carolyn Forestiere's lectures where she highly encouraged new students to participate in research. I was far from a new student at that time, but her words really stuck with me. She presented the possibilities for research to be infinite and limitless no matter what area of academia you studied. After talking to her at the end of her lectures, I began to investigate the process of applying for the award and eventually began to research my project proposal.

What academic background did you have before you applied for the URA?

At the time I had applied for the URA, I was starting my junior year as a double major in Media and Communication studies and Visual Arts with a concentration in Photography.

Was the application difficult to do?

The application was certainly thorough. I began my literary summary by checking out an arm full of books from the library to start and began to read about performance art and media spectatorship. Preparing a proposal required me to be well read, concise, and challenged me to make sure that my project was clear to the members of the committee.

How much did your mentor help you with the application?

Professor Durant was a great help to my proposal. He is a walking encyclopedia of artists and performers and was able to give a lot of references. As I began to present him with my project he was not afraid to question and challenge my approach in order to make sure I could clearly convey my intent and execution for my performances.

What has been the hardest part about your research?

Getting out there and performing was a great challenge. The first time I performed, I was scared to leave my hotel in New York and begin interacting with people before I just forced myself to take my first steps outside. With time I became more comfortable with walking through the streets and even in some stores, but I always felt the pressure of looking different from everyone else even though I was performing. Putting myself out there in this way required me to confront my own vulnerability and safety. I will never quite get used to it, but my experiences throughout the process have been invaluable.

What was the most unexpected thing?

In every city I was asked out on a date at least once while covered in and gray body paint and performing. I, respectfully, declined all offers.

What is your advice to other students about getting involved in research?

Look into it as soon as you can. I was very lucky to have been given the opportunity to be told about research almost every day working as an orientation peer advisor. This academic community thrives on works that break traditional expectations of what is expected of an academician, which of both the challenge and excitement of doing research at UMBC. We are not a research institution because some people are out there doing research. It is a research institution because everybody has the opportunity to do research in any discipline.

Mina Attia, Psychology
McNair Scholar
"Foreign-born Psychology Students' Supports and Barriers"

Little research on the experiences of psychology students has focused on those who are foreign-born. This study compares the academic and non-academic barriers and supports experienced by students who immigrated to the United States early in their childhood versus those who immigrated at a later age. We hypothesized that participants who immigrated earlier would have more academic and non-academic supports and fewer barriers than those who immigrated later in life. A national web-based survey was used to collect data from 3633 psychology students regarding their experiences. Implications and limitations of the study will be discussed.

When did you join the Ronald E. McNair (REM) program?
I joined the McNair Scholars program my senior year of college (2012).

How did you find out about McNair?

I was actually going to the student services office to ask for help on my personal statement and with applying to graduate school. I ended up in the office of Dr. April Householder, the assistant director of the McNair Scholars program. She explained to me what the program is about and encouraged me to apply.

What have you gained from being a McNair scholar?
I have gained so much from being a McNair Scholar. The various workshops tailored to the scholars as well as the research course during the semester were a great start to getting me thinking like a scholar. This was followed by the Summer Research Institute fellowship, which was one of the most amazing experiences I had academically. I was able to work one-on-one with my mentor while being in a scholarly atmosphere the rest of the time.

What is your most recent independent research project?
My research is on foreign-born students and the age that they immigrated to the U.S. and how that has is correlated with their academic and non-academic barriers and supports.

How did you find your mentor for this project?
I searched on the psychology department website for the faculty list and their research. Going down the list I took note of several labs that were of similar interest as mine. I contacted and met with several professors and Dr. Maton's research seemed to be most fitting for me.

How did you know this was the project you wanted to do?
I figured that doing research on something that I am passionate about or can relate to is the key to staying motivated in the research process. I am a foreign-born student who immigrated to the U.S. I experienced the barriers and supports that I am researching first hand.

How much time do you put into it?
I started working on my research project the beginning of my last semester at UMBC (Spring 2012). I will be working on it until the end of the McNair Summer Research Institute in July when I will be presenting at the University of Buffalo McNair Research Conference.

What academic background did you have before you started?
Since I started this research project my senior year, I pretty much had all of my major classes finished. Courses that helped me were Psychology 331 and 332, which focused on research methods and statistics.

How much did your mentor help you with your research?
Dr. Maton helped me a lot with my research project. I try to meet with him at least once a week just to make sure that I'm on track and to get any help that I need. From day one, Dr. Maton has been a dedicated mentor, guiding me along my research.

What is your advice to other students about getting involved in research?
Definitely get involved in research as an undergraduate! UMBC offers a rare opportunity in having so many research programs and labs available for undergraduates. This is not the norm at other universities, so take advantage of it! The sooner that you get your foot in the door the more involved and excited you will become about your future.

What are your career goals?
I plan to apply to Ph.D. programs in clinical psychology. I am interested in topics such as immigration, minorities, and oppressed populations. I hope to use my knowledge and Ph.D. to make a difference in those communities.

Aneep Bindra, Computer Science
"Lights, Camera, Motion, Action: The Dance Application of Microsoft's Kinect and Intelligent Stage Lighting"

The Microsoft Kinect is one of the premier entertainment peripherals in today's gaming scene. There are, however, many other uses for this sensor apart from the world of motion-controlled gaming. Our group will design a system which uses the Kinect's motion-tracking capabilities and will integrate it with dancers through intelligent stage lights. The lynchpin of the system will be a DMX controller which will connect the PC (and by extension, the Kinect) with the lights. These lights can then be controlled to do certain actions in response to the motion input garnered by the Kinect. This fusion of art and technology will provide for a unique and surreal performance piece.

How did you find your mentor for year research, scholarship, or artistic project?
Our group began looking for a research mentor by investigating the researcher profiles on the Computer Science research webpage. Because UMBC is a research school, we knew that it wouldn't be long before we found someone like Professor Marc Olano with a background that would fit our needs. Coincidentally, our other soon-to-be mentor Professor Carol Hess, had contacted Dr. Olano at the same time asking him if they could put together a project with dancers and an Xbox Kinect. In no time we had a project with a strong technical mentor and a dance professor mentor and a unique real-world application.

How did you know this was the project you wanted to do?
We knew that we wanted to integrate an Xbox Kinect with intelligent stage. This was the project for us because it combines development with art. After learning that we would have our own workspace we were ready to go.

Is this your first independent research/scholarship/artistic project? Do you get course credit for this work?
Yes, this is the first time that any of us have conducted independent research. No, we do not get academic credit for this work.

How much time do you put into the research?
In the summer we are working one or two nights a week for three or more hours as well as the occasional research independently throughout the week. Come the fall semester we will be working more nights each week.

How did you hear about the Undergraduate Research Award (URA) program?
Before we began the project we had heard that there was a funding program for the projects, but it wasn't until Professor Hess encouraged us to apply that we knew the details of becoming URA Scholars.

What academic background did you have before you applied for the URA?
Cumulatively, our group has more than five years of programming experience with several languages including Java, Python, C, C++ and several others.

Was the URA application difficult to do? What was the most unexpected thing?
The application was simple but the number of documents that needed to be completed and in what order was a little confusing. The most unexpected thing was how nice and formal the award ceremony was. I am sure that being able to present in URCAD will be even more amazing.

Monica Berron, Media and Communication Studies
Summer Researcher

What research did you complete last summer?
Last summer, I completed a 10-week research project at Iowa State University's Virtual Reality Application Center (VRAC). My team's project contributed to their established Human-Computer Interaction (HCI) program. We experimented with game devices utilizing pre-designed software called ISIS. ISIS is a computer program, which uses medical data to view body parts in 3D volumes. Our team connected the Microsoft Kinect to ISIS successfully and user studies are going to be done to see what results from viewing ISIS hands-free. Is it more accurate, efficient or user-friendly than other previously studied game devices?

How did you find out about this opportunity? Was there a formal application process?
I co-taught a Y-seminar last fall and Janet McGlynn gave a presentation on undergraduate research to our students. I joined the group on myUMBC and received emails about REU (Research Experience for Undergraduates) application deadlines. I found two schools that wanted my background. I only applied to one, Iowa State, which I later discovered is a world-class graduate program.

The process required references, essays, and an application, but was not particularly formal. I was very honest about my interests. The day I heard from both of my mentors that they had not been called, when I was so sure I was not going to be accepted, I received an email that I had been chosen for the program.

Who did you work with on this project?
The lead of my project was Dr. Eliot Winer. He served as great coach and mentor for our team. Team members included my two undergraduate teammates, a post-doc, and a current HCI graduate student.

Was this your first independent research project?
This was my first time doing formal academic research.

Do you get course credit for this work or get paid?
I pursued the research program to learn about graduate school first-hand. I received a stipend for my work, housing, meals, and compensation for travel. The coordinators and VRAC team were very accommodating and allowed me to work for them without financial difficulty.

How much time do you put into it?
I worked 9 a.m. to 6 p.m. Monday through Friday. There were some days my team came in early and left late. The first few weeks we additionally completed courses in psychology, ethics, research, user studies, Heuristics, C++, 3D modeling, and more.

Many activities were scheduled for our professional development including luncheon presentations with professors on their research as well as day trips to prospective employers like John Deere and Principal Financial.

What academic background did you have before you started?
My academic background consisted of critical media skills, technical writing, and basic computer programming. I was chosen more for my work ethic than the brief coding background. No previous experience was required and many of the other REU students had no computer background. My fellow undergraduate peers were from all over the country with backgrounds in education, graphic design, theatre, mathematics, and neuropsychology.

HCI is about solving real-world problems with technology as an application, so interdisciplinary teams are required. I met professors doing work for the U.S. military, U.S. Census Bureau, John Deere, and Boeing. Other areas of study included mass-produced clothing, designing educational programs for children with autism, and creating apps to educate young women in college about reproductive health.

How did you learn what you needed to know to be successful in this summer project?
The archiving I completed for the Alumni Association two summers ago developed my interest in research and definitely played a pivotal role in preparing me for lengthy research.

Jeffrey Boyd, Information Systems
Summer Researcher

What research have you been doing this summer?
This summer I have been working on a project to make fashion more accessible to people who are blind or visually impaired. One approach to this is to use an iPhone app called VizWiz (developed at the Univ. of Rochester), which allows visually impaired users to take a picture of something, ask a question about it, and then have people on the Internet answer their questions. We just launched a six-month study where pa rticipants will ask questions about their clothes and get responses from a pool of handpicked volunteers. They can ask a mix of objective and subjective questions, with everything ranging from, "What color is this shirt," to questions like, "Do you think these two items work well together? Can you offer me any pairing suggestions?"

How did you find out about this opportunity? Was there a formal application process?
I approached one of my professors about my interests in Human-centered Computing (one of the graduate programs available here in the Information Systems department). The professor suggested this project. I initially started out by helping a Ph.D. student researching a smart chair during the spring 2012 semester, and was offered the opportunity to come onboard for the summer to work on other projects in the lab.

Who did you work with on this project?
The primary investigator for the VizWiz trial is Michele Burton, a Ph.D. student studying accessible fashion. I worked closely with her and with our advisor, Dr. Amy Hurst, with whom I had worked during the previous semester. Also on our team was another undergrad from Washington State University, Vancouver.

Do you get course credit for this work or get paid? How much time do you put into it?
You can do both, actually. If there were more time (I am concurrently enrolled in an accelerated summer course, so my free time is somewhat limited) we would have added on an credit-bearing component of the internship where I would be learning iOS development and programming. That portion wasn't possible this summer, but it is still a paid internship. On average, I work about 20 hours each week in the lab.

What academic background did you have before you started?
I am a senior Information Systems major. Before coming to UMBC, I was enrolled in the Information Systems Security program at Anne Arundel Community College. When I started in the lab, I had only just finished my first "Fundamentals of Human-Computer Interactions (HCI)" course. That is to say, not a lot of my academic experience directly related to the projects I worked on this summer.

How did you learn what you needed to know to be successful in this summer project?

I think it was a combination of prior work experience, coursework training, and my natural curiosity. For the past two summers, I held an internship at Legg Mason Capital Management in their technology department. I brought some of that systems administration knowledge with me to the lab. The knowledge of HCI processes that I gained in class also helped me to better understand the type of research that goes on in this field (and the research that I would later be working on.)

The one thing that helped me most to be successful this summer was a willingness to diversify. I naturally have a lot of varied interests, and those things came in handy when my labmates and I needed to do 'non-science-y' things like producing two tutorial and demonstrational videos – projects which incorporated my knowledge of lighting, videography, and photography.

What was the most unexpected thing?
I really didn't expect the time to fly by so quickly! It seems like only yesterday the other undergrads and I were meeting for the first time, and already we are only a week away from the end of our time together. I thought that it would feel more like work, but this whole experience has been really enjoyable.

What has been the hardest part about your work this summer?
Besides adjusting to a new commute, I'd say the hardest thing was probably figuring out the right amount of attention to devote to each task. I have a tendency to become somewhat myopic when I'm focusing on a task, and in the lab I got involved in a number of different areas (exploratory projects, data coding and analysis, audio-visual projects, and systems administration, to name just a few). So, figuring out how to strike the right balance between all these things was something of a welcome challenge for me this summer.

How does this research experience relate to your course work?
Experience leading and working with user studies is extremely useful to Human-centered Computing prospects. It is helpful for those with plans to go to graduate school and also aids in drawing practical connections between the theories taught in classes and the real-world concepts people use in the industry every day.

What is your advice to other students about getting involved in research or taking on internships?
Absolutely, do it. I cannot stress enough how much easier it is taking classes once you have real-world experiences to relate the endless PowerPoint slides and those dry, wearisome book chapters to. While research may not be right for everyone, I would definitely encourage undergrads to find an internship somewhere. For any student in the tech field, nothing stands out to potential employers (or grad schools) more than practical, applicable work experience.

What else are you involved in on campus?
I'm a staff photographer and contributing writer at The Retriever Weekly. I also work for the Office of Residential Life and am a member of the UMBC Gospel Choir.

Lauren Bucca, English
"St. Cuthbert and Pilgrimage 664-2012 AD: The Heritage of the Patron Saint of Northumbria"

The purpose of this research is to shed light upon pilgrimage during the Middle Ages, a time when arduous journeys were a part of daily life. This study concerns both the literal and figurative aspects of pilgrimage during the Middle Ages, as well as the cultural significance of St. Cuthbert, patron saint of Northumbria. St. Cuthbert, a seventh-century saint, was himself a traveler whose shrine at Lindisfarne was and is a popular pilgrimage site. This research will focus primarily on the travels of St. Cuthbert across Northumbria, in particular his journey from Melrose, Scotland to Lindisfarne, England. This journey has become known as St. Cuthbert's Way and has been traveled by pilgrims from its inception to the present day. During the summer of 2012, my research will bring me to St. Cuthbert's Way so I can elucidate the cultural heritage of St. Cuthbert to an audience unfamiliar with pilgrimage during the Middle Ages. St. Cuthbert, as a saint who has drawn pilgrims to Lindisfarne from the seventh to the twenty-first century, offers a window to understanding both medieval and contemporary perceptions of pilgrimage. In addition to researching secondary sources on medieval travel, such as those reflected in illuminated manuscripts of St. Cuthbert's Life, my observations will include interviews and photographs. The final essay will focus on medieval and modern cultural ideas of pilgrimage. The imprint of St. Cuthbert upon Northern England is just as vibrant as it was in the seventh century—for 1300 years St. Cuthbert has drawn pilgrims to his shrine in Lindisfarne and will continue to do so, for the significance of pilgrimage and travel is just as relevant and meaningful today as it was in the Middle Ages.

How did you find your mentor for your research project?
My mentor, Dr. Gail Orgelfinger, was my professor for a Spring 2012 Honors Independent Study. She encouraged me to develop a research project as a part of the course, and to apply for the URA.

How did you know this was the project you wanted to do?
I am very interested in medieval studies, so I knew the perfect project would be incorporating my interests in British literature and history. With these things in mind, my research became about pilgrimage during the Middle Ages, in particular about St. Cuthbert and his association with the abbeys at Melrose, Scotland and Lindisfarne, England.

Is this your first independent research project?
Yes.

Do you get course credit for this work?
Yes, the URA is part of my independent study from Spring 2012.

How much time do you put into it?
I am not sure if I can count the hours! My time has truly been filled with study, editing papers, and planning my research in England.

How did you hear about the Undergraduate Research Award (URA) program?
I heard about it from my sister Allison, who graduated from UMBC in 2010.

What academic background did you have before you applied for the URA?
Junior status at UMBC and several classes focusing on the medieval period.

Was the application difficult to do?

The application was simple enough, save for making the statement of purpose concise and understandable. I had a difficult time putting my project in a short statement. Though overall, it is a simple application.

How much did your mentor help you with the application?
Dr. Gail Orgelfinger was very kind to edit my abstract several times.

What has been the hardest part about your research?
The most difficult part has certainly been trying to narrow down my subject and realize that I can neither understand nor cover everything I would have liked to have covered. Also, planning my trip along St. Cuthbert's Way has posed many challenges and surprises. Although I would say that planning my research was more difficult than executing it, as I greatly enjoyed traveling through the English and Scottish countryside, visiting the abbeys, and interviewing people about my research topic.

What was the most unexpected thing?
The most unexpected thing about my research was uncovering all of the information about St. Cuthbert in Northumbria and the Scottish Borders, and how there is more relevance of pilgrimage in our times than I would have expected. While executing my research in Britain this summer, I was also surprised to see how much religious history has infiltrated contemporary culture.

How does your research relate to your work in other classes?
This project fits perfectly in my studies of religious history and pilgrimage literature.

What is your advice to other students about getting involved in research?
The opportunity to do research is something unique to UMBC. This is one of the reasons that I decided to transfer to UMBC from HCC, because it is not easy for an undergraduate to do this kind of research at any university. If you are prepared for editing papers, sleepless nights spent researching, and carrying hoards of books out of the UMBC library, then you are more than ready for a rewarding research project. I am grateful to have received the URA in order to travel to England to study what I love; it is an opportunity that should not be ignored by any serious student at UMBC.

What are your career goals?
My goal is to be a university professor, editor, and writer.

Did you transfer to UMBC from another institution? Where?
I transferred to UMBC in 2010 after taking my freshman year at Howard Community College, in Columbia, MD.

Grace Calvin, Psychology
"Acculturation Stress, Psychological Well-Being, and Parenting among Chinese Immigrant Families"

Over one third of America's immigrant population is from Asia and a large and growing portion are of Chinese descent. It is crucial that the acculturation experiences of this growing population are studied and understood in order to promote positive, and decrease negative, outcomes in these families. Although prior research shows that immigrant parents' acculturation experiences and psychological well-being are associated with their parenting styles, the specific pathways among these variables are not well understood. To extend the existing literature, the current project aims to understand the predictive role of the acculturation experiences of Chinese immigrant mothers on their parenting styles and practices towards their young children, through their psychological well-being. We predict that a negative acculturation experience will be positively associated with poorer

psychological well-being, which will, in turn, be associated with more maladaptive parenting styles and practices. Findings from this study will shed light on risk and protective factors in the parenting of the children of Chinese immigrants.

How did you find your mentor for year research, scholarship, or artistic project?
My first semester at UMBC, I took Cultural Psychology and was approached by one of Dr. Cheah's graduate students within that course. Knowing that it would be good for me as a young academic to get involved in research, I decided to join the lab.

How did you know this was the project you wanted to do?
Although I find cultural psychology and child development fascinating, my true interest lies in abnormal and clinical psychology. Given my resources and position, I have access to a wealth of data and equipment in Dr. Cheah's lab, including a mental wellbeing evaluation we do as a regular part of the larger study. I decided to branch out a little to discern the links between parenting, mental health, and acculturation experience.

Is this your first independent research project?
Yes, this is my first independent research experience in terms of running statistical analyses and presenting my findings. I had a project in my cultural psychology course that involved interviewing an immigrant to the US and analyzing the interview in light of the course material. I loved that experience, and I am excited to go a little farther in the course of my Undergraduate Research Award (URA).

Do you get course credit for this work?
I have been receiving departmental course credit for my work in Dr. Cheah's lab, and I plan to enroll in the Honors College research course as I complete my URA experience.

How much time do you put into it?
I spend as many as ten hours each week on Dr. Cheah's lab needs. I will probably spend a little more time than that as I work to complete the URA.

How did you hear about the Undergraduate Research Award program?
Dr. Cheah suggested I apply, as I have put a great deal of time and energy into her research project and she felt I would be a good candidate. I am very appreciative of her support, and I would not have attempted this without her!

What academic background did you have before you applied for the URA?
I had worked in the lab for 11 months when I decided to apply, and I have completed many psychology and honors courses that I believe have prepared me for this.

Was the application difficult to do?
Not really. I looked through the library databases for information regarding the links I was interested in studying, determined that not much had been done to discern the aforementioned connections, and pieced together what the field has done thus far. That was the hard part, after that it was just combining and learning to express my ideas and findings.

How much did your mentor help you with the application?
Dr. Cheah was very helpful in the course of my application. I presented to her a very rough draft, and she gently suggested improvements while guiding me to understand how best to voice the application. After bouncing our ideas and experience back and forth, and a lot of learning, I had a complete application.

What has been the hardest part about your research?
It's only just beginning, but I think the most daunting thing for me is sifting through all of the work that has been done to get ample background understanding. One must tread lightly and be aware of biases and misunderstandings, and to never trust one single account. I feel I have a lot of work to do in the coming months, as I make sure I know where the field lies at present.

What was the most unexpected thing?
As far as I can tell, cultural psychology, being a very young discipline, is untraveled, not well understood, and very messy. Although I know this going in, I imagine it will present many difficult to resolve issues as I move forward.

How does your research relate to your work in other classes?
As I complete the research psychology courses, Psychology 331 and 332, my lab experience helps me give names to the things I must learn and understand. It gives me a deep understanding of the papers I read and the work that I do in all of my psychology and science courses. I believe my research process gives me an advantage in my courses.

What else are you involved in on campus?
I am an officer in SGA's executive branch, and in that position I serve on a number of committees and work with extraordinary people to make a difference for our campus. I am also involved with some clubs on occasion.

What is your advice to other students about getting involved in research?
It seems really scary and impossible and not for you, but given appropriate motivation and a good mentor for support, it is very doable. If you have an idea, go for it! Chances are, your passion will attract someone and you will easily be on your way towards a publication and a lot of fun.

What are your career goals?
My present dream is to get a Ph.D. in clinical psychology and to work with mentally and developmentally abnormal adolescents in an outpatient (non-institutional) setting. In the course of earning my Ph.D., I hope to contribute to the small but growing pool of knowledge about music's impact on the behaviors of the mentally ill.

Sonia Dalal, Biological Sciences
"Determine the Mechanism CD80 Uses to Activate T-Cells and Induce Immunity in Individuals with Cancer"

Programmed Death Ligand-1 (PD-L1) is expressed by many tumor cells and increases tumor progression by binding to its receptor PD-1 on T-cells, thereby inhibiting T-lymphocyte activation and causing T-cell apoptosis. Cluster of Differentiation 80 (CD80), expressed by antigen presenting cells provides a potent costimulatory signal needed for T-cell activation by binding to T-cell-expressed CD28. We have recently identified another function for CD80 and shown that human cancer cells modified to express CD80 inhibit PD-L1 binding to its receptor, resulting in increased T-cell activation. To distinguish if tumor cell-expressed CD80 promotes T-cell activation by binding to CD28 and/or inhibiting PD-L1 we must construct a mutant CD80 that does not bind to CD28. We are generating a soluble CD80 mutant (sCD8096,97,99) because it is not feasible to inject cancer cells expressing CD80 into patients. Previous studies demonstrated that CD80 mutated at amino acids 96. 97, and 99 (CD8096,97,99) no longer binds CD28. To generate a mutant soluble molecule the sCD8096,97,99 gene was inserted into the pINFUSE-hIgG1-Fc vector. Mammalian cells are being transfected with the sCD8096,97,99 construct. sCD8096,97,99 will be purified and western blot analyzed and used in functional experiments to determine how CD80 restores T-cell activation.

How did you find your mentor for your research?
As a freshman entering UMBC, I hoped to pursue cancer research and learn related laboratory techniques. I read about professors' research in the Biological Sciences Department and then emailed professors about research I was interested in. The Meyerhoff Scholarship Program helped me to get involved in research as early as the first summer after my freshman year and I have been working in Dr. Rosenberg's Laboratory ever since.

How did you know this was the project you wanted to do?

Since I have a strong interest in focusing my future research endeavors on cancer biology and related fields, this project fit into my goals perfectly.

Is this your first independent research?

Though I had some research experience with NASA in high school, this was my first independent research project. It proved to be very fulfilling as I was able to learn many of the basic and advanced laboratory techniques necessary for a competent scientist.

Do you get course credit for this work?

Yes, I receive two or three pass/fail credits per semester.

How much time do you put into it?

Working on my research excited me and I put in about 15-20 hours per week during the academic year. During the summer and winter breaks I spent about 40 hours per week in the lab.

What has been the hardest part about your research?

Before working in Dr. Rosenberg's laboratory I believed that research was "black and white." I learned that research requires accepting many failed experiments. Working in the Rosenberg laboratory has allowed me to learn that although failure is a part of research, it will be overcome with experience. I have also learned how to work with graduate students and post doctoral researchers in a competitive and fast-paced environment.

What are your career goals?

I hope to pursue a M.D./Ph.D. due to my strong desire to perform research and identify solutions that benefit people.

Andrew Dillon, Chemical Engineering

"Optimization of a Process: Are Algae-based Biofuels the Solution to the Energy Crisis?"

With the price of crude oil steadily growing, a search for the next generation liquid fuel that can replace dependence on crude oil is essential. For some time corn and other plant-based biofuels have been in the forefront of this search, but scientists are discovering problems with these alternatives that cripple their sustainability. Recently, algae-based biofuels have entered the spotlight and are believed to be a potential alternative. While algae as an alternative fuel source is promising, little analysis of an industrial-sized plant has been performed. This research project will provide a critical analysis on whether a pilot algae-to-biofuel plant is currently feasible. The plant will be modeled with Aspen Plus, a powerful chemical process simulator. The unit operations that make up the basic pieces of a production plant will be included in the model and optimization techniques will be applied to individual components and to the processing plant as a whole. Our results will be evaluated through both comparison to other plant designs and analysis of the best energy output per energy input for the process.

How did you find your mentor for year research, scholarship, or artistic project?

I took a course with my mentor, and during one of the classes she strongly encouraged students who wanted to go to graduate school to seek out on-campus research. I talked to my mentor right after class, and it turned out we had similar research interests.

How did you know this was the project you wanted to do?

I am hoping to do research in the field of alternative energy in graduate school while I pursue a Ph.D. I knew doing alternative energy research at UMBC would better prepare me for graduate school.

Do you get course credit for this work? How much time do you put into it?
I don't get credit right now. Maybe in the future, though! I work 10 to 20 hours a week in the lab.

How did you hear about the Undergraduate Research Award (URA) program?
The mentor I am working with has had URA scholars work with her before, so she encouraged me to apply.

Was the application difficult to do?
Not at all. Some aspects of the application were time consuming, but it wasn't difficult. It was definitely worth my time!

How much did your mentor help you with the application?
My mentor was very helpful. Since she has had URA scholars work with her before, she knew a lot of what went into a solid application. I wrote the application, and then we went through the application together. She was able to point out areas in the application that needed to be strengthened. After several drafts, we had a really solid application.

What has been the hardest part about your research?
The time commitment. As a full-time student in an extremely demanding major and a member of a couple of clubs, balancing time has always been a challenge. Research was the priority and so I had to cut back on a lot of extra-curricular activities.

What was the most unexpected thing?
The most unexpected good thing was how much fun research is. I know it's a cheesy answer, but it's true. In just preparing for research, I have learned a lot of cool things relating to my field of interest.

The most unexpected negative thing was how long it takes to get results. When I started, I looked at all the different steps and said to myself "Yeah, I'll have this project done by the end of the semester." I was mistaken! More than a semester later I am maybe halfway done with my project!

How does your research relate to your work in other classes?
My research directly uses ideas, problem solving strategies, and equations I have been learning in my classes, especially my major-specific classes. It also is preparing me for work I will be doing in future classes!

What else are you involved in on campus?
In the past I have been in leadership positions in both Intervarsity Christian Fellowship and the UMBC Humans vs. Zombies club, although I am currently only a member in these clubs.

What is your advice to other students about getting involved in research?
To all the people who think they'd like to get involved in research, but haven't done it yet: Just do it. It's totally worth it. Talk to advisors, professors, and mentors about how to make your research be more than just a good experience that beefs up your resume. You can easily get class credit and funding for on-campus research if you search for it.

Lastly, find research you want to do. Research can be challenging at times, and if you're doing something you hate, it will be harder through those tough times. If you like your research, then you will find the challenges become puzzles (fun!) rather than problems.

What are your career goals?
My long-term goals are to do alternative energy research and development in a corporate setting. After graduating from UMBC, I plan to pursue a Ph.D. in the field of alternative energy.

Did you transfer to UMBC from another institution? Where?
Yes, I did! I spent two years at Montgomery College (both Germantown and Rockville campuses) before I transferred to UMBC. I actually met several UMBC students the summer before I transferred through an internship at the National Institute of Standards and Technology (NIST) in their SURF program.

David Eisen, Computer Engineering
"Mid-IR Optical Stimulation of Nerve Cells"

Neuron excitation and inhibition have been previously studied as they have important applications to bio-medical fields, particularly in human prosthetics, as well as in audio and visual assist devices. Optical stimulation via high power mid-IR (MIR) quantum cascade lasers (QCLs) coupled with a MIR fiber provides a non-contact method of stimulus delivery direct to the neural site. It offers possible advantages over traditional electrical stimulation techniques, which can lead to either electrode or cellular damage. By using cultivated rat nerve cells on a multi-electrode array circuit board we can configure MIR optical fiber coupled QCLs to deliver signals in the 3 μm wavelength range. The focus will be on examining the range of excitation energy per unit area, possible excitation rates, wavelength dependence of the excitation and inhibition characteristics around the main peaks of the neuron absorption spectra, and identifying optical stimulation/inhibition thresholds as well as damage thresholds at these wavelengths. We will also apply similar studies to plants and insect subjects such as Venus Fly Traps, and fruit flies and hope that this will eventually lead to in vivo studies of small-animal brains with our collaborators at NIH NIDA lab., Baltimore, who are interested in applying MIR techniques to the studies of brain circuitry, chemical pathways, and drug effects.

How did you find your mentor for your research?
I was lucky and found my mentor and learned about the URA program by chance really. I was required to join an engineering professional society for one of my classes and was having difficulty with the UMBC IEEE website so I contacted Professor Fow-Sen Choa, who oversees the UMBC chapter. I explained I was a computer engineering major and as a professor of the department, he asked if I was interested in doing undergraduate research. We set up a meeting and discussed the different opportunities available.

How did you know this was the project you wanted to do?
Admittedly, when I went to meet with my mentor for the first time I didn't know what to expect. However, after hearing about the projects he was working on, including using lasers as part of brain controlled robotic arm, I couldn't resist finding out more about this research area. We are currently working on using cultured rat neurons for mid-IR optical stimulation and inhibition testing.

What academic background did you have before you started?
As an engineering major I had a fairly strong background in general math and science courses including physics, chemistry, calculus, and computer programming. However, I had no background whatsoever in photonics, which is now my area of research. This was okay though as my mentor as well as graduate students in the research group, were able to explain the basics so I could get a hands-on learning experience right away.

How much time do you put into it?
During the semester I try to put in 5-8 hours a week in order to complete about 70 hours of work per semester. Scheduling work hours is very flexible so I can accommodate my schedule of classes. I also do work during the summer and over winter break where I can put in more time without classes.

Was the application difficult to do?

The application is not long and is very straight forward. If you have some background in your research area, you will be in great shape and even if you do not, you can always get help from your mentor. That is, after all, what they are there for.

How much did your mentor help you with the application?
My mentor helped a lot with the application. As I had no background on the subject, he was very willing to offer other technical papers on the material, as well as help fill in any parts that I was unable to answer due to my lack of knowledge in the field of photonics and the finer details of the project.

What is your advice to other students about getting involved in research?
Do not hesitate to get involved. If you have a particular subject or idea you want to explore, you should pursue it but even if you do not and just know you would like to get involved in some project speak with your advisor, professors in your department, and the Shriver Center for opportunities that interest you. Even if you do not have a background in the field, as I did not, you should still investigate it as the professors on campus are very helpful in getting you up to speed and involved in work you enjoy. Remember, the idea is to investigate a subject or problem you are interested in, so you don't need to already be an expert coming into the game.

Cristóbal Fernández, Psychology
"Spiritual Music and its Relation to Personality"

For some time, researchers have been interested in studying the relationship between spirituality and personality traits. Studies have shown that transcendental meditation, a type of spiritual meditation, has yielded positive results in reducing migraine-related problems in individuals who are classified as being "opened to experience," by the "'Big Five" personality traits scale. The current study investigates whether spiritual music can help reduce anxiety for individuals who are "opened to experience." Sixty participants are randomly assigned to one of three groups. An initial blood-pressure reading is taken for all three groups. Then all participants complete a simple task but are given falsified results, showing poor performance, in order to create anxiety. Next, a second blood-pressure measurement is taken, after which participants are asked to wait. Depending on their group assignment, they will hear in the background either Gregorian chants, Pop music, or no music at all. After five minutes, a final blood-pressure reading is obtained in order to be compared to the previous two readings. It is expected in this study that participants who listen to Gregorian chants show a faster return to their original blood pressure levels indicating that spiritual music may be helpful in reducing anxiety.

When did you start conducting research at UMBC? How did you find a mentor and project to work on?
In 2009, I took Experimental Methods (PSYC 331 / 332) and I learned to conduct my own research. I never thought that two years later I was going to apply that knowledge to my own project. Although it is a lot of work, I enjoy research very much and Dr. Alonso (my mentor) has been working with me throughout the entire process.

What did you know about your field/project when you started? How did you learn what you needed to know?
I knew very little, if anything at all. I just wanted my project to include the concept of spirituality somehow and I hoped to combine spirituality and Psychology. The topic of spirituality is very broad and my mentor asked me to narrow it down. In other words, I was asked to find a specific thing that could be measured. After much research, I focused on personality and how it was affected by spirituality. Then, I learned that spiritual music (e.g., Gregorian Chants) had not been tested on personality traits. For this reason, I decided to test Gregorian chants on individuals who are self-described as being "open to experience" according to personality scales.

Who do you work with on your project?
I was the only person conducting this particular study and my mentor/advisor was the person supervising my work.

How did you decide to present at URCAD?

When a student enrolls in the "Independent Study" course (PSYC 490), the student has two choices: if the student is only taking the course for one semester, then he is supposed to specify in his final paper what things would he have done, had he presented at URCAD. The second option is to take the course for a second semester and present at URCAD. I wanted to do the latter, and that is why I chose to continue and took the class for a second semester. I originally wanted to present a poster but my advisor/mentor encouraged me to give an oral presentation. I am not good at presenting orally because I am somewhat shy and it is hard for me to speak in front of an audience. Nevertheless, I wanted to overcome this fear and decided to present anyway. I also wanted to present a poster and fortunately, I was permitted to do both.

Was the URCAD application difficult?

No, the application was not difficult to fill out at all. What was difficult, though, was the completion of the IRB forms. It took me a while to have all the information entered in correctly. The second most difficult thing to do was the URCAD abstract. The abstract was to be written in 200 words or less, and including the major aspects of the study in one paragraph was very difficult. Fortunately, my mentor reviewed it several times and she helped me with the revising process before submitting it.

How did you know what to put on your poster?

I actually did not. I had some idea of what to include such as the "objective," the "results" and the "discussion" sections, and I also had seen other posters but they all had different things in them. I also had to pick a background for my poster since I did not like the ones I had seen previously. Again, with the help of my mentor I was able to include the essential components of my poster, as well as taking into consideration the aesthetics. She guided me through the whole process.

Were you nervous about explaining your work to so many people? How did it go?

I was not nervous when I showed my poster to the people who kindly took the time to come and look at it. My dad also had a great idea and he made small pamphlets of my poster and pinned them to the cardboard for everyone to take if they were interested in learning more about my study. Now, I was nervous before I orally presented but it was gone once I was called up and went over the slides. I had made a script to myself of what I was going to say (and memorized it for several days) and that took away much of my nervousness. I acknowledge that I did not do a splendid job, but compared to my class presentations, I think I did very well.

What is next for you?

This is my last semester at USG/UMBC and I will be graduating this spring. I received academic credit for doing my own study (as well as to write a research paper) but I mainly did this for the sake of conducting research in general. Some people enjoy playing sports, going to the movies, etc. I enjoy doing research because it enables me to expand my knowledge and to apply what I have learned during my years as an undergraduate at USG/UMBC. I also like to explore other ways to benefit people through research.

I definitely plan to go to graduate school, but first I need to get a job that can pay for it. For the immediate future I plan to pace it down a bit because I have not stopped since my senior year in high school. I have taken summer courses ever since and I need a small break before I venture into the world of graduate school. I also plan to continue pursuing psychology as my major but I want to specialize, and get my Masters, in a more holistic discipline, such as "Transpersonal Psychology."

Would you suggest to other undergraduates that they find a research project?

Yes, I would suggest other students get involved in their own research because it is a very gratifying experience. It is a lot work but in the end it pays off. Some people may not find research very interesting but the knowledge and experience that a student acquires is priceless.

What else are you involved in at UMBC?

Besides conducting my study at USG/UMBC, I am also involved in the "Psychology Student Association" (PSA) as the Senior Representative; as well as being involved in the "Writing Fellows Program," which is a program that helps sophomores and juniors who are taking lower- and upper- level courses and who need assistance in improving their content/writing in their research papers.

Additional Information:
I was a transfer from Montgomery College to USG and this transition was a little difficult because I was not used to writing research papers using the APA format. For this reason I had to adapt myself to this new way but I easily picked it up. One of the reasons that I joined the "Writing Fellows Program" was to help those students who were still at Montgomery College and who were going to struggle if they were not used to the way things are done at the upper level.

Thomas Hervey, Information Systems
"Lights, Camera, Motion, Action: The Dance Application of Microsoft's Kinect and Intelligent Stage Lighting"

The Microsoft Kinect is one of the premier entertainment peripherals in today's gaming scene. There are, however, many other uses for this sensor apart from the world of motion-controlled gaming. Our group will design a system which uses the Kinect's motion-tracking capabilities and will integrate it with dancers through intelligent stage lights. The lynchpin of the system will be a DMX controller which will connect the PC (and by extension, the Kinect) with the lights. These lights can then be controlled to do certain actions in response to the motion input garnered by the Kinect. This fusion of art and technology will provide for a unique and surreal performance piece.

How did you find your mentor for year research, scholarship, or artistic project?
Our group began looking for a research mentor by investigating the researcher profiles on the Computer Science research webpage. Because UMBC is a research school, we knew that it wouldn't be long before we found someone like Professor Marc Olano with a background that would fit our needs. Coincidentally, our other soon-to-be mentor Professor Carol Hess, had contacted Dr. Olano at the same time asking him if they could put together a project with dancers and an Xbox Kinect. In no time we had a project with a strong technical mentor and a dance professor mentor and a unique real-world application.

How did you know this was the project you wanted to do?
We knew that we wanted to integrate an Xbox Kinect with intelligent stage. This was the project for us because it combines development with art. After learning that we would have our own workspace we were ready to go.

Is this your first independent research/scholarship/artistic project? Do you get course credit for this work?
Yes, this is the first time that any of us have conducted independent research. No, we do not get academic credit for this work.

How much time do you put into the research?
In the summer we are working one or two nights a week for three or more hours as well as the occasional research independently throughout the week. Come the fall semester we will be working more nights each week.

How did you hear about the Undergraduate Research Award (URA) program?
Before we began the project we had heard that there was a funding program for the projects, but it wasn't until Professor Hess encouraged us to apply that we knew the details of becoming URA Scholars.

What academic background did you have before you applied for the URA?
Cumulatively, our group has more than five years of programming experience with several languages including Java, Python, C, C++ and several others.

Was the URA application difficult to do? What was the most unexpected thing?

The application was simple but the number of documents that needed to be completed and in what order was a little confusing. The most unexpected thing was how nice and formal the award ceremony was. I am sure that being able to present in URCAD will be even more amazing.

Zulqarnain Khan, Biology
"Research in Translational Medicine"

When did you start conducting research at UMBC? How did you find a mentor and project to work on?
I began working in my current research lab in fall 2011, so I've been there about two semesters. I met with Dr. Hrabowski last spring and he asked me whether I was conducting research in translational medicine (my area of interest). At the time, I was looking for positions, but I had not found anything. Dr. Hrabowski told me to contact Mr. Toliver of the Meyerhoff program to see if he had spotted any recent ads that may be of relevance to me. In a couple of weeks, I received an ad from Mr. Toliver about a position at the University of Maryland, School of Medicine to manage a mouse colony at a lab that was conducting research on BK Channels, which may have medicinal applications in bladder dysfunction and other smooth muscle. Very intrigued by the lab's past work, I applied for the position, then met with my mentor (Dr. Andrea Meredith) who is a UMBC alumna, and was accepted into the lab.

What did you know about your field/project when you started? How did you learn what you needed to know?
At the time, my main attraction to the lab was the fact that they were working on projects that had a basis in neuroscience. Going into my first day at the lab, I knew about basic action potentials, some limited aspects of physiology, and biological applications of statistics. When I started at the lab, my primary responsibilities were to manage the colony of transgenic mice and genotype them (using tiny parts of their tail) for the lab's experiments. Prior to working at this lab, I did not have any experience handling mice or any animals, for that matter. I quickly realized that before I got involved in any complicated assays or experiments, I would have to become accustomed to handling mice. I also had to learn the background for all the experiments I became involved in later on. For example, I had to figure out what trends I was looking for in a motor-learning assay where mice were put on a moving rod to see how long they could stay on without falling off. Theoretically, the genetically enhanced mice should have learned faster and more effectively, so they should have stayed on longer than the normal mice over the course of the experiment. Over time, I just had to keep learning about new experiments, reading background on those experiments, and finding ways to implement them effectively to get usable data.

Who do you work with on your project?
Earlier this year, I conducted some behavioral and motor learning experiments on an independent project to determine whether the various phenotypes of mice in our lab showed a significant difference in their motor learning and/or behavioral responses. For that project, I was largely working independently with the support of my mentor, who was always available to guide me. Recently, I have been learning about certain smooth-muscle experiments because I will be conducting a summer project regarding bladder function. One of the post-docs in our lab is currently teaching me the nuances of these experiments, which are quite tedious but rewarding at the same time. She has been working on this project to this point, but she is leaving the lab soon, so I will take over for her and continue the project from that point onward.

Will you work in the lab during the 2012-2013 school year? How much time will you put in? Do you get paid for this? Academic credit?
I will definitely continue to work in this lab during the 2012-2013 school year for about eight to 10 hours per week. During the year this is a voluntary position so I will not be getting paid. Hopefully, I will receive an upper-level Biology credit for my research next semester. I received a Prac98 notation for the past two semesters.

What are your goals for after UMBC?

Short term, I want to obtain an MD or MD/PhD following my graduation from UMBC. Long term, I am very interested in pursuing a career in international medicine. Through various internships and volunteer work, I have found that I enjoy the type of personal interactions and experiences that are found in international settings. Specifically, I am drawn to "Doctors without Borders" because I saw their efforts first-hand while in Pakistan a couple of years ago during the mass-flooding. These responders were among the first to offer any kind of aid to areas that were decimated by natural disaster. I truly believe that I would enjoy working in that type of organization whether as a physician or as a researcher helping to develop the types of treatments that would be valuable in disease-prevention in those harsh conditions.

Would you suggest to other undergraduates that they find a research project?

YES! To be very honest, I did not recognize the value of undergraduate research before attending UMBC. My view of research was that it was something only pursued by people interested in PhDs or working in labs for a living. However, it is truly an enlightening experience for anyone who is interested in learning about the process of designing experiments, gaining experience in a certain field, or just learning about an area of interest. Also, do not be discouraged to apply if the positions do not appear to be glamorous! Almost all undergraduate researchers have to work their way up, so you will likely start of in a small capacity, but as you grow more comfortable in a lab and become accustomed to the background of the topics being studied, the lab will very likely increase your involvement. The first step is to find a lab or professor that is conducting research that interests you and just talk to them about it!

What else are you involved in at UMBC?

I am the Program Coordinator of "Health Leads", which is a volunteer group that helps address the socio-economic needs of patients in impoverished areas. We help patients at St. Agnes Hospital get connected to resources that can help them access employment, health insurance, adult education, emergency food, shelter, state Identification, and many more benefits. Our goal is to assess what assistance a patient needs, find resources for them, help them access that resource, and follow up with them to ensure they have successfully accessed that resource to fulfill their need.

I played cricket for the UMBC 22-Yards team last year, but due to time constraints this year I haven't been able to play in any matches.

Hannah Kurlansky,
English and Media and Communication Studies
"Cultural and Linguistic Implications on Language and Art: How Language Colors Childhood Imagination"

This research will examine the relationship between language and perception, specifically the role in imagination and artistic creation. Though communication is often thought to be transparent, language is closely related to culture and inherently conveys cultural differences. I will write a children's story in both English and Spanish with simple vocabulary to minimize translation differences. I will then present Spanish-speaking students with the Spanish text and ask them to create appropriate illustrations. This will be repeated with the English text and English-speaking students to provide an alternative set of images. Both sets of text and illustrations will be collected and produced into a dual-language children's book. This final product will allow for easy comparison between the two sets of interpretations and provide examples through which to discuss the impact of language. I will write a critical paper discussing the cultural similarities and differences as expressed through the illustrations.

How did you find your mentor for year research project?

I actually had some trouble finding a faculty advisor. I talked to Dr. Snyder from the MCS department about possibly using my research idea as my capstone project. He advised me to look towards other departments for an advisor. I contacted Dr. Bell from the MLL department and he put me in touch with Dr. Stolle-Mcallister who agreed to advise me. I had never met Dr. Stolle-Mcallister before, but he was very supportive of my idea.

How did you know this was the project you wanted to do?

I had been thinking of developing a research project to conduct while I was abroad. Though my study abroad plans fell through, I already had the idea and was still interested in following it through. I have always loved children's books and working with young children, and I had been introduced to the analysis of language through my English and MCS classes. It seemed natural to merge topics that interested me.

Is this your first independent research/scholarship/artistic project?

This is not my first independent research project, though it is the first that requires any funding. I am writing an honors thesis for the English Honors program, which also focuses on a critical analysis of language and its implications.

Do you get course credit for this work?

I might try to use this project as a capstone for MCS, but as of now it is completely independent and self-motivated.

How did you hear about the Undergraduate Research Award program?

My teachers have advertised the URA program for years, but I never thought I would develop an idea worthy of one. I was not overly confident in my proposal idea, but as a junior, this was my last year to apply. I knew this was a great opportunity, and everyone was very supportive of me, so I decided to apply.

Was the application difficult to do?

The application was not difficult at all. Writing the application was beneficial because it forced me to expand and elaborate on my idea to make it stronger and more competitive. My advisor was supportive and helped with any concerns I had.

How much did your mentor help you with the application?

Dr. Stolle-Mcallister helped me with proofreading and final review. He supported my ideas and gave me the independence to craft the project I wanted.

What was the most unexpected thing?

I am still early in the program, but the most unexpected thing so far is the supportive community for URA Scholars. The program directors seem genuinely invested in my success, and the other students help create a positive environment. There is so much more to being a URA Scholar than just conducting independent research; it is a community dedicated to individual student success and achievement.

What else are you involved in on campus?

I work as a production assistant for The Retriever Weekly, as well as a tutor in the Writing Center. I am a member of the Oxfam International club and an editor for the school's literary magazine Bartleby.

What is your advice to other students about getting involved in research?

If you have an idea - or even if you don't have an idea - you should consider research! The URA Program offers a support system, but ultimately provides you with the independence and freedom to do whatever you want.

Mary Li, Biochemistry

"Development of New Methods for the Estimation of Dissociation Energies between Isoelectronic Pairs"

We suggest that it is necessary to review estimation techniques of dissociation energies between isoelectronic pairs. Isoelectronic pairs are compounds that share the same number of electrons such as BH_4^-/CH_4 and CO_2/NO_2^+. These compounds can be substituted for each other in experiments. We are studying whether there is a better model for the estimation of the dissociation energies than William L. Jolly's method, published in "A New Method for the Estimation of Dissociation Energies and Its Application to the Correlation of Core-Electron Binding Energies Obtained from X-Ray Photoelectron Spectra" Journal of the American Chemical Society (1970), 92(11), 3260-5. Because there are updated techniques for finding experimental values of dissociation energies, Jolly's model may not hold true for the same isoelectronic species he once used. We can evaluate this by assuming that a difference in dissociation energy is equal to the difference in the sum of the ionic contributions to the bonds. At this stage of the research, we are trying to calculate the dissociation energies of each of the bonds to determine which one relates most closely to the actual bonds.

When did you start conducting research at UMBC? How did you find a mentor and project to work on?
I started to conduct research at UMBC in February 2011. I was very lucky to find my mentor. During an Honors Orientation the summer before my freshman year, we were able to eat lunch with the professors of similar majors, so I met Dr.Liebman there. Later on in the year, we bumped into each other in the hallway, and I asked him about his research. I was interested in theoretical chemistry, and so he assigned a project to me.

What did you know about your field/project when you started? How did you learn what you needed to know?
When I started, I was only a freshman in General Chemistry, so I knew about formal charges and Lewis structures and that was about it. I had also taken up to Discrete Mathematics in high school, so I knew a little about calculations. Dr.Liebman taught me most of what I needed to know, including walking me through calculations and explaining different chemical theories to me.

Who do you work with on your project? Other undergraduates? Graduate students? Faculty?
I worked on my project with only Dr.Liebman and another assistant professor in Slovenia.

How did you decide to present at URCAD?
I decided to present at URCAD because this may be my last research experience at UMBC and I wanted to do something I've never done before.

Was the application difficult?
The application was not difficult at all. After completing the abstract, my professor and Ms.McGlynn made a few changes, and we were all set.

How did you know what to put on your poster?
Ms.McGlynn and Mr.Fick did a god job of giving us examples of what to put on our posters, and my research professor and I thought of some good examples to put on as well.

Were you nervous about explaining your work to so many people? How did it go?
I was not very nervous because I like public speaking. I just didn't want people getting lost in all of the equations on the board. I was a little surprised and very flattered that everyone seemed so interested in my project and in theoretical chemistry. I think they understood what I was saying, and I'm glad I got to expose people to this other side of chemistry.

Will you work in the lab during the 2012-2013 school year? How much time will you put in? Do you get paid for this? Academic credit?

I do not know if I will work during the 2012-2013 school year, because I will be in pharmacy school during that time.

What are your goals for after UMBC?

I will be going to University of Maryland Baltimore Pharmacy School, where I may pursue a dual degree in MBA, MPH, or PhD.

Would you suggest to other undergraduates that they find a research project?

I definitely would. It has been a great experience, and I learned to think more creatively about science.

What else are you involved in at UMBC?

At UMBC, I am involved with the Golden Key International Honor Society, Biology Tutorial Center, Community Orchestra, and Pre-pharmacy club, among other things.

Sania Malik, Health Administration and Policy Program
"Testing Ability of Live Attenuated Tetravalent Dengue Vaccine to Develop Antibodies against All Types of Dengue Virus"

Dengue Virus (DENV) is a mosquito-borne virus that infects millions of people living in tropical or subtropical regions annually. DENV has four serotypes Dengue1, Dengue 2, Dengue 3, and Dengue 4. Each of which can cause the full spectrum of dengue illness which ranges from a mild febrile syndrome to hemorrhagic fever/shock syndrome and can even cause death. Being subsequently infected with a second DENVserotype different from that which caused a first infection can make a person severely ill. For this reason, it is very critical to develop a vaccine that will protect against all four DENV. In this Phase I clinical trial, healthy adult subjects were given an experimental live attenuated vaccine containing all four DENV to see evaluate the safety of the vaccine and to determine if they develop antibodies to each of the DENV serotypes. Replication of each of the vaccine virus strains was evaluated by titrating the DENV at frequent time-points post-vaccination. This study will evaluate the safety of the vaccine and will quantify the antibody response against all four DENV serotypes.

How did you find the research opportunity?

I met my research mentor Dr. Anna Durbin at a networking session at Johns Hopkins Bloomberg School of Public Health. I emailed Dr. Durbin, expressing my interest in working at her research lab. After looking at my resume and interviewing me she gave me the great opportunity of interning at her lab.

How did you know this was the project you wanted to do?

I visited my home country Pakistan in 2011 and saw there was a Dengue Fever epidemic in the country. I saw so many people suffering from it, and there was no cure and no prevention from this deadly disease. That made my heart bleed, and I wanted to do something to help so many sick people. When I came back to the United States and met Dr. Durbin, I was excited to find out that she was working on making a vaccine for Dengue. That was moment when I knew that this is something I really wanted to do.

Do you get course credit for this work? Paid? How much time do you put into it?

This research is part of my internship. I don't get paid for it, but it is totally worth it without being paid. I work for about 18-20 hours a week at the research lab.

How did you learn what you needed to know to be successful in this project?
Watching the associate researchers do their work was really helpful because I learned many techniques by just watching them.

What was the hardest part about your research?
The hardest part was to learn all the scientific terms for the research project.

Is this the first time you have applied to present at URCAD? How did you find out about applying to present your work? Are you excited?
My Research Methods class Professor Andrea Akalfogl was the first one to tell me about URCAD, and she encouraged me to really take a part in it. I am excited to present my research for the first time.

What is your advice to other students about getting involved in research?
I would recommend every student to take a part in any kind of research they may be interested in.

What are your career goals?
After I graduate, I plan to work in Global Health and Epidemiology field. I would like to work with any NGO's that are working in developing or under developing countries.

Adam Mayer, Biological Sciences
"Development of Optimized SAM SERS Nanosensors for Intracellular Analyses"

Surface-Enhanced Raman Scattering (SERS) is a highly sensitive vibrational spectroscopic method that can be used to detect target analytes down to the single-molecule level. The analytical power of SERS, which stems from the quality of the substrate on which the measurements are conducted, can be applied to numerous areas, including disease diagnosis and biodefense. The focus of our work has been on the optimization of the SERS substrate for maximum molecular-information acquisition. However, the long-term objective of the project is to effectively incorporate and use the substrate as nanosensors for real-time intracellular monitoring. By optimizing the individual nanosensors and determining the best method by which to introduce them into the cell, accurate intracellular SERS analyses can then be performed. This project will specifically focus on the monitoring of ZAP-70 and Interleukin-2 protein activity in T-lymphocytes upon activation of the immune response in those cells. By monitoring changes in the concentration and activity of these proteins, information about the activation state of the immune system can be easily and non-invasively accessed, allowing for the early detection and subsequent treatment of harmful pathogens in the body.

How did you find your mentor for year research project?
During winter break of freshman year, I searched the biology and chemistry department websites and looked at all of the faculty members' research profiles to see which projects I would be interested in. I then emailed those professors, stating my interest in their project and my past experiences/credentials as pertinent to an undergraduate research position. I was quickly offered interviews and accepted into a lab within two weeks of sending those emails. That is just an example of how there are many great opportunities that are easily accessible to undergraduates at UMBC.

How did you know this was the project you wanted to do?
The project I am conducting has widespread medical and biological application which sparked my interest as a biology major and pre-med student. Additionally, I knew that the ability to work in a lab where the actual lab techniques are largely based in physics,

engineering and analytical chemistry would be a great chance to explore areas outside of my major and thereby expand the horizons of my scientific knowledge and experience.

Is this your first independent research project? Do you get course credit for this work?
This is my first independent project. I have gotten course credit through the PRAC 98 course via the Shriver Center, and through the CHEM 399 course.

How much time do you put into your research?
During the semester when classes and work become more hectic, I devote between three and 12 hours per week on my research work. During winter and summer breaks when my schedule is more open, I generally commit 30-40 hours per week on my project.

How did you hear about the Undergraduate Research Award (URA) program?
My research mentor, Dr. Brian Cullum, told me about it and encouraged me to apply. I also heard about it from peers who were current URA scholars at the time.

What academic background did you have before you applied for the URA?
Before applying for the URA, I had already completed nearly three years of study at UMBC and had already been conducting research in Dr. Cullum's lab for two years.

Was the application difficult to do?
As long as you meet with your research mentor to discuss the exact structure of the project prior to filling out the application, it is straightforward to complete. It is very important to convey your information concisely and simply enough that people outside of the particular field in question can comprehend what is going on.

How much did your mentor help you with the application?
I completed the application by myself, however, my mentor was integral is helping define the specific steps I would need to take in completing the proposed project. That, combined with the specifics of the budget for the process, were discussed in detail with my mentor, and significantly simplified and quickened the application process.

What was the most unexpected thing in your research?
Being able to attain a research position at the University of Hawaii this past summer through my UMBC lab was a completely unexpected benefit of my research here. I was able to obtain a 10- week paid undergraduate researcher position at the University of Hawaii at Manoa in Honolulu, HI at a lab which collaborates with ours at UMBC. This was an amazing experience, made possible through my UMBC research mentor, which allowed me to conduct an exciting research project and have fun at the same time! I am extremely grateful for having been given such an opportunity and this only further displays the endless possibilities one has when conducting research at UMBC!

What else are you involved in on campus?
Outside of my research, I have also been a chemistry tutor for the past two years in the UMBC Chemistry Tutorial Center and a TA for Cell Biology (BIOL 303) for the past year. I am also involved in several clubs on campus and hope to start a Disney club within the upcoming year!

What is your advice to other students about getting involved in research?
My advice to those students is to start early. The earlier in the year you contact professors, the more likely that you can attain a position before they begin to fill up. Additionally, some students may be hesitant about entering research due to the complexity of the topics at hand. However, be assured that the lab members and mentors at UMBC are all very welcoming and helpful; they will be there to guide you as your conceptual understanding and practical proficiency in the lab improve, and eventually you can begin working on your own project.

What are your career goals?

I plan to pursue an MD degree in medical school after graduating from UMBC this May.

Brent McBride, Physics

"Monte Carlo Simulation (MCS) of Photon Transport in Three-Dimensional Clouds"

Radiative transfer contributes to the growing influence of heat pollution, weather patterns, and the energy balance of our planet on human activity via the permeability and reflectivity of Earth's thin atmospheric layers. Using Monte Carlo pseudo-random number generation simulation, this research inspected the presence, uniformity, and unpredictability of Sun-based photon "packets" entering and travelling through one, two, and three-dimensional isotropic and anisotropic cloud systems. By likening the model to a "pinball game" and the Earth as a virtual blackbody, MCS was used to visualize the bounce-like scattering behavior of particle-like photons on their way to extinction. Factors including single-scattering albedo, directional scattering modeled by the Henyey-Greenstein phase function, cloud depth, the angle of solar incidence, and azimuthal scattering angle contributed to the determination of chaos and homogeneity in photon samples sent through ideal cloud structures. This modeling was supported by previous observations of planetary surface and atmospheric reflectivity at pre-determined photon incidence angles. This research provides a foundation for future investigations into atmospheric intensity and temperature patterns as a factor of planetary latitude, longitude, or solar strength.

What was your specific research proposal?

With this research, I postulated that atmospheric radiative transfer, though uniform on the macro scale, would yield chaotic and ergodic behavior on the level of individual photons. When light particles enter the atmosphere, there is a chance they will pass straight through to the surface of the Earth, hit a molecule and jump back to space, or bounce around in an atmospheric layer like a "pinball" until they run out of energy. This last event is called scattering, and the probability photons will scatter is based on the thickness/density of the atmospheric layer, the angle at which the photons approach the atmosphere, and the reflectivity of the layer (albedo), among other factors.

Which faculty member did you work with on this project?

Dr. Zhibo Zhang, Assistant Professor in the Physics Department, served as my faculty mentor for this research.

How did you find the research opportunity?

Dr. Zhang received an Undergraduate Research Assistantship Support Award (URAS) in 2011 for a student willing to accompany him in his approved research proposal. He presented his need to the UMBC Honors College. I responded to the email inquiry and after meeting with Dr. Zhang in September 2011, I was brought aboard!

Was this your first independent research project?

Yes, but it was not my only research experience. In April 2011, I worked alongside a diverse team from Howard Community College studying 21cm hydrogen spectral lines at the National Radio Astronomy Observatory in Greenbank, West Virginia. We were able to determine the relative speed of and distance to a particular "spiral arm" of the Milky Way galaxy by integrating the deviations of each spectral pattern we received as we scanned the radio telescope across the sky. Earlier in 2011, I took on political science research as a legislative intern at the Maryland House of Delegates. The majority of my work focused on collaboration with Delegate Elizabeth Bobo (D,12B) on environmental sustainability issues.

How much time do you put into your research?
I met with Dr. Zhang to gauge my progress once a week, but typically put in four hours a week outside of the meeting into research. The time flexibility was great because I was able to throw in research time whenever my busy schedule permitted. The internship was also paid, which was a nice bonus!

How did your background contribute to your perception of the project?
I am a senior Physics major, with a love of weather and the atmosphere since childhood. I had never looked at the atmosphere in such a mathematical way before this research, so the entire process gave me a new understanding of the system I had read about and admired from my living room window as a kid.

What was the hardest part about your research?
The programming expectations were daunting at first, but MATLAB, the software we used to create the model, was easy to pick up and understand. Dr. Zhang also had a very specific, unique way of looking at the atmosphere as a constantly moving, planar system that took some time to grasp.

What is your advice to other students about getting involved in research?
Start early and stick with it. The experience is invaluable, and it looks great to have already contributed to your field when applying for internships, jobs, and related opportunities.

What are your career goals?
I plan to become a research professor at a research university, after some time in the lab, with a focus on atmospheric science. I'm inspired every day by the faculty members in the Physics department who can balance the heavy load of designing, executing, and finalizing research proposals while teaching classes.

What are you doing next for research?
I've spoken with a few professors about continuing research on campus in the coming year in fields from atmospheric physics to physics education. I've also applied for several summer internships, including the program at the nearby Johns Hopkins Applied Physics Lab.

What else are you involved in on campus?
I am an RA in Patapsco Hall with a great floor! I'm also involved with the Tau Sigma Transfer Honor Society and the Honors College.

Oliver Muellerklein, Biological Sciences
"Spatial Dynamics and Territory Estimation for Grasshopper Sparrows (Ammodramus savannarum): a Mathematical Model"

Understanding territoriality and the population structure of individuals within a given area in a dynamic way is an essential tool in animal ecology research. Our research focuses on a comparison of the changes in size, accuracy, and statistical variance of territories using two techniques: minimum convex polygons and kernel density estimations. The data were taken from GPS waypoints of Grasshopper Sparrows (*Ammodramus savannarum*) at the Chester River Field Research Station, Chestertown, MD during the 2003 – 2012 breeding seasons. Based on a sample of 25 songbirds, we found average territory estimates and major sources of reduction in variance at varying intervals of GPS waypoints for both these techniques. To account for within-season movements in territory, we applied a novel dynamic time window algorithm that computes minimum convex polygons at fixed time frames throughout the entire breeding season for each individual songbird. Our research

coincides with a major conservation effort in establishing proper breeding area for a potential reintroduction of the critically endangered Florida subspecies of Grasshopper Sparrows (*Ammodramus savannarium floridanus*). Habitats in both Maryland and Florida are similar, so what we learn for Maryland birds may have direct applications in estimating necessary space for reintroduction efforts in Florida.

What research experiences have you had?
I have worked with Dr. Bernard Lohr for the past two years. In summer 2012 I worked at the Chester River Field Station in Chestertown, Maryland, where we collect songbird data. When I returned to campus for this academic year, Dr. Lohr asked me to start an individual project on territory estimation in our songbirds, after I expressed my interest in computational methods. This project has grown into a large-scale study where I am the primary contributor. I presented this research at the 125th Annual Wilson Ornithological Society Conference in March and **won the Nancy Klamm Best Undergraduate Student Poster Award.**

How did you find the research opportunity?
I originally found out about this research through a friend, Aymen Hussein, who worked with Dr. Lohr the summer before. I had already gained invaluable experience working in both Dr. Leips' lab and assisting in PhD student Michael Martin's research (Dr. Mendelson's lab) during the course of the previous year. I wanted to broaden my experiences to try and find where exactly my interests were in research. Dr. Lohr's research on song analysis in Grasshopper Sparrows captured my interest.

Who did you work with on this project?
Dr. Lohr and I have had a number of discussions on the overall goal of my project. Initially, he gave me the research problem of how to efficiently calculate territories of individual Grasshopper Sparrows at various intervals of GPS waypoints. After this initial question, I contributed to the majority of the research direction while Dr. Lohr helped me fine tune it. Pavan Vutukur, the research technician in our lab, worked extensively with me on much of the program design and function in our MATLAB script.

Was this your first independent research project?
Yes, this was my first independent research project.

Do you get course credit for this work? Paid? How much time do you put into it?
I received two academic credits per semester plus a paid summer of research (which included housing and transportation). Generally, I have spent 10 to 12 hours a week doing research while over the summer I worked in the field (at the Chester River Field Station, Chestertown, MD) between 35 and 40 hours a week.

What academic background did you have before you started?
I did not have much of an academic background in mathematical modeling, programing, or experimental design before starting my research. I have learned an amazing amount in all three of these subjects by working on my project.

How did you learn what you needed to know to be successful in this lab?
To be successful, I had to constantly work hard and be extremely responsible. If you do these two things, almost all professors, graduate students, and research technicians will gladly guide and teach you.

What was the hardest part about your research?
The hardest part about my research has been hitting dead-ends with the design of the project. There has been so many times that I have tried various methods and had them fail. It is extremely frustrating and disappointing to spend weeks working on a new method of your research and then have it fail or yield insignificant results. But, that is the beauty of scientific research! We, as researchers, have a job to venture down every conceivable path of our research in order to find what works, what does not, and what makes no sense to do. That is how we learn, that is how we discover, and that is how we further our scientific understanding of the world.

How does this research experience relate to your work in other classes?
When I took the senior-level Animal Behavior course, we learned a lot about the effect of dynamic habitats on behavior. As long with previous classes on evolution (like Ecology and Evolution), we also learned about the effects of sexual selection on behavior. These are all things that I have seen firsthand with my research and experience in the field. Also, I have utilized knowledge of algorithms and mathematics from a variety of computer science and math courses that I have taken.

What is your advice to other students about getting involved in research?
I highly encourage every student to get involved with research no matter what major or program they are in. I have learned more doing research than I ever would have imagined. It has been the greatest experience of my life.

What are your career goals?
I plan to pursue a PhD, Post-Doc, and continue to do computational animal behavior research for the rest of my life. I have also thought about potentially pursuing a professor position one day.

What are you doing next for research?
I just got accepted into a three month long field study in the Amazon starting in June. So, I will be heading down to Peru in June!

What else are you involved in on campus?
Besides school and research, I love to play the piano. I compose a lot of music on the piano in my free time.

Matthew Newcomer, Mechanical Engineering
NIST Researcher
"Performance Assessments of Tactical Handheld Android Applications for Warfighters"

The Defense Advanced Research Projects Agency (DARPA) has been working for several years to develop and field tactical handheld applications running on Android-powered devices to the US military. These devices have been used in Afghanistan by US Soldiers for over a year now and are regularly met with a positive response. Some Soldiers have explicitly stated that the devices have saved their lives during combat situations.

The NIST evaluation team has a core expertise in evaluating advanced technology where some members have extensive experience in assessing user-interface. NIST's role in this effort is to lead the evaluation of these tactical applications. This includes identifying errors and faults in addition to offering suggested improvements. Extensive testing is done on the devices where the data is provided to the DARPA sponsor for review. This information aids DARPA in making informed decisions as to whether or not an application is ready to be field.

I have had two tasks this summer. The first is creating test plans that exercise nearly every feature of the handhelds under more operational scenarios (as compared to testing in an office). Extensive data sets will be gathered once these test plans are exercised. This data will provide the developers with richer information better enabling them to make improvements in the applications. This task required me to do some research on test methodologies, including those targeting handheld devices. My second task is simply testing the handheld, including regression testing. Regression testing is where you test an unchanged function or feature in a new application version to determine if unrelated changes have had negative consequences.

How did you find out that you could do research in your field in the summer?

My neighbor is an employee at the National Institute of Standards and Technology (NIST) and suggested that I apply.

How did you know that research at NIST was what you wanted to do?
All I knew was that NIST would be an incredible place to work.

Did you apply to other places?
No, however I plan on applying to many internships this upcoming February for next summer.

Was the application difficult to do? Did you have help with this?
No, the application was very easy to fill out. I put a good amount of time into my personal statement, but other than that it was quick and easy.

What was your summer research project?
This summer I have been working on military handhelds (smart phones). I have had the opportunity to work on these handhelds, testing them, finding bugs, and reporting back to the developers. The really cool thing about this project is that what I am doing really matters right now. These are being used in the military and have been saving lives.

Who was your mentor for this project?
Dr. Brian A. Weiss in the NIST Engineering Laboratory Manipulation and Mobility Systems Group

How much time do you put into this work?
I do a lot of testing and a lot of writing test plans or scenarios and work 40 hours per week for this 11-week summer program.

Are you paid? Where do you live during the summer research?
Yes, this is a paid internship, and they even pay for us undergraduate researchers to live in a very nice hotel right up the street from NIST. I have greatly enjoyed living with other undergraduate researchers. Living with people you have so much in common with makes things fun.

What academic background did you have before you started?
I have completed two years in the Mechanical Engineering Program at UMBC.

How did you learn what you needed to know for this project?
My advisor is extremely helpful and patient with his interns. He got me up to speed quickly.

What was the hardest part about your research? What was the most unexpected thing?
The hardest part is getting used to the 9-to-5 style of this job. Sitting in the office and staying focused and on task for that long is a difficult thing to do. I've been doing well with it, but I don't quite think I could handle it for more than a summer. The most unexpected thing is making so many great friends.

What is your advice to other students about getting involved in research?
Be creative. Think of many different ways to contribute to the project. If all you do is what your boss tells you, you will likely complete the task then sit around bored. Instead, if you do what your boss asks of you, then do a handful of things that you think may help too, you will impress your advisor, and not waste time at work.

What are your career goals?
I would like to become a successful Mechanical Engineer working on the latest automotive technology.

Are you a transfer student or did you start at UMBC as a freshman?
I started my first semester at UMBC, then got in to UMD College Park spring semester, and went there. After one semester at UMD I hated everything about it, and I quickly rushed back to UMBC. UMBC is a great school.

KimChi Nguyen, Biochemistry and Molecular Biology
"Determination of dsDNA Binding Site on Gene 32 Protein"

Bacteriophage T4 gene 32 protein is known to be a single-stranded binding protein which aids in the replication and repair of its own DNA within a host cell. In DNA replication, gene 32 protein helps in protecting the DNA from nuclease attack, destablization of the double-stranded helix, and guiding important protein factors to the replication site. Gene 32 protein has a high affinity for binding to single-stranded DNA; its cooperative binding abilities are due to the conserved amino acid sequence (Lys-Arg-Lys-Ser-Thr) within the binding cleft known as the Last Motif. Recent experiments suggested that gene 32 protein also contains a cluster of positive charges in a chin-like region that electrostatically interacts with double-stranded DNA. This electrostatic interaction with double-stranded DNA allows the protein to approach the replication fork and carry out its replication functions. The focus of the proposed experiment is to use DNA affinity chromatography method to obtain the binding constant for the interaction of the wild-type protein with DNA. Then we will compare the binding constant of the wild type with that of protein with a mutated chin. The result of this experiment will confirm the theory that the lysine residues are important for the protein's interaction with double-stranded DNA. This is critical because the interaction accelerates the rate at which the single- stranded binding protein gets to the single-stranded DNA in order to protect it from nucleases.

How did you find your mentor for your research project?
I have always been interested in research. In the summer of my sophomore year, I emailed Dr. Richard Karpel expressing my interest in his lab. It was a very exciting moment when Dr. Karpel emailed me back to set up a date to talk about his research. As a result, since fall 2012 I have been working in Dr. Karpel's lab.

How did you know this was the project you wanted to do?
I started out working on projects with other undergraduates in my lab, familiarizing myself with the experiments and how to work the different instruments needed for our research. Dr. Karpel approached me one day and asked me if I wanted to work on my own project. I have always wanted the experience of independently leading a project, so I accepted. I knew I wanted to work on the project Dr. Karpel suggested because it is the same concept to which I have been exposed while working with other experienced undergraduates. However, this project will be a new learning experience for me because instead of working with ssDNA, my project will focus on dsDNA. I hope that my project will further our understanding of the interaction of dsDNA with gene 32 protein.

Is this your first independent research?
No, this is not my first independent research project. However, it is my first project that involves funding.

How much time do you put into it?
I started to work on my URA project in the spring 2012. I have been working about 10 hours a week in the summer. I plan to work 5-8 hours a week during the academic year.

How did you hear about the Undergraduate Research Award (URA) program?

Many of my undergraduate friends who work in various research labs recommended that I look into the Undergraduate Research Award. Dr. Karpel gave me a research topic, emailed me the URA application, and encouraged me to give it a try. He said to try my best and even if I was not accepted, the application process would give me experience in the future with writing proposals and asking for funding.

What academic background did you have before you applied for the URA?
I had already finished Biochemistry and was taking Biochemistry II at the time, so I felt like I was prepared for this project.

Was the URA application difficult to do?
The application was not hard to do. It was very straightforward. The process of filling out the application allowed me to expand my ideas on the topic and I was able to understand more about my project as a whole.

How much did your mentor help you with the application?
Dr. Karpel helped me proofread my application. He also gave me suggestions to improve the background information section on my application. He was very helpful and supportive.

What has been the hardest part about your research?
The hardest part of my research so far is my attempt to produce DNA cellulose because the absorbance of dsDNA was too low, so I had to repeat the process. This process requires much time because the DNA cellulose takes weeks to dry.

What else are you involved in on campus?
I have been a volunteer of Health Leads for three semesters now. Health Leads is a volunteer group that addresses the socio-economic needs of patients in impoverished areas. We help patients at St. Agnes Hospital obtain resources that can help them access employment, health insurance, adult education, and many more benefits. Starting in fall 2012, I will be a Campus Coordinator of Health Leads. In addition, I am peer mentor for Psychology 100 and President of the Vietnamese Student Association.

What is your advice to other students about getting involved in research?
Do not be afraid to approach faculty members about being a part of their research. If they see that the student is passionate and sincere about their research, then they will happily let the student in their lab. Our campus is full of research resources, you simply have to ask, and someone will guide you.

Michael Nguyen, Biological Sciences
"A Comparison of Genetic and Epigenetic Diversity between Urban and Nonurban Populations of a North American Stream Fish (Etheostoma olmstedi) in the Potomac Basin"

Many urban pollutants such as metals (e.g., cadmium, arsenic), peroxisome proliferators (e.g., trichloroethylene), and endocrine-disrupting/reproductive toxicants (e.g., bisphenol A) have been shown to alter the epigenome, specifically DNA methylation. The epigenome literally translates to "above the genome," and is composed of numerous chemical modifications to DNA and histones, such as methylation of cytosine bases and acetylation of lysine residues in the histone tail. Methylation typically occurs at the 5-C of cytosine in DNA and does not alter the nucleotide sequence. However, DNA methylation can effect gene expression and has been shown to be transgenerationally heritable for many traits, therefore providing a potential substrate for evolution. The goal of this study is to test the hypothesis that urban pollution affects epigenetic DNA

methylation diversity both within and between natural urban populations and clean reference nonurban populations of a freshwater stream fish. Genome-scan methods known as Amplified Fragment Length Polymorphism (AFLP) and Methyl-Sensitive Amplified Polymorphism (MSAP) will be utilized to assess both genetic and epigenetic diversity in six different urban/nonurban populations of Etheostoma olmstedi (Tessellated Darter) in the Potomac basin. Significant differences in epigenetic diversity between the urban and nonurban populations may suggest a role of anthropogenic activity in evolution.

How did you find your mentor for year research?

I went to the UMBC Biology website and read about the research that the faculty is involved in. I then emailed the professors whose research interests me.

How did you know this was the project you wanted to do?

My mentor gave me several options on what research projects to do. I chose the one that suited me best.

Is this your first independent research project?

No, I worked on several projects within the same field prior to this independent research.

Do you get course credit for this work?

When I first started I did; however, I have the maximum allowed credit for research so I do not get anymore. Now I get a zero-credit practicum on my transcript from the Shiver Center.

How much time do you put into it?

It varies depending on what needs to be done next. Usually about 15 hrs/week.

How did you hear about the Undergraduate Research Award (URA) program?

I attended URCAD the year before and asked one of the previous scholars about how she was funded for her research.

What academic background did you have before you applied for the URA?

I've taken many biology and chemistry courses with their respective labs to help me prepare for this research.

Was the application difficult to do?

No, the questions were basic. The most difficult part was to write a professional abstract without it being too long.

How much did your mentor help you with the application?

I did not have a lot of experience writing abstracts, and she guided me in the right direction and did the final edits to it.

What has been the hardest part about your research?

In research it is common for things to go wrong. The most difficult part is to figure out what went wrong and how to fix it.

What was the most unexpected thing?

I was able to see a different side of research then what you would normally read in a textbook. Part of it was going out in the field to collect and identify specimens.

How does your research relate to your work in other classes?

I find my classes easier because research allows me to think like a biologist. When learning about experiments in the textbook, I often think about how I would answer the same question using a different method.

What else are you involved in on campus?

I tutor and TA for organic chemistry and I am a pre-dental officer.

What is your advice to other students about getting involved in research?
Asking professors to get a position in their lab can be difficult because there just isn't enough room. Do not be discouraged if you get rejections. Another good way to get in is to talk to your professors after class. They will remember you and when it comes time for interviews you will have an advantage.

What are your career goals?
I plan to go to dental school after I graduate UMBC.

Did you transfer to UMBC?
Yes, I am a transfer student from CCBC.

Megan Pejsa, Psychology
"Video Game Distraction for Acute Pain: The Effects of Pre-Trial Training"

Researchers have shown that video game distraction via virtual reality (VR) technology can be used to provide distraction from a stimulus that causes mild discomfort. The continued research in VR distraction is critical for young patients in hematology-oncology clinics, as they must endure repeated uncomfortable medical procedures. The findings of this research are intended to benefit this population specifically. To the best of my knowledge, there is no guide in the literature on how long you need to train people before video-game distraction becomes an effective pain-reduction tool. This study is aimed to fill this gap in the literature by examining the difference between practicing for two to three minutes before playing a video game and practicing for 20 to 30 minutes before playing a video game before using the video game as a distraction during exposure to uncomfortably cold water. This study will: (1) test the effectiveness of video games as a distraction for acute pain management, and (2) evaluate the impact of training intensity on the video games' effectiveness as a distracter for acute cold-pressor pain.

How did you find your mentor for year research, scholarship, or artistic project?
I took a psychology course during my freshman year with my current mentor. I enjoyed the class and wanted to do research in a psychology lab. After talking with her, I started working in her Pediatric Psychology Lab during Summer 2010.

How did you know this was the project you wanted to do?
I have really enjoyed working in this lab during the past three summers, when we typically run participants in the virtual reality distraction study. Because of this, I have been interested in video game distraction as a project. I love the application of this study; using research to determine the best method for distracting kids in hospitals from their painful medical procedures is a great way to help the general public and local communities.

Is this your first independent research project?
Yes.

Do you get course credit for this work?
Yes, I'm taking PSYC 398 for course credit.

How much time do you put into it?
It is important to put a lot of care and dedication into a project of this nature because the success of the project is dependent on the development of the methodology and how to complete data collection. When the protocol is complete, I will be in the lab collecting data for the participants, which will typically be about 10-15 hours per week. Data collection will be from approximately September 2012 until January 2012.

How did you hear about the Undergraduate Research Award (URA) program?
A few of my friends have applied and earned URA awards for their research projects. Because of how helpful the program was for their research, they suggested that I apply and learn more about this program.

What academic background did you have before you applied for the URA?
I was a Junior at UMBC, earning a B.S. degree in Psychology. I had taken my core requirements within my department in order to be able to complete an independent project and understand how to do the statistical analyses for my data.

How much did your mentor help you with the application?
My mentor helped me highlight the strengths of my project and be able to convey the effectiveness of my research skills in the application. Because of my experience in her lab, she was able to help see the most important rationales for doing this project and how this experiment is beneficial to the literature on distraction and pain.

What else are you involved in on campus?
I have been a part of the Residential Life community on campus, specifically working as a Resident Assistant (RA) for the past two and a half years. I've also been a supplemental instruction (SI Leader) in the math department, helping tutor weekly sessions of pre-calculus for students.

What is your advice to other students about getting involved in research?
Get as much experience with research as possible. Talk with your professors and ask them about what they do in their lab. Getting involved is the best way to figure out what type of research you might want to do in the future.

What are your career goals?
I will be applying to Clinical Ph.D programs this fall. I plan on doing research on the ritualistic tendencies of eating disorders and OCD. Following a program of this nature, I would like to work in academia and do research with patients in local hospitals and community centers.

Yekaterina Pidgurskaya, MLLI
McNair Scholar
"Immigrant Voices: Central Americans' Perception of Constraints in the Assimilation Process"

For this research I apply Alejandro Portes' theories of context of reception and segmented assimilation to Central American immigrants to determine what is the path of assimilation that this population will follow. A survey of Central American residents of Maryland and Virginia, which focuses on the immigrants' perception of their own situation, will assess their understanding of their economical, political and social circumstances and how they affect integration into the U.S. community. It is my hypothesis that if Central Americans are received in a negative context of reception, that their assimilation into the U.S. community will lead to lack of economic advancement. This study could bring some interesting insight for policy-makers when predicting

immigration trends and whether they should use immigrants to their advantage in future policies and political support. The participants who experienced an overall negative context of reception and are now struggling financially to maintain the basic standards of living they expected to have before they left their countries of origin. If the DREAM Act becomes law, it can provide Central American immigrants educational and employment opportunities not as easily realized in the past.

When did you join the <u>Ronald E. McNair (REM) program</u>?
I joined the McNair program in the spring semester of 2011.

How did you find out about McNair?
I found out about McNair from a friend who was also planning to apply.

What have you gained from being a McNair scholar?
Being a McNair scholar helped me learn to handle homework in addition to doing research on my own. The program still helps me plan for my future, providing resources to research potential graduate schools and jobs that I could apply for. Additionally, I gained a wonderful group of friends and some memorable experiences that I otherwise would never be able to have.

What is your most recent independent research project?
My current research project is on Central American immigrants: how they perceive their job and lifestyle circumstances and whether their expectations of immigrating to the United States have been fulfilled. In the future I plan to focus on other groups of immigrants.

How did you find your mentor for this project?
I found my mentor by asking for referrals from professors with whom I have had classes with. One of my very recent professors told me that Dr. Sara Poggio would be a great mentor because her research was on immigration as well. After she agreed to be my mentor, she was and still remains one of my biggest supporters in my research process.

How did you know this was the project you wanted to do?
I was interested in immigration because of my personal experience. I arrived to the United States in 2000 with my parents, and have experienced many things that immigrants of any country go through, especially the process of obtaining a citizenship. These experiences, as well as my love for learning new languages guided my research interests to what I am doing as my project now. I am interested in learning how groups of people from different countries experience their arrival and adjustments while living in a new country.

How much time do you put into it?
In a way, I put a lot of time in my project because the topic is constantly on my mind. Everything I see I can basically relate to the subject of immigration. The research project is not just about writing the paper. It is about scheduling meetings with my mentor, reading numerous articles and keeping up with the news on immigration, as well as formulating the methodology of obtaining the data to prove hypotheses. I could feel accomplished about my project just by talking to my mentor about what sort of questions I could ask in an interview, or reading up on other immigration groups and their adjustments in the United States. There are so many levels of doing my research that I feel like I never stop putting time into it.

What academic background did you have before you started?
I received an Associate of Arts in International Relations from Montgomery College in 2010. Since then, I have pursued Political Science as a minor, and putting Russian and Spanish languages as my majors. I am interested in linguistics and communication with different languages. Learning languages does not just mean learning the linguistics; it involves learning history and culture of the people who speak the language as well. The topic of immigration in the United States definitely ties in political science (particularly immigration and foreign policies) as well as cultural and linguistic adjustments of the people who arrive into the country.

How much did your mentor help you with your research?

If I had to describe the help and advice I receive from my mentor with my research, I would say that Dr. Poggio is the one person who keeps me level-headed. Meetings with Dr. Poggio provide me with a sense of direction: I know what I have to do, what I have to work on, and what I have to plan to do in the future. She is always there when I need advice, and her sense of honesty and clear mindedness helped me learn about myself and how exciting a research project can be. She taught me responsibility in addition to many lessons about life in general, like how to remain calm during times of hardship.

What has been the hardest part about your research?
The hardest part of research has been getting the methodology approved by the Institutional Review Board (IRB), creating the questionnaire for interviews, and actually finding people for the interviews. It has been very time consuming, and it is highly probable that conducting interviews themselves will take a long time as well. It is also hard to be able to include all the articles I read about into the literature review without getting off topic.

What is your advice to other students about getting involved in research?
My advice is to make sure that you know exactly what you are doing for your research. If you know you need to do something that is time consuming like getting IRB approval, do it as soon as possible. Do not leave things to be done on the last day before the deadline. Lastly, find things that you are truly interested in as potential research projects: if your heart is not in it, then it is harder to put effort into the work.

What are your career goals?
My career goals involve working in the government, particularly Department of Homeland Security, Department of Defense. I would be interested in working as a translator or have a position in the United Nations, as well.

Megan Powell, Psychology
"Motivational Interviewing and Intimate Partner Violence Recidivism: An Eight Year Follow-Up on Men Who Batter"

Intimate partner violence (IPV) has persisted in society as a major public health issue. The current study focuses on intervention for men who perpetrate IPV. The findings are generally divided and inconclusive, and experts in the field continue to struggle to find a universally-successful IPV intervention program. However, recent literature shows promise in the way of an approach called motivational interviewing (MI), which is meant to instill a sense of responsibility and a desire to change in batterers. Recent study findings have revealed improvements in IPV perpetrators' engagement into a change process when exposed to MI. The current research analyzes the long-term criminal recidivism rates over an eight year period after treatment, comparing groups of men who were treated either using MI or a standard intake (SI) at the Howard County Domestic Violence Center. Data on criminal recidivism is currently being organized and quantitative findings will be available to present at URCAD. If the findings demonstrate significantly lower recidivism for men who received MI, this will provide strong support for more IPV intervention programs to adopt MI methods, and will contribute to the search for more universally-effective treatments for male perpetrators of IPV.

What research experiences have you had?
I started working with a clinical psychology doctoral candidate Amber Norwood on her dissertation, utilizing the Maryland Judiciary Case Search site to find and code participants' criminal histories. Her thesis investigated the effects of a number of demographic variables on criminal recidivism among a population of people who were found Not Criminally Responsible (the insanity defense) for their crimes, and were thus hospitalized instead of imprisoned. From there, I started work on my current independent project.

Currently, I work in Dr. Robin Barry's relationship lab, investigating how and why disengagement among newlywed couples leads to distress.

How did you find the research opportunity?
I had worked with Dr. Chris Murphy, chair and professor of the Psychology department, for about two years doing various tasks around his Relationship Violence lab, as well as working with his graduate student, Amber Norwood. At the end of my sophomore year, Dr. Murphy discussed some of my options for the next year, and that included doing an independent project. He laid out some ways that some old data could be used to ask a new research question, and we went from there.

Who did you work with on this project?
I'm working with Dr. Murphy and his graduate student, Brian Jobe.

Was this your first independent research project?
Yes, this was my first independent project. I knew I wanted to be involved with research during my career and I thought this would be a great way to be exposed to it, as well as impress graduate schools!

Do you get course credit for this work? Paid? How much time do you put into it?
I'm getting three credits for each semester I've been working on this project (two, including this semester) for PSYC 490. Technically it's eight hours per week but it fluctuates depending on what work needs to be done.

How did you learn what you needed to know to be successful in this project?
Dr. Murphy and Brian have been just amazing, guiding me through writing my paper for PSYC 490, and explaining along the way the logic and flow a research paper needs to have. I knew inherently that I would have to stay on top of the work required for this project (literature review, writing the paper, data analysis) or I would fall behind very quickly.

What was the hardest part about your research?
The hardest part is always keeping up with the work. You need to make sure you are constantly making more and more edits to make sure that your paper, abstract, poster, etc, is the best that it can be. You want it to be quality writing that you would see in an academic journal.

What was the most unexpected thing?
I knew my paper would take a lot of edits, but I don't think I realized just how much! I think I was also a little surprised at how rusty my research paper writing was. You really need to practice all the time. It's easy to fall back on poor writing habits.

Is this the first time you have applied to present at URCAD? How did you find out about applying to present your work? Are you excited?
This is the first time I have applied to URCAD, and I am super excited and nervous! In past years I've seen students getting ready to present, and I knew that if I could get a research project together, I would definitely want to apply. So here I am!

What is your advice to other students about getting involved in research?
Do it now! There are always opportunities to get involved with research and there is nothing worse than regretting something that could have helped you advance your career.

What are your career goals?
My goal is to go on to graduate school in a clinical psychology Ph.D. program. I hope to continue doing research on relationship violence and criminal recidivism behaviors. Ultimately, I would like to work in the courts conducting court-ordered assessments (such as to determine competency), and in the prisons doing therapy with inmates. Whatever I end up doing, I always want to be working

with the criminal population. I find there is a wealth of research just waiting to be done with this population, and it's always extremely interesting!

What else are you involved in on campus?
I've been a Resident Assistant on the Honors College Living Learning Community (LLC) in Susquehanna for the past two years. I'm also working with Dr. Robin Barry in her Couples an

d Family Relationships lab, which has been a great experience!

Lael Rayfield, Mathematics
NIST Researcher
"Simple Analysis of Biometric Matchers Based on Generated CMC Curves"

What are biometric matchers? In Forensic Science, biometrics refers to technologies that measure and analyze human body characteristics, such as DNA, fingerprints, eye retinas and irises, voice patterns, and facial patterns, for authentication purposes. Biometric matchers compare a person's features against stored biometric features in a database to see if the computer can find a match and identify the subject. Modeling the performance of the automated matchers is important for recognizing abnormal behavior in test results, and predicting performance of matchers when the size of the database is greatly increased. In this talk I will present the results of comparing two different functions that model the performance of biometric matchers: 1) experimentally measured Cumulative Match Characteristic (CMC) curves; 2) and best-fit curves produced by the Power-law Distribution.

How did you find out that you could do research in your field in the summer?
I found out that there were research opportunities available for mathematics majors through the Meyerhoff Scholarship Program.

How did you know that research at the National Institute of Standards and Technology (NIST) was what you wanted to do?
I was interested in NIST because I thought it was a great opportunity to work alongside government researchers on a real problem that has not been solved. I also heard a lot of positive feedback from students who had participated in the SURF program.

Did you apply to other places?
Yes, I did! I applied to 16 other programs in addition to NIST and received three acceptances. I was also accepted into the Summer Institute for Training in Biostatistics at University of South Florida and the Summer Undergraduate Math Research program at Kansas Sate University. It is difficult to get a research position as a freshman, so I was very grateful to have options.

Was the application difficult to do? Did you have help with this?
I started my applications pretty early—by Thanksgiving I had a list of all 17 places I wanted to apply to and had written my personal statement. I started filling out the applications in early January. Some of the applications were more time consuming or required more written essays than others. I worked very diligently, though, and finished them all in about two weeks. I did have assistance from the Meyerhoff staff and my peer advisors in selecting good programs and writing a strong personal statement. I imagine the process would have been much more frustrating without their help!

What was your summer research project?
My research was on Biometric matchers. Biometric matchers compare images of a person's features (such as DNA, fingerprints or irises) against images stored in a database to see if the computer can find a match and identify the subject. The matchers I analyzed

were used for latent fingerprints and face recognition. I compared two different functions that model the performance of biometric matchers and tried to figure out which matchers worked best and why.

Who was your mentor for this project?

My mentor was Dr. Vladimir Dvornycheko, one of the mathematicians working on this project in the Information Access Division at NIST.

How much time did you put into this work?

NIST employees typically work 40 hours per week. I work from 8:30 to 5:00 on weekdays for 11 weeks this summer.

Were you paid? Where did you live?

Yes, I was paid! I've never had a real job before, so the excitement of receiving a paycheck was a new experience for me. All SURF students are paid a stipend. As for living arrangements, I lived in the Hyatt House hotel in Gaithersburg for free. It is nice to live so close to NIST and to meet aspiring researchers from all over the world.

What academic background did you have before you started?

I had just finished my freshman year when I started at NIST. I did not know very much about math research or how it is done until this summer.

How did you learn what you needed to know for this project?

My mentor and officemates were very patient with me and helped me get up to speed. I also spent some time reading books and research papers related to my project. Within a few weeks, I had a pretty solid understanding of everything.

What was the hardest part about your research?

The hardest part was probably the beginning. Initially I found myself staring at dozens of spreadsheets full of data, not having a clue what to do. I did make some mistakes, but over time I got used to working with the data.

What was the most unexpected thing?

I didn't expect people at NIST to be so friendly. Everyone you meet to is happy to help you and very enthusiastic about what they do.

What is your advice to other students about getting involved in research?

Don't be afraid to apply for a research position! Even if you don't have much experience (like me), it doesn't hurt to just apply. Also, don't limit yourself by applying to only a few schools. Programs are competitive and it's good to have as many options as possible.

What are your career goals?

After I finish at UMBC, I plan to go to graduate school for a Ph.D. I'm not sure what kind of career I'm suited for yet, but I have a lot of options to choose from. I'm interested in a career that involves math or math research.

Abigail Rein, Psychology
"Changes in Spirituality, Optimism and Self-esteem among Participants in a Women-Centered Wellness Program"

Spirituality, optimism, and self-esteem are important aspects of individual well-being. Interventions that impact these variables may provide insight about how to create positive change in people's lives. Transformation 101, an eight-week course developed by a women-centered social change organization called Shakti Rising, aims to increase self-esteem, optimism, and spiritual awareness among participants. The curriculum includes activities that encourage participants to explore the physical, mental, emotional, and spiritual domains of their lives through meditation, group discussion, and guided journaling. Participants also learn to make small changes that positively impact their lives. This study investigated the success of the program by analyzing differences in participants' pre- and post- scores on the Spiritual Involvement and Beliefs Scale - Revised (SIBS), the Rosenberg Self-Esteem Scale (RSES), and the Life Orientation Test - Revised (LOT-R). Researchers hypothesized an increase in spirituality, optimism, and self-esteem. The results of the analysis will be discussed during the presentation.

When did you start conducting research at UMBC? How did you find a mentor and project to work on?
I started doing research at UMBC during the Fall 2011 semester. I had a very helpful Teaching Assistant in one of my classes during Spring 2011 who was looking for some help with her research and she invited me to work with her.

What did you know about your field/project when you started? How did you learn what you needed to know?
Previous to starting this research project, I had a solid background in general psychology, but I did not know a lot about the type of community psychology that our project is based on. I learned a lot through discussion of the project with my mentors and through researching background information on the topics that we were studying.

Who do you work with on your project? Other undergraduates? graduate students? faculty?
I mostly work with one graduate student, Magda Permut, and her mentor, Professor Ken Maton.

How did you decide to present at URCAD?
I received a Travel Grant through the Office of Undergraduate Education to help fund a trip to present the research that I was doing at a conference in California. The Office of Undergraduate Education asked if I would also be willing to present the research at URCAD.

Was the application difficult?
I felt that the URCAD application process was fair and straightforward.

How did you know what to put on your poster?
The poster presentation information session led by Dr. Steven Miller greatly helped me to understand the basics of what should go on a research poster. I have also received guidance from the graduate student that I work with.

What are your goals for after UMBC?
After graduating from UMBC, I would like to enter into a graduate program and ultimately pursue research as a career.

Would you suggest to other undergraduates that they find a research project?
I would absolutely suggest that other undergraduates get involved with a research project. It can not only help you to become more familiar with certain areas of a subject, but it also encourages you to be creative and motivated. There are many personal and professional benefits that can be gained by being part of a research project.

What else are you involved in at UMBC?
I also work as a desk staffer at Potomac Hall on the UMBC Campus.

William Rice, Economics
"The Humble Beginnings of Public Education"

Many people in this country take for granted the immense benefit that public schooling provides for the citizens of the United States. Even those of us who have been instructed in the public fashion are not privy to the processes by which universal education came into fruition. This research investigates the driving factors behind what caused public institutions for education to first be established in eighteenth century England. When taking a close look at the underlying themes, one soon realizes that these schools were being created for a number of reasons other than solely the betterment of youth. From powerful bureaucrats stroking their already enormous egos, to the devout Christians attempting to bolster their chances of receiving a heavenly reward; the incentives that eventually led to the expansion of public schooling are diverse and in some instances, ethically questionable. This presentation will feature leading figures that both supported and opposed the creation of public schooling in eighteenth century England. Specific examples may be selected from Mandeville's writings and those of Sarah Trimmer. This presentation aims to convey the conflicting motivations behind the origins of public education in the world's first industrial nation.

What research experiences have you had?
I have spent the past year researching the driving factors that brought about the creation of widespread public education in 18th Century England

How did you find the research opportunity?
I met with my economics professor privately, as we were speaking about our academic interests this opportunity presented itself.

Who did you work with on this project?
Professor David Mitch PhD

Was this your first independent research project?
No, last year in high school I researched the effects of licensing vs. non-licensing legal cases involving landlords and tenants.

Do you get course credit for this work? Paid? How much time do you put into it?
I am paid for this work. I put in between 12-16 hours of work per week, most of that is spent reading through 18th-19th Century texts.

What academic background did you have before you started?
I have always loved studying European history, but never specifically England during this time period. So I had some general knowledge about what was occurring in Europe at the time but not many specific details.

How did you learn what you needed to know to be successful in this project?
I spent time with my advisor at the Library of Congress and in his office discussing the methods he would like me to use to find the information that would be most useful to him.

What was the hardest part about your research?
There was a lot of reading to do. Being accurate in addition to balancing the time needed for research with time needed to focus on my

studies was difficult at a few points during the year. Dr. Mitch was flexible and understanding during stressful times in the semester such as finals week.

What was the most unexpected thing?

How much fun reading such old texts could be! I believe that the work I have done has improved my writing as well as my vocabulary.

Is this the first time you have applied to present at URCAD? How did you find out about applying to present your work? Are you excited?

Yes, it is the first time that I have taken part in URCAD. Dr. Mitch suggested the idea to me. I cannot wait to make my presentation. I thoroughly enjoy speaking in front of crowds.

How does this research experience relate to your work in other classes?

It has helped me to improve my writing which has proven to be extremely useful in my Constitutional Law class.

What is your advice to other students about getting involved in research?

Get involved as soon as possible and try something new. You never know what kind of interesting material you will get involved with!

What are your career goals?

I will graduate with a degree in economics and a minor in legal policy. I plan to attend UB Law and practice locally. I love Baltimore and there is nowhere else that I would rather live!

What are you doing next for research?

Potentially doing more work with Dr. Mitch or working for WR Grace over the summer time as a paralegal intern.

What else are you involved in on campus?

I am a Sondheim Public Affairs Scholar, I have been offered a job as a residential assistant next year, and I volunteer at a local aftercare program. In my spare time I play club as well as intramural soccer.

Dan Roeder, Theatre Studies and English
"'Terms of Art': Interpreting Mamet's *Oleanna* for the Stage"

When David Mamet's *Oleanna* debuted in 1992, reviewers immediately contextualized the play as a response to the Clarence Thomas-Anita Hill sexual harassment scandal. The play was widely seen as a polemic against notions of political correctness in academia, and past productions have provoked notoriously misogynistic reactions from its audiences, with many critics labeling the play as inherently anti-feminist. My research attempted to challenge these perceptions. While directing the play, I have used script analysis skills, rehearsal techniques and the manipulation of promotional material to create a production that subverts anti-feminist insinuations and focuses on the power of language and the dangers of corrupt or inefficient pedagogy.

What academic background did you have before you started your research?

Since coming to UMBC, my primary interests have been in dramaturgy and political theatre. While I am a Theatre and English major, I feel as though my work between the two majors is ultimately geared towards a sociological understanding of the world around me so that I can interpret it on stage as honestly and effectively as possible. The courses that made my work on this play possible are Script Analysis and Modern Theatre 1: Social Protest. Script Analysis taught me the analytical strategies necessary in interpreting a script as a blueprint for theatrical performance and drawing organic conclusions about the play

independent of impressions of past productions. Modern Theatre 1 taught me how to use my knowledge of Script Analysis to identify the dominant ideologies behind the playwright's rhetorical strategies so that I can either enhance or subvert them with my production choices.

Was this your first independent research project?

I had the opportunity to write and direct a play for my Humanities Scholars seminar, *New Orleans Sounds… Creole* last spring, which was produced through TheatreCOM. My research for that project centered upon interpreting New Orleans for the stage, which led me to interview director Emily Mann about New Orleans' influence on her work for the recent Broadway revival of *A Streetcar Named Desire*.

How did you find the research opportunity?

I had read *Oleanna* for the first time in high school and immediately put it on my shortlist of shows to direct in the future. I'd fallen in love with the rhythms of the language and the balance of power between the two characters. Over winter break, I was developing directorial proposals for local companies when I realized that I could simply ask the Theatre Council of Majors if they could produce*Oleanna* that semester. I was very lucky that it worked out!

What was the hardest part about your research?

The hardest part was balancing our schedules. Due to school and rehearsal space conflicts, we only had time for four weeks of rehearsals (10 hours of official rehearsal time a week, on average). The average show, especially at the collegiate level, has a much longer rehearsal schedule, so we had to condense our work effectively.

How did you learn what you needed to know to be successful in this project?

As I was developing my proposal, I made sure to spend time studying scholarly discourse on the play so that I could see how audiences have responded to it in the past. After reading about critiques of perceived anti-feminism within the text, I made an effort to return to the feminist texts I had explored in Modern Theater 1 to help me to subvert such perceptions from within the script.

Who did you work with on this project?

My core production team comprised of my two actors, Jonathan Jacobs and Erin Patterson, and our Stage Managers, CiCi Grady and Grace Davenport. The fight choreography was developed by the Theatre Department's technical director, Cristian Bell, and our lighting consultant was Billy D'Eugenio. Publicity for the show was developed by Serafina Donahue and Mike Woodard.

What was the most unexpected thing?

There was a snow-less "snow-day" the day before our first performance- as we had been running behind schedule, it was an entirely unexpected and very welcome opportunity to make substantial progress on the show before opening.

What is your advice to other students about getting involved in research?

For undergraduate theatre students, I recommend working on as many shows as possible; the more challenging, the better. Also, it helps to look into theatre workshops that build upon your knowledge of your areas of interest (puppetry, devising, Commedia, specific craft techniques). Plan your schedule so that there's no time when you aren't engaging your craft- don't be afraid to test your limits and don't be afraid to fail.

What are you doing next for research?

I'm currently serving as a dramaturg for the Theatre Department's production of *The Two Gentlemen of Verona*. I'm also gearing up to Study Abroad in Leicester England this fall, where I hope to develop a research project centering around new play development. I'm also looking for my next project to direct; hopefully I'll find a supportive venue soon!

Matt Schley, Environmental Science and Mechanical Engineering

"Correspondence among Impervious Surface, Water Quality, and Water Quantity Time Series"

Current understanding of the impacts of land development on streams is typically based on study of a single site through time, or multiple sites at a single point in time (space-for-time substitution). Spatially extensive studies through time are needed to generalize long-term analyses and confirm broad-scale relationships to better guide land-management policy. Recently, investigators have developed an annual history of satellite-derived impervious cover for the Baltimore-Washington, DC metro area spanning the past 20 years. Rates of land conversion and storm water management regulations have changed dramatically during this period. This research will compare the "space-time stack" of impervious-cover maps to stream discharge and water quality time-series data from more than 30 tributary watersheds of the Chesapeake Bay throughout the region. I will assess whether or not changes in development policy and practices have had a detectable influence on the status and trends of water quantity and quality, and how effectively site-specific or extensive snapshot studies represent the effects of development.

How did you find your mentor for your research?
Students in the GES department have the ability to pick their own advisor. When I saw that there was a professor, Dr. Matt Baker, who shared both my research interests and name, I knew that's who I was going for! A watershed science class with Dr. Baker during freshman year confirmed for me that I wanted to work with him.

How did you know that this was the project you wanted to do?
There were a few things that drew me directly to this project. First of all, I have recently become interested in the use of Geographic Information Systems (GIS) technology for the purposes of mapping and analysis. Second, this project is a study of local watershed data from Maryland, DC, etc. I have lived in Baltimore all of my life and have a natural attachment to the area. Finally, I have always enjoyed hydrology and watershed analysis. Sounds crazy, right? It grew from playing in streams as a kid at summer camp and developed into a love and passion for the mechanics of water flow, the beauty of the biota, etc. The fact that I am able to combine all of these interests into one research project is reason enough to be excited!

Is this your first independent research?
This is not my first independent research project. I worked with Dr. Baker in my freshman and sophomore years on other watershed analysis projects.

Do you get course credit for this work? How much time do you put into it?
I don't get course credit for this work, but that's not what it's about in the end! The amount of time I spend working on this depends upon where I am in the project. A lot of the work is coding in a statistics program language called 'R.' Some of the tasks that I need to accomplish use simple codes that I am able to figure out pretty quickly, so the work only takes me a few hours that week. Other weeks, I am packing every hour of my free time into figuring out a code that is more complicated than the aforementioned, or that I haven't worked with before. These tend to take WAY more time than the codes from the easy weeks!

How did you hear about the Undergraduate Research Award (URA) program?
My advisor, Dr. Baker, suggested the program to me. Since I had worked with him in the past, he recommended that I apply for the URA and come back to work with him in hopes that we could knock out another project.

What academic background did you have before you applied for the URA?

I currently am an Environmental Science and Mechanical Engineering double major. Since UMBC doesn't have a Civil Engineering program for undergraduates (or didn't when I started here), I have been forging my own program using classes from my two majors. I started as an Environmental Science and Math double major, but quickly realized that I needed a stronger engineering background and made the change to Mechanical Engineering.

Was the application difficult to do?
Not at all! The URA application is made to be very straightforward for students and mentors. If you are thinking about applying, definitely don't let the application trouble you!

How much did your mentor help you with the application?
Because this is a fairly new project for me, Dr. Baker worked with me to carefully craft my abstract so that it focuses exactly on what I already have, and what I hope to accomplish for this project.

What has been the hardest part about your research?
The hardest part of my research, hands down, has been learning to code in 'R.' Prior to working with Dr. Baker, I had never written a line of code in my life. When he introduced me to 'R,' I was beyond lost. I had no idea what I was doing. I started with simple things like getting a count of the number of columns in a spreadsheet, but only after I figured out how to load that spreadsheet into the program itself! With a lot of practice, experimentation, and help files, I have been able to gain a much better understanding of the language.

How does your research relate to your work in other classes?
My research relates directly to most of my Environmental Science studies and even to parts of my Mechanical Engineering studies. I have been taking a lot of hydrology and GIS classes in the GES department, both of which are directly connected to my research. In the Mechanical Engineering department, I have taken statics and dynamics and am getting into fluid mechanics, all of which help me to better understand the flow quantity aspect of my research.

What else are you involved in on campus?
Prior to this year, I was a member of SEB, Pi Kappa Phi, club soccer and volleyball, and a few other things. I am still a part of both club soccer and Pi Kappa Phi, and will also be a TF for statics starting this fall.

What is your advice to other students about getting involved in research?
By all means, if you have an interest in it, GO FOR IT! The faculty at UMBC is committed to helping students get involved in projects that are both relevant to their interests and groundbreaking in their respective field. We have an amazing opportunity at UMBC and it would be foolish not to act on it if it is something in which you hold a genuine interest.

What are your career goals?
I would like to continue my work with hydrology and/or GIS. I am not sure if I will work for the government, work in the private sector, teach younger students, or where I will end up. The dream for me would be to work in Colorado or some other cool place for a few years as a hydrologist and watershed analyst and then to switch over to teaching high school Environmental Science and/or Engineering.

Caitlin Smith, Anthropology and Ancient Studies
"Interpretation in the Museum: An Ancient Gem in a Modern Context"

Museums are often presented as repositories for material culture from ages past or distant places. They are storehouses where visitors can go to look at and learn from objects they might otherwise never see in their lifetimes. This presentation adopts a different perspective, examining the museum instead as a reflection of modern mental constructs and interpretations of a past which we can never objectively know. It explores the history of the Gem with Oedipus and the Sphinx from its creation in Hellenistic Greece to its current setting in the Walters Art Museum's massive collection, focusing on the gem's changing functions and meanings over the course of its existence. My research suggests that as the gem has evolved from a private object to a public one, its uniqueness has been largely subverted. Instead, it is only one among many objects which the museum categorizes and employs to convey a highly generalized modern interpretation of the people and culture of Ancient Greece.

What research experiences have you had?
I'm working on two big projects right now. I'm working with Dr. Michelle Stefano of the American Studies Department and Maryland Traditions on the documentary she and another professor are making for their class. I've been doing fieldwork with her in Dundalk, mostly observations and interviews. The other project is my own and has inspired my URCAD presentation. I'm focusing that research on the effect of the museum environment on interpretation. I've been doing a lot of observations at the Walters Art Museum before, during, and after the tours I give there and compiling papers from various disciplines including material culture, ancient studies, and museum design. It's been a very private experience, mostly to fill my own curiosity until now.

How did you find the research opportunity?
I began the research last semester in order to write a term paper for ANCS: 350 Myth and Archaeology. I wanted to find a way to bring my interest in museum interpretation into the paper which was meant to be an exploration of a particular ancient object on display. From there, it just kind of exploded. I had a lot of support from my professors, Dr. Tim Phin and Dr. Michelle Stefano, who helped me figure out exactly where to go with my research and what sources would be best.

Who did you work with on this project?
I worked on this research on my own, for the most part, though I did have the support and assistance of many professors in the Ancient Studies Department and Dr. Stefano.

Was this your first independent research project?
I would not say it was my first but definitely my first large scale project.

Do you get course credit for this work? Paid? How much time do you put into it?
I received credit for this project as it was originally a term paper. I was not paid (unfortunately) but I did put a lot of time into it. We were working on these individual projects over the course of the entire semester. I did observations every Friday during my tours and read a ton of articles.

What academic background did you have before you started?
I declared my dual major in Anthropology and Ancient Studies before I even took my first university class. I've had a near spotless record during my college career though I have not always put myself out there to do individual research. I've had a job since I was 14 so most of my academic work was restricted to the classroom.

How did you learn what you needed to know to be successful in this project?
I did A LOT of reading. Most of my information came from academic papers and books and information from the museum itself. I also found a lot of inspiration in the classes I was taking that semester with the aforementioned professors. Dr. Stefano, especially, taught me a new way of thinking about the museum and museum interpretation in AMST 420: History and Theory of the Museum.

What was the hardest part about your research?
Finding a good breadth of sources was a bit difficult at times. I was tapping into a few different disciplines in order to construct and defend my thesis and it was hard sometimes to ensure that I had a good balance of sources. It was also a lot to process at once. I had a bunch of notes in a few different places - it was really hard to get organized before I knew exactly what I wanted to say.

What was the most unexpected thing?
This paper/research has stuck with me a lot more than most of the terms paper and projects I've done over the years. I just feel like it's not quite done, in a way. There's so much more to say and consider. In fact, I've decided to continue this research for my master's thesis. It's kind of strange how this one paper for this one class turned into a project which will play heavily into the next several years of my life.

Is this the first time you have applied to present at URCAD? How did you find out about applying to present your work? Are you excited?
It is my first time applying to URCAD. I've known about URCAD for years but I've never felt that any of my work was good enough to present. I probably wouldn't have applied at all in Dr. Phin hadn't suggested it. Now that I've been accepted, I am very excited to share my work. I think it will be a great experience for me personally and a wonderful way to share my passion with others.

How does this research experience relate to your work in other classes?
I consider this research to be the joint result of my time in ANCS 350 and AMST 420. My classes and experiences came together for me last semester in a really inspiring way which is a lot of the reason why I've been so interested and dedicated to this project.

What is your advice to other students about getting involved in research?
Find someone or something that truly and deeply inspires you. Maybe you'll find that in an internship or a class or even in a particular professor. It's important that you love what you're researching so that when it gets stressful and difficult and you feel like nothing is getting done, you'll want to keep going anyway. And remember to have confidence in yourself and your work.

What are your career goals?
I intend to pursue a career in cultural sustainability be it in the museum, a non-profit, or elsewhere. I want to find a position which would allow me to mediate between cultural institutions and the people to which they cater. There are a lot of voices and stories that are lost in the construction of heritage and history which I think needs to be addressed. I would love to do that as a career.

What are you doing next for research?
I intend to continue my work with Maryland Traditions which may encompass a variety of projects. As I mentioned before, I also intend to bring this research into my graduate career and hopefully build on it over the next few years. It will absolutely play into my masters thesis.

What else are you involved in on campus?
I am a Humanities Scholar and a member of the Honors College. I was inducted in Phi Beta Kappa Honor Society this past fall.
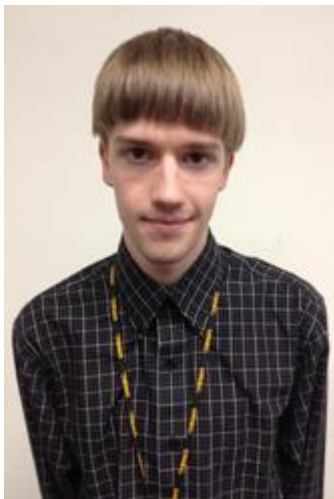
Nathan Smith, Physics/Mathematics
SURF Scholar
"Optimization and Modeling of Metal-Oxide-Semiconductor (MOS) Photoelectrochemical Cells"

Solar energy represents one of the most promising and potentially useful fields in terms of renewable energy and thus the importance of developing and improving solar cell designs and directives is extremely high. Photoelectrochemical cells are one of many innovations on the concept, and often utilize the classical method of gathering electricity from light via the photoelectric effect and then using that electricity to dissociate water to generate hydrogen for subsequent electricity generation by fuel cells. This research focuses on the use of metal-oxide-semiconductors (MOS) with metallic Pt collectors on an oxide-covered p-type Si bulk. In order to maximize the energy harvested from the sun many aspects of semiconductor physics must be analyzed and optimized in these solar cells. Various design considerations such as direction of illumination, the geometry of catalytic collectors, the nature of the tunneling oxide layer, and the incorporation of a multiple junction (tandem) structure. Using MATLAB and the Python-based FiPy engine, the influence of changing these various cell design parameters can be analyzed and then tested on solar cells created in the laboratory. The trends determined will hopefully allow the development of more advanced and efficient PV and PEC cells. Silicon is the primary element being evaluated in the is work due to it's low cost, large elemental abundance, and ability to efficiently harvest solar energy. A thin SiO_2 layer serves as the tunneling oxide and the collectors are made by depositing platinum on the surface via electrodeposition (for smaller sizes) or a shadow mask technique (for larger sizes). The sun delivers a huge amount of energy to the Earth's surface every day (180 W/m²), most of which is absorbed and dissipated instead of being put to proper use; improving PV and PEC technologies can change this.

How did you find out that you could do research in your field in the summer?
The Meyerhoff program introduced me to the idea of research internships during undergraduate summers. Since freshman year they have encouraged many applications to many places, including the Summer Undergraduate Research Fellowship (SURF) program at the National Institute of Standards and Technology (NIST.) Before I came to college I had never noticed research opportunities or even heard of them or thought about them. As a Physics/Mathematics major, I had kind of thought all the internships available were more for the life sciences as those were the only ones I had ever heard about.

How did you know that research at NIST was what you wanted to do?
My father has worked at NIST for quite a while and on the few occasions I visited the campus I always loved it. Physics has a huge presence at NIST, which is a delightful change of pace from what I usually see. I liked the idea of starting my first research experience at somewhere close and comfortable that I also knew for sure would be a great place. I'll be back next year if I am fortunate enough to be accepted again.

Did you apply to other places?
I applied to several other places such as NASA, APL, and a few REUs at various universities across the country. I was rejected or did not hear back from all of them.

Was the application difficult to do? Did you have help with this?
The SURF program application is very straightforward, in my opinion. There are some finer details to work out with the college, but for UMBC at least, Ms. McGlynn makes everything you need to do extremely clear and is quite helpful throughout the entire process even going as far to review your personal statement and resume. By the time your application is sent off there is essentially zero chance that anything is incorrect.

What was your summer research project?

My project dealt with the modeling and optimization of metal-oxide-semiconductor electrochemical solar cells. The purpose of the photoelectrochemical cells is to take light and convert it into electricity and use that electricity to break water into hydrogen gas and oxygen gas, thus providing hydrogen gas for fuel cells. The project deals heavily in renewable energy and aims to make silicon-based solar technologies more viable. I was altering solar cell geometries and composition to attempt to improve the efficiency and ensure that the voltage generated is enough to split water.

Who was your mentor for this project?
My mentor is a post-doctorate student named Daniel Esposito. I could not have asked for a better mentor. I also worked with Dr. Jon Guyer (who was invaluable as well) when it came to the more complicated FiPy partial differential equation solver.

How much time do you put into this work?
I worked five days a week from around 7:30 a.m. to 4:30 p.m. for 11 weeks over the summer, so quite a bit of time. The project was large and interesting; I could have used more time!

Were you paid? Where did you live?
SURF students are paid $5,500 for the 11 weeks of work, which is a very good deal. I commuted from home, but I know that NIST will house most of the SURF students at Hyatt House (a nearby hotel) in very accommodating conditions, so that is certainly an option.

What academic background did you have before you started?
I had no previous research experience, but am a rising junior Physics/Mathematics major with ~115 credits under my belt. I have a job setting up labs at the UMBC Physics Department and am fluent in Python as well as MATLAB and Mathematica. Academically I was rather strong, but in terms of research I was completely new to it.

How did you learn what you needed to know for this project?
My mentor gave me a few papers to read and there is a wonderful website called PVCDROM that provides a wealth of information on how solar cells function and the semiconductor physics behind them. Google also played a large role in my learning.

What was the hardest part about your research?
The hardest part would have to be learning to research. When I had problems in classes, I can check my answers and ask questions. Here, I can still ask questions, but what makes this research is that NIST doesn't know the answers; that's why the SURF students are working on these problems, to find answers. It is a bit unnerving at first when you come up with a result and you can't know whether or not it's correct because it's brand new.

How does this research relate to your course work at UMBC?
My research had multiple tie-ins to my Modern Physics course and I was glad to have had it before hand as I was better equipped to understanding the physics behind semiconductors. The classes on/using MATLAB, Mathematica, and Python were invaluable. Having programming knowledge beforehand was very useful and it seems that most of the friends I made here use programming in their research as well.

What is your advice to other students about getting involved in research?
Try it. I find it extremely rewarding and fun, but not everyone will. Best you don't go through undergrad never taking these opportunities and then get into a research position because it's what you THINK you want and find out instead that you hate it. Find out now. Also, don't get discouraged if you're not accepted the first time, try again. I applied to 17 places my freshman year and got into none of them.

What are your career goals?
I want to get my Ph.D. in physics and go into research at a fine establishment such as NIST. After a nice long time as a researcher I hope to return to academia as a physics professor at a research university.

David Stonko, Mathematics and Statistics

"A Force-Based Approach to Unraveling the Mechanism of Cell Migration"

Faculty Mentors: Dr. Michelle Starz Gaiano, Assistant Professor, Department of Biological Science
Dr. Brad Peercy, Assistant Professor, Department of Mathematics and Statistics

Cell migration is essential for the normal development of multicellular organisms. Despite its prevalence throughout biology, the mechanism of cell locomotion is poorly understood. This is especially true of the situation where a cluster of motile and non-motile cells translocate together. Our team studies a genetically orchestrated process of this type within *Drosophila melanogaster*. During development migratory cells begin in the epithelium, differentiate, form a cluster and collectively migrate toward a chemoattractant. This movement is dictated by forces that act between neighboring cells. To understand these interactions we constructed a force-based ODE model of the dynamics of adhesion, repulsion, migration and stochastic fluctuation between cells. Our results indicate that our model is sufficient to reproduce the behavior observed *in vivo*. Moreover, this model predicts the behavioral change associated with altering the number of migratory cells, provides insight into the mechanism sufficient to cause rotation in the migratory cluster, and makes predictions about the epithelial to motile transition of the inchoate cluster. This model will thus be useful for streamlining experimental work, providing a context to interpret experimental results and for elucidating the mechanism of collective migration from fundamental bio-physical interactions.

When and how did you find out that you could do independent research or creative work as a UMBC undergraduate?
From the very beginning of my freshman year I had heard about the support given to undergraduates to do research here at UMBC. As I began to get into my coursework in Mathematics and Biology I began to realize that these stories are not fairy tales, but are the experiences of everyday students. I was also encouraged to get involved in research by several professors, who would eventually become my research and (later) my thesis mentors. Their encouragement in conjunction with the culture of research at UMBC inspired me to do research.

What academic background did you have before you started?
When I first became involved in research at UMBC I was finishing up my sophomore level mathematics courses and introductory chemistry and biology. Even with only these basic courses I was able to contribute because my mentors spent the time to catch me up and provide assistance when I required it. I encourage everyone, regardless of where you may stand in your coursework, to begin speaking with your professors and consulting programs that interest you.

How does your research/creative work relate to your work in other classes?
It has been amazing to see my work in the lab translate into not only my coursework, but also to real world situations. It has helped me become a stronger critical thinker, expanded my interpersonal skills, helped me to work better on a team, and given me perspective into the nuances of interdisciplinary research. It also contributed to my success on the MCATs and with tutoring other students.

What is your advice to other students about getting involved in research?
Get involved! It is an amazing and unique experience. If you are a mathematics or biology major then I encourage you to check out the same program that I have had the honor to be a part of. It is called UBM, for Undergraduates in Biology and Mathematics research training program, and is an amazing program that approaches problems that lie at the interface of mathematics and biology.

How did you find a mentor and decide on a project?
I first met Dr. Peercy when he was my instructor for Linear Algebra in the spring of my freshman year. During this class he introduced me to the extremely interesting work that he was doing in the field of Mathematical Biology. This was around the same time that the

UBM program was starting up here at UMBC, so I applied to work with Dr. Peercy and Dr. Starz-Gaiano on a project. It was one of the best decisions that I made here in my time here at UMBC.

What are your career goals?
I am currently in the process of preparing to apply to medical school. My dream is to get into medical school and become a surgeon. I have no doubt that my undergraduate research experience here at UMBC and the amazing mentoring that I have received has been, and will continue to be, instrumental in helping me reach my goals.

What else are you involved in at UMBC?
In addition to the work I have described here, I am also a member of Lambda Chi Alpha Fraternity, on the Men's Club Volleyball Team, the Director of Institutional Development of SGA, a Member of the Pre-Medical Society, on the Math Team, an OPA and a Woolie. I am also a lab assistant at Johns Hopkins Medical Institute with Dr. Ryan Riddle, and I am a grader for the Department of Mathematics and Statistics here at UMBC.

Manpreet S. Suri, Information Systems
McNair Scholar
"A Wearable Braille-Based Computing Device"

According to the World Health Organization there are 285 million people in the world who are visually impaired. This number includes 39 million who are blind and 246 million who are low vision. Braille is a useful option for the visually impaired and allows them to read and write just as well as those who are able to read and write print. Assistive technologies enable the visually impaired to be productive citizens by facilitating effective communication. The visually impaired need a mobile solution to interact with technology because most computers don't support Braille. Although Braille keyboards are a wonderful advancement for the visually impaired community, they are too expensive and too large to conveniently use in any mobile context. Currently, the only option is text to speech technology which can be limiting due to interruptions, accuracy, and lack of privacy. The Arduino electronic prototyping platform is a tool that will allow us to build a wearable Braille output device that is cheap, portable, and user-friendly. We will conduct a user study in which we ask participants to speak out the characters that are programmed on the device to assess how long users take to read, how accurate their reading is by calculating error rates, and how small we can build the device and still have it be legible to users. We will also vary the device layout to test user preferences and ease of use.

When did you join the Ronald E. McNair (REM) program?
I was accepted as a McNair Scholar for the 2011-2012 academic year (REM 20).

How did you find out about McNair?
I found out through a friend who was applying.

What have you gained from being a McNair scholar?
I gained many valuable skill sets including: independent study skills, the ability to critique research, interpersonal skills, and the importance of fostering the mentor relationship.

What is your most recent independent research project?
I am working on creating a device that assists the visually impaired in reading Braille.
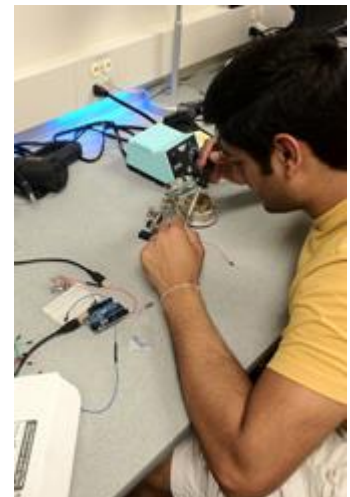
How did you find your mentor for this project?

I searched the Department of Information Systems for a professor doing research in the area of assistive technologies and Human Centered Computing. I came across Dr. Shaun Kane, who has done much work in these areas.

How did you know this was the project you wanted to do?

I didn't, Dr. Shaun Kane gave me a list of projects in his lab to pick from. I wasn't able to decide at first, but the opportunity to create a novel device really excited me.

How much time did you put into it?

I spent two hours every Friday during the spring 2012 semester working on the proposal and literature review. I worked about five to eight hours a day Monday through Friday for my summer Research Fellowship.

What academic background did you have before you started?

I was a Mechanical Engineering major for a semester, then I switched to Information Systems for its interdisciplinary nature.

How much did your mentor help you with your research?

My mentor introduced me to the topic and potential directions for the research. I am doing all of the research as an independent study under his guidance.

What has been the hardest part about your research?

The most difficult part of my research is iterative prototyping. This is a cyclic process of designing, testing, analyzing, and refining a product or process.

What was the most unexpected thing?

There is no one unexpected thing. The process of design is always unexpected because design, like fashion, changes very rapidly and constantly. Design is always improving.

How does your research relate to your work in other classes?

As an Information Systems major, I learn to work with computer hardware, software people, and the design process. I get to take what I learned in class and apply it directly to a real world problem.

What is your advice to other students about getting involved in research?

Research is a challenging yet rewarding way of exploring your interests. It is not for everyone. However, this should not dissuade you from attempting it, you might discover that you enjoy it and realize a passion of yours.

What are your career goals?

I aspire to go to graduate school and then work in the government in Network Security Administration.

Ke Tang, Political Science
"Jordan: NGOs in a Burgeoning Civil Society"

Civil society is the space occupied by citizens who involve themselves in organizations and institutions operating outside of a country's government structure. These informal institutions can be powerful forces, as reflected in the ongoing Arab Spring movement. Civil unrest in the Arab world is challenging regimes and in several cases has resulted in the ousting of dictators. However, the forces at work within any civil society are complex and range across a wide spectrum of social, political and economic activities. This research project focuses on Jordan as a case study and is designed to examine some of the organizations and institutions at work within the Jordanian civil society. Specifically, it will focus on a sample of Non-Governmental Organizations (NGOs) operating within Jordan at both the local and global levels. Their contributions will be assessed in terms of how their work on the ground measures up to their stated objectives. Through the creation of a documentary film consisting of interviews with key staff at the NGOs as well as footage of their day-to-day operations, this research will assess the nature and administrative capacities of the NGOs and address their contributions to the development of civil society in Jordan. By supplementing these interviews with analysis of project data and research statistics, this research will be able to generate a larger picture of the climate of Jordanian civil society and the ways in which it is impacting the institutional architecture of the country.

How did you find your mentor for year research?
Originally, I had no idea what I wanted to research. I knew what my regional interest was, and that was the Middle East. I was taking a class called US National Security Policy, and found out that my professor, Dr. Brigid Starkey, had regional expertise in the Middle East. I took another one of her classes, International Relations of the Middle East, and realized that given her interest and knowledge, she would be the perfect mentor for my project. I was also well into my application processes for study abroad opportunities in Jordan, and after consulting Dr. Starkey about the prospects of conducting research abroad, I realized the insights she was able to provide me were unique and very compelling.

How did you know you wanted to do your research in Jordan?
At the time of the Undergraduate Research Award application, I already knew I wanted to study abroad somewhere in the Middle East. In searching for programs that would send me there, I found many programs in Jordan, which has been a relatively stable country throughout the recent political turmoil in the Middle East. I had already applied for the Boren Scholarship Award by then, and on that application I had indicated my desire to study abroad in Jordan with **CIEE**, where there was a program "Diplomacy and Policy Studies." That program was perfect both geographically and academically: the country is located at the heart of the Middle East, and the classes (in addition to Arabic courses) were geared towards students pursuing career objectives in national security and other similar interests in international development. It seemed like the perfect match.

How did you define a project to do in Jordan while you were still in the United States?
When coming up with a project, I had to consider some constraints. I would be in a foreign country the language of which I'm still mastering. Given the cultural differences, navigating through a research project on my own would have proven highly challenging. My project, therefore, had to be feasible in terms of access and relevance, but still capture my interest. I knew Jordan would be the place to go. My adviser helped me by prodding me in the direction of possibly examining Jordanian civil society. My subsequent literature review of existing knowledge on Jordan yielded some interesting information, but not as much as I thought there would be: political reforms had allowed an increased flow of capital to the development of Non-Government Organizations (NGOs), but little literature actually existed on the subject. So from there, I devised a plan to examine NGOs in Jordan, and investigate their role in the development of Jordanian civil society.

Will your travel to Jordan and your work in Jordan be connected to the UMBC Study Abroad office? When do you leave? How long will you be there?

Yes, my travel to Jordan is coordinated with the **UMBC Study Abroad Office** as well as the programs to which I'm applying: CIEE (Council on International Education Exchange) for the Diplomacy and Policy Studies program, for Spring 2013, and SIT (School for International Training) for the summer Intensive Arabic Program for Summer 2013, immediately following CIEE.

What is the National Security Education Program Boren Scholarship?

The **NSEP Boren Scholarship** is a US federal government initiative legislated by David L. Boren, who argued to the US Senate the necessity of an increase in the number of experts in target languages and cultures that are valuable to the sustenance of US national security interests. These target languages and cultures reflected the nations that were typically underrepresented in US study abroad opportunities, and partnership with these countries would foster greater understanding and prospects with regards to US foreign relations. In 1991 the National Security Education Act established the National Security Education Program, with the goal of providing scholarships to undergraduate students and fellowships to graduate students. Following the completion of the program, recipients participate in the NSEP service requirement: one year of occupational service in a field related to either national security, or the language studied. Postings are usually in the Department of State, the Department of Defense, the Department of Homeland Security, or other teaching opportunities worldwide. I had the honor of receiving $20,000 to fund my study abroad in Jordan next year.

How did you know to apply for this? Was it hard? Who helped you?

The application process was largely straightforward. It was difficult in the sense that the essays had to be conceptually solid enough that whatever creative flair I injected to distinguish myself from the rest of the pile must not dilute the ideas I was trying to convey. To answer the prompts, I had to have a solid grasp of my stance of US national security – and I was fortunate to have taken Dr. Starkey's class by that point, because discussions from that class helped me generate my repertoire. Dr. Souders of the Study Abroad office was immeasurably helpful and was an invaluable resource for editing. He knew the application process inside and out, having done so many of them. He was actually travelling in Asia at the time of the application, and despite spotty Internet access and the distractions Asia has to offer, he still maintained a very encouraging level of correspondence.

How did you hear about the Undergraduate Research Award program?

I heard about it from a friend of mine who received it. She conducted her research while studying abroad, which was very similar to what I wanted to do. From there I did some research into the URA and talked to my advisers about the prospects. I received a lot of positive feedback and encouragement, so I decided to move forward with the application process.

Was the URA application difficult to do?

The application, no. The creation of the research idea was the most difficult part. The background research was time consuming, because I didn't want to miss anything and end up producing possibly redundant work. Once I had an idea that could be verbalized in an application proposal, the rest of the process fell into place.

Will you get course credit for this work?

At this point, I will not be receiving academic credit from the URA. It was started largely out of my own interest, and my desire to take advantage of my study abroad experience and explore the undercurrents of a country I otherwise may not have had a chance to visit. The courses I will be taking at CIEE will count towards my transcript.

What is your advice to other students about getting involved in research at UMBC or abroad?

Do your homework. Gather as much information about as many things as you can. Consider as many scenarios as you can think of. And – know what you want and how you want to get it. At the time I submitted my URA application, I did not know if I had received the Boren Scholarship. I went ahead with it anyway because I felt strongly enough about studying abroad that I was determined to go to Jordan one way or another, with or without scholarship money.

What are your career goals?

I am interested in diplomacy, foreign service, international development, and intelligence. Career paths within those fields have a huge spectrum of possibilities, all of which tend to be competitive. I am particularly looking forward to the NSEP service requirement because I will have a guaranteed position within an agency. From that I will be able to better determine my interests and long term goals.

Jeffrey Turner, Computer Science
NIST Summer Researcher

The VidAT tool was developed in conjunction with the ClearDTScorer to place bounding boxes around objects of interest. The ClearDTScorer identifies coordinates and dimensions of the boxes; as well as color coding them depending on how the system identifies them. This is a somewhat time-expensive procedure and cannot realistically be done to every frame of a video. The VidAT tool can draw bounding boxes onto the video wherever identified by the tracking log provided by the ClearDTScorer, and when one in every fifteen frames is evaluated there was a significant improvement in processing time of the video. The tradeoff of this sparse frame evaluation was poor video quality in the transitions of the bounding boxes, which appeared to "jump" every half-second. The enhancement to the VidAT tool interpolates the data in between video frames, and produces a modified tracking log that can be drawn by the filter without the costly process of evaluating every individual frame of the video. VidAT is being developed as a video filter for the open source FFMPEG project, and is being designed to conform to the specifications so that it can be used in conjunction with other video filters.

How did you find out that you could do research in your field in the summer?
I'm a rising senor computer science major/mathematics minor and I learned of the opportunity from being on a mailing list from the Shriver Center.

How did you know that research at NIST was what you wanted to do?
I have always wanted to study something that had not been studied yet, and I knew that the National Institute of Standards and Technology (NIST) was a prestigious institute, and that research and NIST would shine outstanding on my resume for grad schools or workplace.

Did you apply to other places?
Yes. I applied to about five different places for a summer internship and got acceptances from two.

Was the application difficult to do? Did you have help with this?
The application was not difficult to do, but it did take some amount of time. After I was done writing my personal statement and other essay-type questions I got my friends to proofread them for errors.

What was your summer research project?
I am working on a software that can enhance a working video filter to identify and track human facial movement in a video. Because of the complexity of the process, a human face cannot feasibly be identified every frame, so this summer I am working on a mathematical tool that can track what the person could be doing in the "in between" frames.

Who was your mentor for this project?
Dr. Jonathan Fiscus in the Information Technology Laboratory (ITL) at NIST.

How much time do you put into this work?

I worked seven to nine hours a day, five days a week for 11 weeks over the summer.

Were you paid? Where did you live?
Yes I was paid through NIST, and I chose to live at Walker Avenue apartments on campus. It is slightly less than an hour drive a day to NIST.

What academic background did you have before you started?
I was one course shy of completing a minor in mathematics, and a small handful away from completing my bachelor of science in Computer Science.

How did you learn what you needed to know for this project?
Different programming textbooks around the office were invaluable to my work, I commonly referenced the internet, and did readings assigned by my advisor to help.

What was the hardest part about your research?
Sometimes the computer has memory problems because of imperfect usage of dynamic memory allocation in the C programming language. These errors often do not show right away, but instead cause inconsistent program usage over time, so today's errors may have been caused by last week's mistakes.

What was the most unexpected thing?
How well I have adapted to using a Mac OSX system (I am a power Linux user, and thought I disliked Mac products.)

How does this research relate to your course work at UMBC?
Dynamic memory allocation is one of the cruxes of this project, and the computer organization practiced here at NIST is crucial to many core classes of the UMBC computer science program.

What is your advice to other students about getting involved in research?
Do it, and have an open mind if you don't think you like the project at first. I thought I didn't like mine at first glance.

What are your career goals?
I wish to be a computer forensics worker for the United States government.

Are you a transfer student or did you start at UMBC as a freshman?
I transferred to UMBC my sophomore year from James Madison University in Virginia.

Do you now live on campus or commute to UMBC?
I have lived in Walker Avenue apartments on campus for the past two years, going on my third year.

Shannon Zik, Biological Science

"Design and Synthesis of Conjugated and Substituted Vinylene-Linked Chlorin Dimers"

An imperative need has arisen for a strongly florescent molecule which exhibits tunable wavelengths in the 650-900 nm region for use in medical diagnoses. Chlorins (synthetic analogues of naturally occurring chlorophylls) present themselves as an intelligent choice to study as they contain a highly conjugated, planar system which produces absorption and emission in the optical range of 650-700 nm. This project will focus on the design and synthesis of chlorin arrays possessing two chlorin subunits connected by a vinyl linker. We hypothesize that such dyads will exhibit strong absorption and emission in the near infrared spectral window (~750 nm), therefore providing an excellent platform in the development of in vivo fluorescence imaging. I will prepare the chlorin monomer comprised of an exocyclic ring and electron withdrawing groups by following well-established synthesis routines. The McMurry coupling reaction will be employed to bridge the chlorin monomers and form the target dyads. The optical properties of extended conjugated structure will be determined through absorption and emission spectroscopies.

How did you find your mentor for year research?
I took Organic Chemistry I, taught by Dr. Ptaszek, in the fall of my sophomore year. I thoroughly enjoyed the class and knew I wished to pursue a deeper understanding of the material than my biology major required. I knew that Dr. Ptaszek was involved in research, as his undergraduate assistants would periodically ask questions pertaining to their experiments while I was visiting during office hours. I wanted to be a part of his team, but did not feel qualified until after taking Orgo II. Near the end of my sophomore year and my completion of Chem352, I sent Dr. Ptaszek an email inquiring if he had any availability in his lab. Dr. Ptaszek and I met and discussed the area of research I would be pursuing: chlorin and porphyrin synthesis. That summer, Dr. Ptaszek added me to his team of undergraduate assistants.

Do you get course credit for this work? How much time do you put into it?
Yes, I receive academic credit. During the semester, in addition to my full course load and part time job, I generally dedicate 12-18 hours per week. The amount of time spent per day is depends on the experiment, or which part of the experiment I am executing, i.e., syntheses, purification, or characterization.

How did you hear about the Undergraduate Research Award (URA) program?
Dr. Ptaszek informed me of the URA program towards the end of my second semester of working for him. He sent me the information at the end of winter break and I began to work on the proposal at the start of following semester.

What academic background did you have before you applied for the URA?
I had just completed my first semester as a junior pursuing my B.S. in Biological Sciences.

Was the application difficult to do?
While the application was not difficult, it did require a significant amount of time, the reading of numerous research papers, many rough drafts, and considerable effort to maintain the two page constraint. Though ample time was provided to finish the proposal, I continued to make changes until the moment I submitted it.

How much did your mentor help you with the application?
After I wrote the first draft of my proposal, my mentor and I met twice to review and edit it prior to submission.

What has been the hardest part about your research?

Unexpected results! After weeks of synthesizing a compound, sometimes the final step will produce unexpected results such as insolubility, degradation of fluorescent properties, or a mix of products will supersede. Such outcomes provide opportunity to brainstorm about solutions, however it usually requires the synthesis of more starting material which could mean weeks before the proposed solution can be attempted at the final steps and a few more weeks before we find a successful solution.

What is your advice to other students about getting involved in research?
DO IT! Research is a fantastic way to develop your knowledge and understanding your field of interest. Additionally, it provides fundamental skills for your classes as well as your future endeavors. Do not be afraid to ask your professors if they have a position open in their lab. Also, do not be worried about knowing everything before you start, most of the techniques will be different than those in your basic lab classes and you will not be expected to know all of them. Ask lots of questions, it's the only way to learn!