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Summer 2019

Special Edition Newsletter

Summer Research 2019

Special points of Interest

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Boy did we have a busy summer! Eagles STEM Scholars were representing Winthrop University across campus and beyond. Students took advantage of varying opportunities. Following May graduation (and before our new freshmen arrived), we had 37 active Scholars. Fifteen of those scholars completed undergraduate research at universities including Winthrop, Michigan State, Purdue, UNC-Charlotte, MIT, and Iowa. One scholar shadowed a cardiologist and another had a dental internship. This Summer Research Special Edition contains updates from these scholars so you are able to share in our excitement at all they accomplished! We are very proud of their achievements! Winthrop professors who dedicated their time to allow selected students to assist and learn in their research laboratories included Dr. Kristen Abernathy, Dr. Fatima Amir, Dr. Eric Birgbauer, Dr. Christian Grattan, Dr. Nick Grosseohme, Dr. Jay Hanna, and Dr. Matt Stern. Thanks to the department chairs, Dr. Dwight Dimaculangan, Dr. Pat Owens, and Dr. Thomas Polaski and steering committee members and others not formerly mentioned who supported the summer research efforts for Eagle STEM Scholars in various capacities including Dr. Cliff Harris, Dr. David Meeler, Dr. Julian Smith, Dr. Kathie Snyder, Dr. Takita Sumter, Dr. Michael Whitney and Dr. Kristi Westover. ■

Winthrop Eagle STEM Scholars Program Director, Amanda Cavin

My Research at Michigan State University

by Marlin McKnight

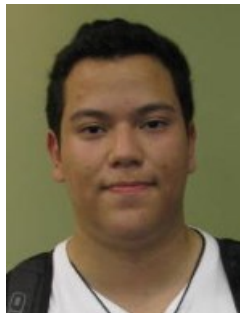
This summer I conducted research through the BRUSH program at Michigan State University in East Lansing, MI. The BRUSH (Biomedical Research for Undergraduate Students in Health) is a NIH funded program that functions to enhance the research experience of scientists from underrepresented backgrounds. My reason for applying to this program was to extend my knowledge of veterinary research, while collaborating with peers from multiple disciplines. Everything that the BRUSH program offered exceeded my expectations: we were provided with 3 meals a day, free lodging, and immersive activities throughout major cities in Michigan. I have gained from this summer at MSU, along with experience in veterinary research, personal growth



McKnight

My Summer Research Experience

by Carlos Escoto-Diaz



Escoto-Diaz

This summer, I conducted research with Dr. Matthew Stern in the biology department here at Winthrop University. Coincidentally, I was introduced to Dr. Stern and his team of researchers through the Eagle STEM Program. The summer before, I shadowed in his laboratory and that allowed me the opportunity of officially researching there for this summer of 2019. My overall research experience was nothing short of great. I've furthered my interest in the field of biomedical research but most importantly, I have joined a lab group where our future goals are inspired and motivated. It has been great to see how many Eagle STEM scholars from my cohort were also doing research with other departments. That was the most enjoyable part of the summer, seeing all of our projects come into fruition and being able to present our findings with everyone. ■

My Summer Research Experience

by Kiera Alexander

My name is Kiera Alexander and I'm a Junior at Winthrop University. This summer, I was given the opportunity to continue biochemistry research as a Ronald E McNair Scholar with Dr. Nicholas Grossoehme. As a McNair Scholar and a researcher, I had to do an intense research bulletin that entailed a literature review, abstract, introduction, materials and methods, results and discussion, and data proof. This process allowed me to obtain an understanding of what's expected as a researcher and led me to be more thorough in my approach to research. Specifically, my research was titled, The Interplay Between Oxidation, Phosphorylation, and Regulation of RitR in Streptococcus pneumonia. This research focuses on studying different proteins found in Streptococcus pneumonia bacteria so we can obtain a better understanding of the inside of the cell. With this project we can potentially further characterize the interplay between oxidation, phosphorylation, and the DNA binding properties of the proteins involved. Since I was only given six weeks to complete this research I was inclined to be diligent and concise while preparing my research article and my presentation. Along with the research experience on Winthrop's campus, I was given an amazing opportunity to attend the 25th Annual Southeastern Association of Educational Opportunity Program Personnel (SAEOPP) Conference. This conference allowed me to engage with McNair Scholars from all over the United States and compete in oral research presentations. Overall, my summer research experience was amazing and really allowed me to further my skills in a laboratory setting for the future. ■



Alexander

Summer Research at Brookhaven National Lab

by Sean Wechsler



Wechsler

This summer I had the opportunity to explore outside of my organic chemistry roots into the interdisciplinary field of electrochemical energy storage. I worked to assemble and test the electrochemical properties of supercapacitors. Supercapacitors are essential in harnessing intermittent renewable energies such as solar and wind due to their extremely quick charge and discharge cycles and high-power output. Each supercapacitor has two electrodes which were coated with the pristine metal organic framework, nickel hexaminobenzene through a process known as electrophoretic deposition. After fabrication of the electrode and supercapacitor assembly, I carried out electrochemical tests such as cyclic voltammetry, galvanostatic charge-discharge, and electrochemical impedance spectroscopy.

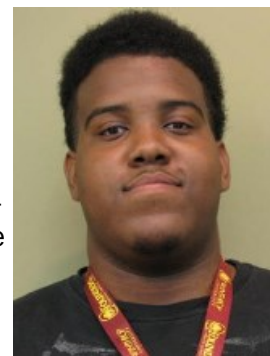
In order to characterize the morphology of the electrodes, I traveled to the Center for Functional Nanomaterials at Brookhaven National lab in Upton, NY. At this national, user-lab I was able to train on x-ray diffraction, x-ray photoelectric spectroscopy, energy-dispersive x-ray spectroscopy, and scanning electron microscopy to examine both the chemical composition and the micropores on the surface of the electrode deposition.

I learned so much this summer about how physics, math, and chemistry are so interrelated on so many levels. While working at the national lab I was exposed to a professional work atmosphere where I got to learn about other cultures and their academic environments. I learned that not only are the “hard sciences” important for success, but also foreign languages, interpersonal skills, and an open attitude to cultural differences. Everybody in chemistry graduate school can do chemistry, but not everybody can teach someone who does not speak their language or work together with a group of people. A special thanks to Dr. Fatima Amir, my faculty mentor this summer. I would also like to acknowledge SC EPSCoR for funding this project. ■

Summer Shadowing Experience

by Jomar Lewis

During this past summer, I shadowed Dr. Charles Kilgore, a pediatrician at a local pediatric clinic in my hometown of Orangeburg, SC. Dr. Kilgore works with the Pediatric Clinic and the Regional Medical Center, both of which are located in Orangeburg, SC. During my shadow experience, I was introduced to the daily lifestyle of a pediatrician. My favorite part of the experience was the wide variety of patients that came into the clinic. From infants being brought in for checkups to teenagers coming in with unknown illnesses, there was always an exciting aspect when moving from patient to patient. Even though some cases were vastly different, there was also a lot of repetition. I can recall one day where all of the patient visits were for physicals since the school year was about to start back. Dr. Kilgore informed that this was not an uncommon occurrence. Some days, it would seem like he was doing the same thing repeatedly. This experience opened my eyes to many aspects, major and minor, in the field of medicine. I am very grateful to Dr. Charles Kilgore for allowing me the opportunity to shadow him this past summer and for the experience and knowledge that I gained during my time at the Pediatric Clinic. ■



Lewis

My Summer Research Experience

by Kendarius Butler

During the summer, I did research with Dr. Christian Grat-tan. We worked on synthesizing an inhibitor for a substance known as Sphingosine Kinase. We are doing this to combat the metastasis of cancerous cells in the human body. Throughout the body, there is a pathway known as the sphingomyelin pathway. This pathway contains a molecule known as ceramide, which is pro-apoptotic, meaning that it promotes

the death of cells. Given the right environment, ceramide can spontaneously convert to sphingosine-1 phosphate, an anti-apoptotic substance. In cancerous tumors, sphingosine-1-phosphate is overproduced. Because of this, it becomes incredibly difficult to destroy these cells. To stop this, we try to prevent the conversion of ceramide into sphingosine -1-phosphate using modified variants of a sphingosine kinase inhibitor that was originally produced in the early 2000s. ■



Butler

My Summer Research

by Alyssa Brook



Brook

Over the summer, I worked in Dr. Hurlbert's biochemistry lab. My project was to express, purify, and characterize XopAZ (a putative foldase from *Xanthomonas cynarae*). During the time I spent in lab, I gained many vital lab techniques such as aseptic technique and pipetting techniques. I learned lab etiquette, how to maintain a lab notebook, and how to give a professional research presentation. I worked closely with my research professor as well as with my lab mates. The overall experience was very beneficial and I had fun. I learned so much and feel much more confident with myself in the lab. ■

My Research at the University of Iowa

by Merylyn Palmer

My name is Merylyn Palmer and I am a junior at Winthrop University. This summer, I had the opportunity of conducting research at the University of Iowa in Iowa City for the Continuing Umbrella of Research Experiences (CURE) program. It was an amazing experience. I met many students from across the United States, explored Iowa City, and learned new lab techniques.

This summer, I was able to research treatments for one of the most aggressive forms of lung cancer, Small Cell Lung Cancer. One of the treatments used was Auranofin, a thioredoxin reductase inhibitor, which selectively increases oxidative stress in Small Cell Lung Cancer Cells. Auranofin was also tested in conjunction with two separate forms of treatment, Auranofin with GPX4 inhibitors and Auranofin with Radiation. The treatments were tested on the Small Cell Lung Cancer cells using clonogenic assay. Both of these combinations enhanced the clonogenic cell killing of Small Cell Lung Cancer cells. I was also able to assist in a mouse model in vivo study with Neuroendocrine Carcinomas. The mice were treated with a combination of Auranofin and Lu-Pentixather and tested for toxicity of the kidney, liver, and bone marrow.

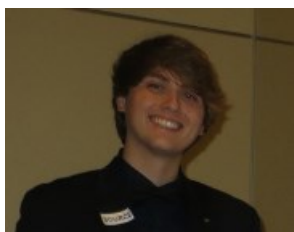


Palmer

Conducting research was a great experience and allowed me to gain insight about cancer, how it affects the body, and forms of treatment. It also allowed me to evaluate plans for my professional career. I am thankful for the Continuing Umbrella of Research Experiences for providing me with exposure in the laboratory, mentors, and professional development.■

Summer Research Experience

by Evan Thibodeaux



Thibodeaux

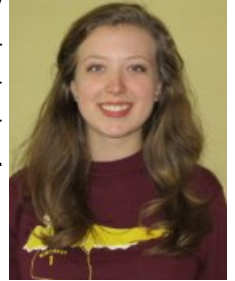
This summer I worked in Dr. Hanna's lab on the photoredox alkylation of aryl amines with an organic photocatalyst. Much of the early optimization of the research had been done by me and my other lab mates in the last summer so my objective this time was to expand the imine and organotrifluoroborate scope in the project. This involved me synthesizing starting materials, setting up reactions in a photoreactor, analyzing results with a GCMS (Gas Chromatograph Mass Spectrometer) and proton/carbon NMR (Nuclear Magnetic Resonance), and isolating product through extraction and flash column chromatography. In the lab, we are trusted to

carry out the research without direct supervision. The skills I gained this summer have allowed me to feel more confident in the lab and with presenting my research to an audience.■

My Summer Research at MIT

by Juliana Quay

This summer, I worked in Guoping Feng's lab at Massachusetts Institute of Technology as part of the MIT Summer Research Program in Biology and Neuroscience (MSRP-Bio). I worked directly with two post-doctoral researchers who allowed me to work independently after the first week of the ten-week summer program. The overall goal of the project was to create a brain-wide circuit for two distinct thalamic nuclei using a mouse model. This project involved intracranial viral and fiber injections, behavioral studies, perfusions, tissue sectioning, immunohistochemistry, epifluorescence microscopy, and cell counting. I took lead on all lab work except the surgery and behavioral studies.



Quay

I feel as if I grew more this summer than I have in a long time. Being put in a new place where I knew no one and was completely unfamiliar with everything allowed me to become what I would like to call a version of my true self. There were no prior biases or predispositions here to sway me into behaving one way or another, and through that I was able to learn more about myself and what I really enjoy. It is hard to pinpoint a single experience that influenced me the most while I was at MIT. I feel that the wonderful people I was surrounded with (peers, faculty, etc), along with the wealth of research knowledge at MIT, and then having opportunity to explore an amazing city on my own influenced me to become a better student, person, and researcher. I cannot even begin to express how beneficial it was for me to be allowed to conduct research and learn at an institution as rich in science as MIT. There, I stepped into a field that I believed I was interested in but frankly knew very little about, and I'm so glad that I did. ■

My Summer Research Experience

by Josiah Bauer



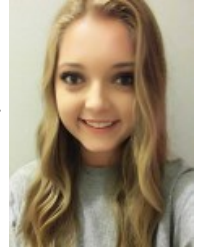
Bauer

My research this summer consisted of me sitting in a computer room with three of my peers testing numerous calculations on models we created with our research mentors. I was part of an eight week program this summer at Winthrop in which the first week involved our research mentors trying to teach all of the necessary mathematics we would need to know in order to successfully conduct our research. After we finished this "short-course" we dove straight into reading up on the research other people had done. We did this to get an idea of what we were trying to do and also a guide as to where we wanted to go. We spent about a week doing this, after which we were able to actually start conducting our own research. This started with the creation of our own models. The four of us research students were split up into two groups of two and each group was given a set of differential equations with which we were going to do a stability analysis on as well as other tests. We did these tests for a couple of weeks trying to figure out how we needed to change our equations or our parameters to give us the results we wanted. Towards the end of the program our research mentors found something incredibly complicated and surprising in my partner's and mine equations which fortunately will lead to much further research in the future. ■

My Research Experience at Purdue University

by Tiffany Dwyer

This summer, I traveled to Purdue University in Indiana to work in a lab in the pharmacy department there through the Summer Undergraduate Research Fellowship (SURF) program. My research focused on creating a safe and effective drug for the treatment of sepsis, since the most effective drug (Polymyxin B) for treating sepsis causes neurotoxicity and nephrotoxicity. More specifically, I worked on formulating a nanoparticle system with PMB that will attenuate the toxicity of PMB. This was a great experience, as I was able to gain lots of invaluable knowledge and learn many techniques that will be useful to me in graduate school. ■



Dwyer

Summer Experience at UNCC

by Amanda Esposito



Esposito

My name is Amanda Esposito, I spent my summer working in the Human Computer Interaction Lab with Madiha Tabassum a PhD student at UNCC and Dr. Heather Lipford. With the expansion of technology, home owners are beginning to bring smart devices into their homes. These devices collect private data, so users want the ability to control the data collection, storage, and access. My main goal was to figure out what improvements are needed, so that I can inform the smart device designers of better interface controls.

My first research question was “What are the current security and privacy controls available in smart home devices?” To answer this question I organized a list of all of the controls in multiple smart devices, for example, the smart doorbell, locks, speakers, and more. Then I compared the list and condensed it into a taxonomy by choosing controls that were similar across all devices. Which I then divided into three main categories: Data collection - users control over when and what data the device collects, Data storage- users’ controls on how their data is being stored and for how long, and Access control- Controls over giving access to the device to different people. You can see here the list of my findings of the controls available in the devices.

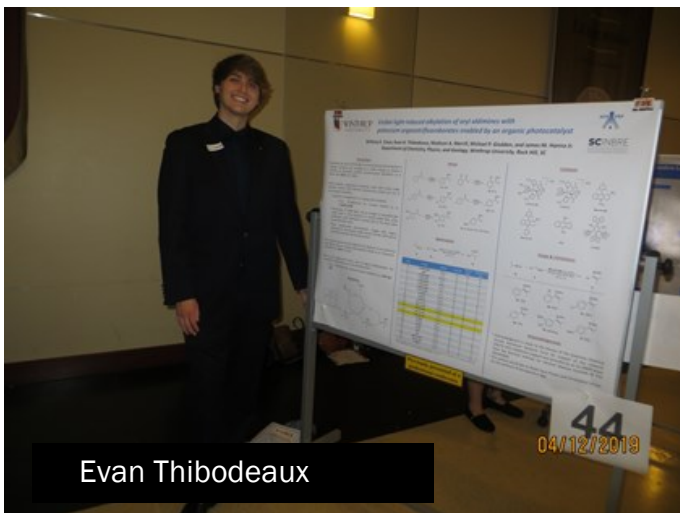
My next research question was “What security and privacy controls do users expect? Do the current controls meet users’ expectations?” I conducted a usability study to answer this question. For our study, we selected two specific smart home devices, the Ring doorbell and the august lock. The study consisted of a pre-interview section which asked participants about their expectations from the device. Then participants had a hands on period in which they had 10 minutes to configure the device as though it was their own. This allowed us to see any controls that may be confusing and get feedback on new users opinions of the interface. The study was followed up by a post interview section, where they answered questions on if their expectations were met.

We conducted the study on 5 participants. I found that users started out with very low expectations for either device, normally only one main expectation of either video, or the ability to lock/unlock. Yet, this changed when the participant had interacted with the other interface. Experience with the other interface increased user awareness about controls and resulted in them expecting more, like an activity log. We also found that in the Ring there was a lack of natural progression when looking at the interface. This resulted in users overlooking important privacy and security controls. So a solution would be to combine functionality controls with the privacy and security ones, so that they are not overlooked. We also found that the Rings sharing interface lacked transparency, and that people liked the lock because they knew what controls they were giving to other users.

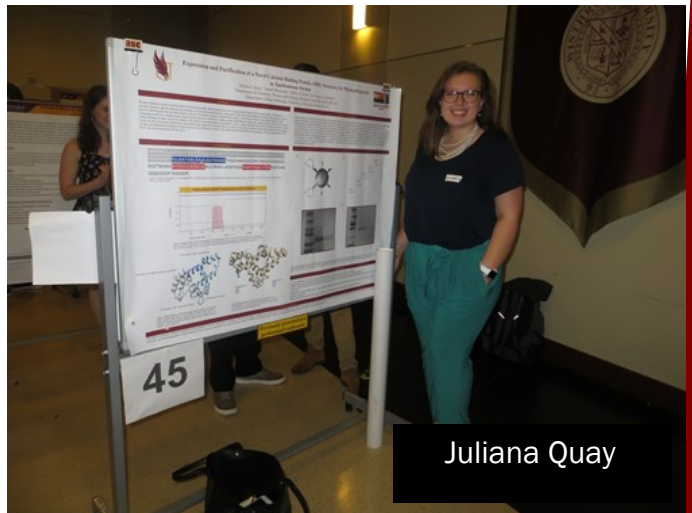
Eagle STEM Scholars Presenting Posters of their Summer Research



Marlin McKnight



Evan Thibodeaux



Juliana Quay



Sean Wechsler

Research continued

My Summer Research

by Sarah Fleetwood



Fleetwood

This summer, Josiah Bauer and I did mathematics research with Dr. Kristen and Dr. Zach Abernathy. We modeled the latent reservoir in the dynamics of HIV infection with CTL memory for the purpose of seeing how the immune system interacts with the latent reservoir of HIV. The model we created was complicated and has many moving parts to it, but it was a wonderful insight into the world of applied differential equations. ■

McKnight continued from front

and a greater sense of duty. I have learned that we are all here to tap into our gifts and passions and to give back to the world the energy that was given to us along our journey. I have become more comfortable knowing that this research experience has helped me along my path to become a veterinarian. ■

Esposito continued from page 7

The final research question was “What is the state of users’ awareness and their perception about the available controls?” For this question, we conducted an interview study on three participants, where I asked participants how they use their smart devices and available controls in their day to day life. I found that current users are aware of the privacy and security controls, but they are not using them. This is because many people are controlling the devices over a hub and not an app which hinders their ability to use some of the controls available because they are just using voice controls instead of seeing the interface. ■

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The Eagle STEM Scholars Program was formed as a result of the INBRE II diversity initiative to effectively matriculate more students from diverse groups into biomedical science Ph.D. programs. Winthrop, because of its diverse population of students, is uniquely poised to increase the number of under-represented minority, low income and first generation undergraduates in South Carolina who matriculate into Ph.D. biomedical science, bioengineering, biochemistry, biology and chemistry programs. It is taking steps to move over the next two decades towards national leadership in this area.