The Newsletter of the Winthrop Eagle STEM Scholars Program

Volume 1, Issue 14-2

Summer 2018

Special Edition Newsletter

Summer Research 2018

Special points of Interest

- Summer Research 2018 Poster Session - pages 6-7

STEM students enhanced their learning experience by participating in summer laboratory research projects, internships and career related volunteer experiences. These students were mentored by professors and professionals as they completed their projects, presented the outcomes of their work, and in many cases, publish their results. These efforts allow the students to become more competitive in the selection process for graduate programs. For summer 2018, twenty, or 48%, of the 42 undergraduate students who remained in the program following spring graduation, had research opportunities, internships, or career related experiences. Fourteen research opportunities were at Winthrop and one was at Augusta University. One student was an intern at a pharmacy and one was at a veterinary hospital. Three volunteered at regional hospitals. This special edition newsletter includes summaries from many of the scholars about their experiences. Dr. Robin Lammi, Director of Undergraduate Research, and Dr. Diana Boyer led the Summer Undergraduate Research Experience (SURE) Program at Winthrop. The research projects were directed by faculty from the Biology, Chemistry and Math Departments at Winthrop University. Students who were McNair Scholars were also in programs directed by Dr. Cheryl Fortner-Wood. Winthrop professors who dedicated their time to allow selected students to assist and learn in their research laboratories included Dr. Kristen Abernathy, Dr. Nick Grossoehme, Dr. Jay Hanna, Dr. Aaron Hartel, Dr. Jason Hurlbert, Dr. Christian Grattan, and Dr. Matt Stern. Thanks to the department chairs, Dr.

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INSIDE THIS ISSUE:

My Summer Research Experience

by Marlin McKnight

McKnight

This summer, I conducted biochemistry research with the McNair Scholars program under the mentorship of Dr. Jason Hurlbert. Our research goal was to express and purify a protein originating from bacteria, Xanthomonas cynarae, that aids in the infection of artichoke plants. Xanthomonas cynarae Xop AZ is an enzyme that catalyzes the conformation change of proteins that have specifically evolved to shut down the cell signaling defenses of an artichoke plant cell and allows the bacteria to consume the insides. Working in the lab has exposed me to important research techniques such as growing E. coli that will express a gene of interest, extracting proteins into cell lysate, and purifying the

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My Summer Research Experience

by Augustine Vinson

Vinson

This summer, I had the wonderful opportunity to work with Dr. Jason Hurlbert on biochemistry research project as part of the SURE program here at Winthrop. We wanted to obtain a crystal structure for a protein that was recently discovered by collaborators at the University of Florida from the bacterium Xanthomonas cynarae, which infects artichokes, in an effort to make advances in characterization of the protein. I was able to use a number of biochemical laboratory techniques like Sodium Dodecyl Sulfate Polyacrylamide Gel Electrophoresis (SDS_PAGE), metal chelating affinity chromatography, gel filtration chromatography, and the hanging drop vapor diffusion protein crystallization technique. I had a lot of fun this summer working with Dr. Hurlbert and other Winthrop students while learning how to be a more competent researcher. I was also able to practice presenting scientific work and received personalized feedback from Dr. Hurlbert. Overall, this summer was a great learning experience and was a lot of fun.■

My Summer Research Experience

by Kiera Alexander

Alexander

This summer, I was given the opportunity to work in a biochemistry lab for eight weeks as a research assistant for Dr. Nicholas Grossoehme. As a rising sophomore, it was a very new and different experience being introduced to upper-level coursework. The research I conducted was on the *Characterization of the metal-dependency of a streptococcal phosphatase*. I studied a protein necessary in the function of Streptococcus pneumonia bacteria. Throughout the summer I was responsible for understanding the background information and previous work done on this research. I was also tasked with conducting my own research to obtain more data to further the study of the protein phosphatase, PP2C. I learned the steps to grow, harvest and purify the protein for actual experimental assays. These steps allowed me to use different machines like the incubator shaker, spectrophotometer, sonicator, centrifuge, and FPLC. Being able to use different equipment to conduct research allowed me to get acquainted with the lab environment and the full research experience. I was also able to apply some of the information I had previously learned in my general chemistry class which enhanced my understanding of the concepts in that course. With the help of my research mentor and my lab partner, I was able to obtain new results and present my findings at the SURE Symposium. As an undergraduate research student, I was also able to attend various seminars and social events with my peers doing research for other disciplines. Being able to do research after my first year in college allowed me to get a better idea of what is expected when doing lab work and opened me up to more things I could potentially do in the future. ■

My Summer Research Experience

by Sean Wechsler

Wechsler

My name is Sean Wechsler and over the summer of 2018, I worked with Dr. Hartel as a research assistant at Winthrop University. In our research, we were attempting to make aldol products (β-hydroxyl-carbonyls) from silyl protected cyanohydrins. Previous students had extensively tested the reaction pathway with aryl groups attached to the cyanohydrin. My work on the project consisted of testing the viability of the reactions with alkyl groups attached to the cyanohydrin. I worked optimize reaction conditions to avoid unwanted reactions such as a cyclization of the product and retro-Brook rearrangements.

While working with Dr. Hartel, I learned about the proper use of chemical equipment and techniques and about the importance of good record keeping in the lab. I was encouraged to read peer-reviewed journal and learned extensively about several new topics that were outside of the scope of our research. I also was able to improve my presentation skills and had several opportunities to present my research to my peers and professors.

Next summer, I hope to further my education with another REU before graduating with my undergraduate degree. During my senior year at Winthrop University, I plan to send off applications to several PhD graduate programs in the South East, including but not limited to, UNC Chapel Hill and Duke University. As I am still quite early on in my coursework, I cannot accurately say what my concentration will be in graduate school. I do however, know that this summer has solidified my interest in organic chemistry and I have a great interest in making this "difficult"subject interesting and accessible to students in the future.■

Summer Internship Experience

by Jessika Bonner

This summer I participated in an internship at Faulkner Animal Hospital. As a pre-vet student, this was an amazing opportunity. I received a lot of hands on experience working with the animals and their owners within the clinic. I was able to help with patient care, assist in surgeries, and even administer vaccines to the dogs and cats that were brought into the animal hospital. I enjoyed working with all of the doctors and vet techs and many of them took time to explain different diagnoses to me as they worked with their patients. Not only did I get to experience what it will be like once I become a veterinarian, but I also got to learn about different illnesses and procedures that are common within an animal clinic. At the end of the summer I was invited to return to the internship next summer and I have already made plans to do so. I really enjoyed this experience and it assured me that I have chosen the right career path.■

Bonner

My Summer Research Experience

by Sydney Frazier

This past summer I had the opportunity to work with Dr. Stern on a cell biology project. I was working on reendothelializing porcine blood vessel scaffolds and using various methods to help the endothelial cells grow and thrive in various conditions. I chose to study this because it was a field that I do not have much knowledge in, and it was exciting to learn hands on about cells and cellular conditions. I am able to use this experience on a resume or applications, and later I can apply the skills I learned this summer to other things further down the road in my educational career. During this summer, I also met a lot of wonderful people and SCEPSCOR/IDeA is a very good grant coalition to be a part of in an undergraduate program.

Frazier

My Summer Internship

by Alyssa Brook

Brook

Over this past summer I was able to shadow in Buford Street Drug Store's pharmacy. While there I completed 100 + hours of shadowing and was able to watch the store's three different pharmacists. They have two main pharmacists: one who has a PharmD and the other who had some other type pharmacy degree. It was very interesting for me to listen to their stories and their personal paths to becoming pharmacists. I also was able to watch the pharmacy technicians and see what everyone in that pharmacy did. It was nice to see how everything worked and to hear about technician's experiences from other pharmacies and from their schools. I think the most interesting aspect of the shadowing was watching the pharmacists and compounding technicians compounding drugs.

Some of the facts they shared were so interesting to me and how knowledgeable they were in their field was amazing to me. It also seemed to provide all aspects of being in a chemistry lab that I like without the other aspects that I don't-which really makes me want to be a compounding pharmacist. The overall experience while shadowing at Buford Street Drug Store's pharmacy was very positive. The experience just shows me even more that this is the career path I want to go down and that I would really enjoy my job every day.

My Summer Research Experience

by Sigrid Dorman

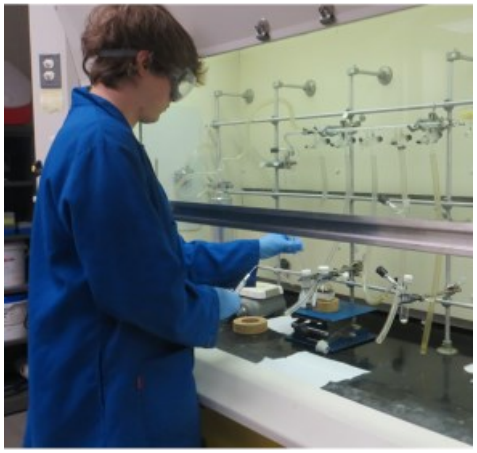
Dorman

This past summer I had the opportunity to perform research in two different labs. From the middle of June to the start of July, I worked in Dr. Grattan's organic chemistry research lab. In the lab I synthesized varying phenylpyrazole compounds which can be used in antimicrobial drugs. From the middle until the end of July, I worked with Dr. Hurlbert in his biochemistry lab. In his lab I tested solutions with varying amounts of calcium on their ability to grow bacterial cells. I greatly enjoyed working in both labs and learned a lot about performing research and using the machines in the various labs. I'm looking forward to continuing research with Dr. Hurlbert this coming summer. ■

Summer Research Experience

by Evan Thibodeaux

During my last summer I was able to fully immerse myself in organic chemistry and got a huge amount of hands on experience that I have been craving. I was able to perform a plethora of organic synthesis reactions and learn how to operate a GC/MS as well as a 400 mHz NMR on my own and how to interpret the data generated by them. In addition there were opportunities to present my research and practice my speaking skills such as the SURE presentations at the end of the summer. Doing organic chemistry research before taking the organic chemistry class allowed me to be able to relate topics in class directly back to my research, which helped me to better understand them fundamentally. Doing research here has been an invaluable opportunity that has helped me to become more comfortable and confident in my major and has pushed me to want to pursue graduate studies even more. I could not recommend it enough for chemistry students who are still on the fence about giving research a shot. ■



Thibodeaux

My Summer Research at Claflin

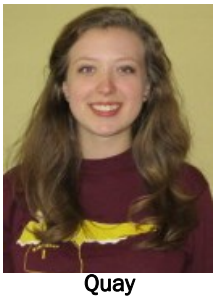
by Merilyn Palmer

This summer I conducted research at Claflin University under Dr. Derrick Swinton, professor and chair of the department of Chemistry. My goal was to decellularize scaffolds for vascular tissue engineering in an animal model. The purpose of this was to test whether I could take the vascular tissue from an animal, decellularize it, and be able to implant it into a human to replace damaged blood vessels and cardiac valves. To prepare to know how to quantify protein samples, I practiced quantifying protein using Sodium Dodecyl Sulfate Polyacrylamide Gel Electrophoresis (SDS PAGE) using samples of African American and Caucasian smokers with Chronic Obstructive Pulmonary Disease (COPD). I used SDS PAGE to separate the COPD proteins into individual bands then fragment the bands to be able to identify the specific proteins within the bands. Practicing SDS PAGE with the COPD samples prepared me to test specific proteins in the vascular tissue of an animal. I would take the vascular tissue from the animal and quantify its protein using SDS PAGE and fragment the protein into individual bands. After fragmenting the bands, I would then identify the protein using mass spectrometry. Due to lack of time, I did not get to start the experiment with mass spectrometry, but I plan to continue the research in the near future. ■

Palmer

My McNair Summer Research

by Juliana Quay



Quay

This summer, I had the privilege to work with the McNair Scholars Program and Dr. Jason Hurlbert on a novel calcium-binding protein that is necessary for bacterial virulence. Our lab previously identified a gene in several strains of Xanthomonas that, when expressed, can elicit a hypersensitive response (hr) in tomato plants. While this response is normally limited to specific bacterial-host pairings, introduction and expression of this gene by bacterial species that do not normally infect tomatoes serves to elicit the response, indicating that the encoded protein is crucial to the infectious process. Bioinformatic analysis of the protein, which we have named EfhX (EF-Hand containing protein from Xanthomonas), reveals that the protein is predicted to contain a single transmembrane alpha helix, spanning amino acids 60 to 81, and two calcium binding domains, termed EF-Hands, in the carboxy-terminal domain of the protein. In order to better understand the function of this novel protein, we have cloned the efhdx gene from Xanthomonas aurantofolia and expressed it in Escherichia coli so that we can obtain quantities of the protein sufficient to grow protein crystals and determine the structure of the protein via x–ray diffraction. So far, we have successfully purified the protein to homogeneity (>95%) as determined by SDS-PAGE and anti-hexahistidine Western Blot.■

My Summer Research Experience

by Tiffany Dwyer

This summer, I had the opportunity to do cancer research with Dr. Christian Grattan in the Summer Undergraduate Research Experience Program. I worked on improving the effectiveness of a known inhibitor for an enzyme that causes cancer cells to proliferate. As a result of effectively inhibiting this enzyme, cancer cell proliferation stops. I really enjoyed this research because I was able to use knowledge I had learned in organic chemistry and I learned so much on the application of my research as well. This research greatly helped me confirm the research/career path that I would like to go into.■

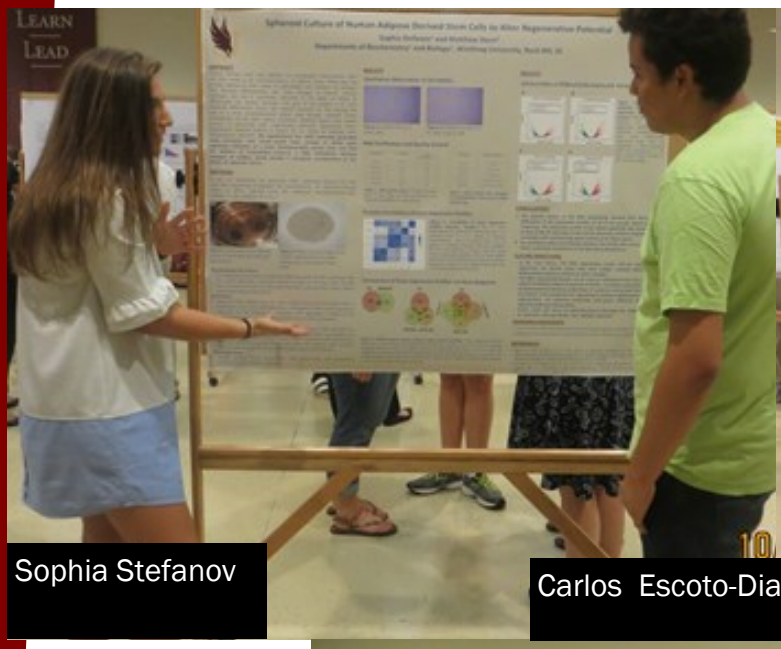
Dwyer

Summer Experience at Winthrop in Research

by Resa Allen

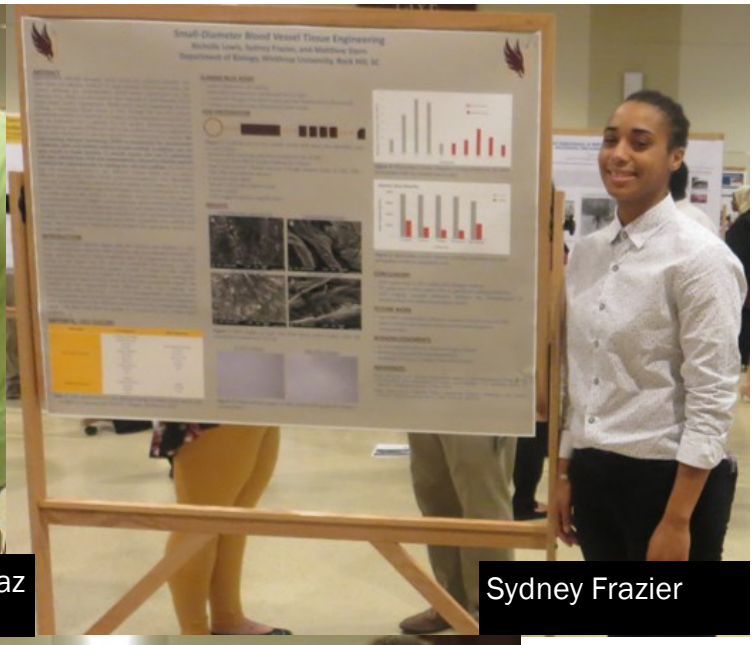
Over the summer, I worked with Dr. Grattan in undergraduate research. It was a shell-shock to be thrown into organic chemistry like that, but I feel like I learned a lot. I worked mainly alone and followed instructions and procedures that Dr. Grattan outlined for me. The summer research really challenged what I thought that summer research was about. I only worked with Dr. Grattan for about 4 weeks, but he put me to work like I knew what I was doing. The worst part about summer research was the presentation at the end that consisted of the research that had been done by me. Though this part was challenging, I feel like I learned a lot and the presentation went well. We also had organic group meetings with Dr. Hartel and Dr. Hanna, which was intimidating but also very informative. Summer research was a great experience and I would gladly do it over again.■

Eagle STEM Scholars Presenting Posters of their Summer Research



Sophia Stefanov

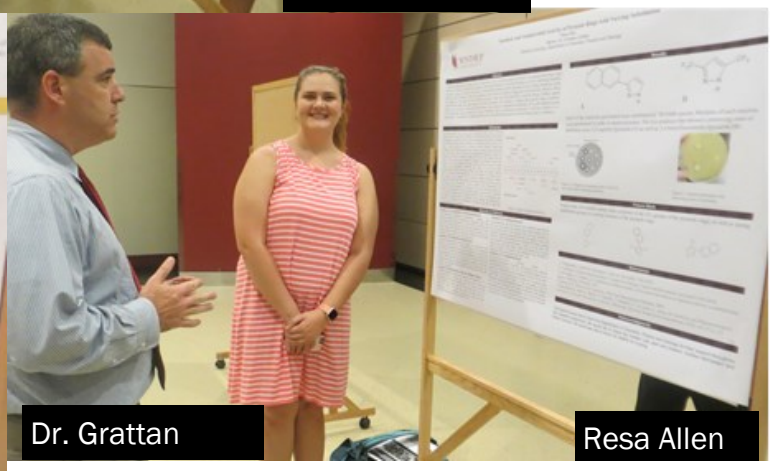
Carlos Escoto-Diaz



Sydney Frazier

Sean Wechsler

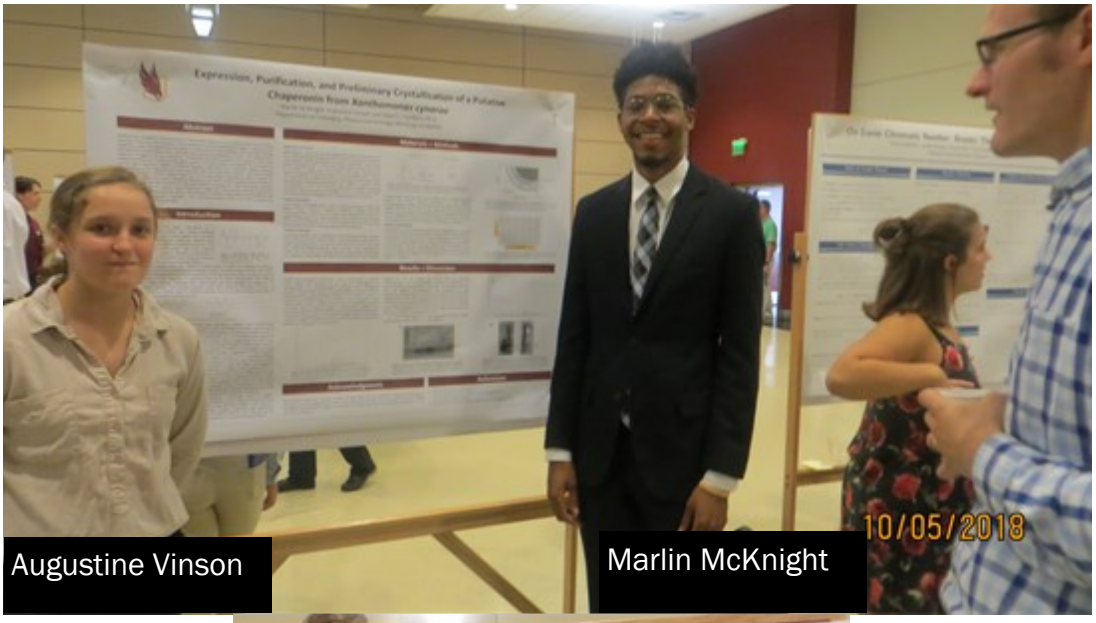
Jessica Stevens



Dr. Grattan

Resa Allen

Eagle STEM Scholars Presenting Posters of their Summer Research

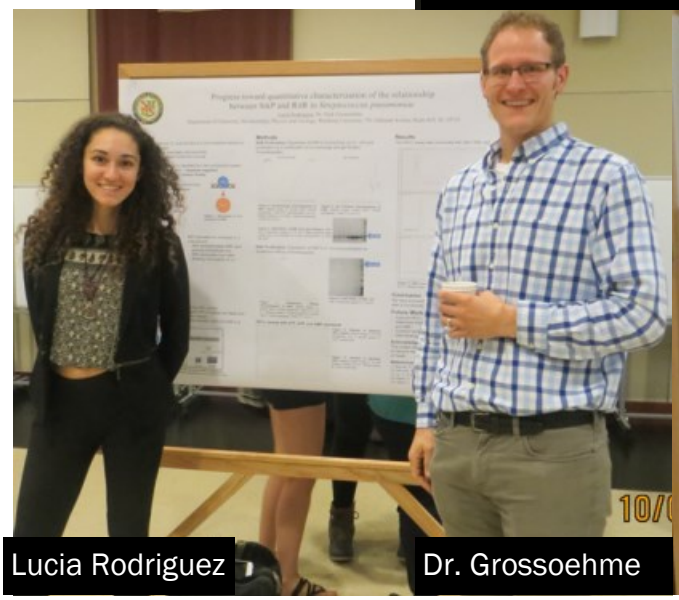


Augustine Vinson

Marlin McKnight

Hunter Sellers

Kiera Alexander



Lucia Rodriguez

Dr. Grossoehme

Tiffany Dwyer

RESEARCH continued from front

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. Kathie Snyder, Dr. Takita Sumter, Dr. Michael Whitney and Dr. Kristi Westover. ■

Winthrop Eagle STEM Scholars Program Director, Rachel Law

McKnight continued from front

cell lysate only to yield the protein of interest, in our case Xop AZ. Providing a molecular view of the shape, structures and residues found in the purified protein, crystallography is the final step of our research; solving the proteins structure gives rise to mechanisms that can inhibit it's activity, saving artichokes around the world. With my mentor's guidance, I learned how to think like a scientist and how to perform, write, and present a research project.

Becoming a McNair Scholar and making it through the summer class and research has granted me with the confidence and knowledge on pursuing a professional degree, opportunities that will forward my career as a scientist, and a chance to gain experience in conducting and presenting research. ■

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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.