



Special Edition Newsletter

Summer Research 2015

Special points of interest:

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STEM students enhance their understanding of learned concepts through practical research and become more competitive in the selection process for graduate programs. Thirty-two or two thirds of the non-graduating Eagle STEM Scholars participated in 2015 Summer Research projects. Eighteen of the scholars participated in research at Winthrop and fourteen scholars participated in research at other locations including Clemson University, MUSC, Northeastern University, St. Jude Children's Hospital, UNC, University of Cincinnati, University of Minnesota, University of Pittsburgh, Virginia Tech, and Wake Forest. This special edition newsletter includes summaries from many of the scholars about their summer research experience. Dr. Robin Lammi, Director of Undergraduate Research, and Dr. James Hanna led the Summer Undergraduate Research Experience (SURE) Program at Winthrop. The research projects were directed by faculty from the Chemistry, Biology and Math Departments at Winthrop University. Students who were McNair Scholars were in programs directed by Dr. Cheryl Fortner-Wood. The research experience at Wake Forest was arranged for two scholars by Dr. Cliff Calloway and also for two scholars at St. Jude Children's Hospital arranged by Dr. Jason Hurlbert. Winthrop professors who dedicated their time to allow selected students to assist and learn in their research laboratories included Dr. Kristen Abernathy, Dr. Heather Evans-Anderson, Dr. Victoria Frost, Dr. Maria Gelabert, Dr. Nick Grosseohme, Dr. James Hanna, Dr. Matt Heard, Dr. Jason Hurlbert, Dr. Kathryn Kohl, and Dr. Takita Sumter. 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. Karen Kedrowski, Dr. Kathie Snyder, and Dr. Kristi Westover. ■

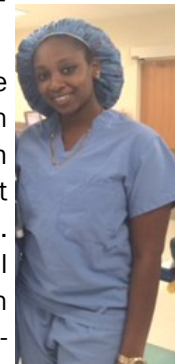
Winthrop Eagle STEM Scholars Program Director, Rachel Law

My Second Experience at St. Jude Children's Hospital

by Ashley Williams

This past summer, I had the pleasure of returning to St. Jude Children's Hospital to participate in the Pediatric Oncology Education (POE) program for a second year. While my previous experiences with research revolved around structural biology and proteins, this past sum-

mer, I was fortunate enough to be able to gain experience in a research field in which I did not have previous experience. I worked with Dr. Paul Thomas and Susu Duan in the Department of Immu-



See WILLIAMS page 4

Esseabasi Etim

This summer, I was fortunate to be a part of Clemson University's Charles Townes Fellowship. This was a ten week Research Experience in Clemson University's Center for Optical Materials Science and Engineering Technologies (COMSET). My research group, the Getman Group, focuses on Computational Catalysis under the guidance of Dr. Rachel Getman. The computational catalysis field, which was a novel field for me, uses theoretical and computational methods to investigate catalytic reactions at the molecular level.

As a Chemist/Computer Scientist, I found this field of research highly intriguing. I primarily worked with Sean Dix on modelling a catalyst for the oxidation of alkane to primary alcohol. The reaction pathway for the oxidation of alkane to primary alcohol is not the favored pathway, tertiary and secondary alcohols are more favored to primary alcohols. Therefore, to favor the primary alcohol pathway, a catalyst is needed to selectively oxidize the primary carbon of the alkane. We modeled a Metal-Organic Framework (MOF) as the catalyst for this reaction. A MOF is composed of an alloy surface, the pore/ring and an organic molecule. The pore of the framework restricts catalyst access to molecules of correct size, geometry and chemical properties. The framework itself will conform organic molecule to a specific orientation where only the terminal/primary carbon can interact with the catalyst.

I was tasked with tweaking the MOF to further in-

crease its efficiency in activating just the terminal/primary carbons. The real fun part of the project was running simulations on Clemson University's Supercomputer called The Palmetto Cluster. Every day, when I was not writing my reports or creating my presentation, I used the supercomputer to simulate my reaction using The Vienna Ab-initio Simulation Package better known as VASP. Typically, the simulations took 3 to 4 days to converge (complete), and the output of the simulation is a 5-second video showing the reaction progress from start to finish. Simulating the transition states of the reaction typically took ten to twelve days to converge. The experience taught me a lot about a catalytic reaction. I learned about the different sites on the metal where the organic molecule can bind to in the MOF. Then I, visually, placed the alkane on a site in the catalyst, run VASP on the reaction, then watch the movie of what happened during the reaction and then explored why and how to improve the original model. In addition, because the project is computational, all I needed was my computer and internet connection to work most days, so working on the project was very convenient. I had a lot of support from Dr. Getman, Sean and the rest of the group.

I really did have an excellent experience this summer at Clemson University COMSET thanks to Dr. Owens who introduced me to the Fellowship. ■



Etim

My Experience at UNC Chapel Hill

by Alexandria Pinnix

I spent ten weeks at UNC-Chapel Hill in the lab of Dr. Wei You, polymer chemist specializing in organic photovoltaics (OPVs). The graduate students there were among the most intelligent people with whom I ever had the chance to work. While the work could get hard, I had a great support system and worked through the majority of my project. The work involved collaborating with a graduate student to create a divergent synthesis to help create a library of donor-acceptor copolymers. The experience was an amazing one, and Chapel Hill is definitely a cool place to be. ■

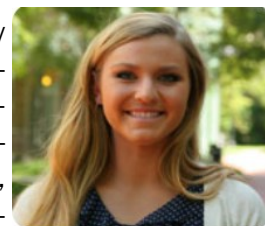


Pinnix

Summer Research at Northeastern

by Jessica Logan

I worked for the Chemistry and Chemical Biology Department at Northeastern University in Boston, MA. My principal investigator, Dr. Ke Zhang, is interested in polymer synthesis and nanomedicine. My project for the summer was developing bio-triggered, self-immolative nucleic acid-drug nanostructures, which involved organic synthesis, DNA synthesis, and nanoparticle formation. The goal was to develop a novel delivery system for anti-cancer drugs, while combining chemotherapy with gene therapy for synergistic ef-



Logan

See Logan page 8

My Summer Undergraduate Research Experience

by Sommer Barber

This summer I spent 8 weeks doing research under the guidance of Dr. Takita Sumter. I learned more in 8 weeks than I did in a year. The subject of my research project was colon cancer cells and an anti-cancer drug called EF-24. We hoped to find that the drug worked by inhibiting a protein called HMGA1 that is a known malignant tumor marker. We do not have sufficient data to support this hypothesis; however, we did find that the drug was notably effective in killing the cancer cells. The research provided incredible hands on experience in the biochemistry lab, and through self-guided studying and literature searches. It also made me more knowledgeable on several subjects. This was my first time doing research so I did not know what to

expect. It was a gratifying experience and I have discovered that research is now something for which I am highly interested. This summer's experience has opened my eyes to new paths and has improved my work ethic as well as my skills at acquiring the knowledge that I need to be successful. Undergraduate research is a wonderful experience here at Winthrop University, and I am thankful that I was given the opportunity to participate this summer. ■



Barber

My Summer Research Experience

by James Dean

This summer I was at the University of Pittsburgh as part of their Particle-based Functional Materials program, operating under the Department of Chemical and Petroleum Engineering. It is a yearly program that the chemical and petroleum engineering department operates. I worked under Dr. John

Keith performing ab-initio computational chemistry work in order to generate useful data regarding the adsorption of various molecules on tin and tin dioxide surfaces.

I really enjoyed the research! It actually caused me to change my plans for graduate school. My plans were

to go to graduate school for a generic MS in chemical engineering, but now I want to get a PhD doing computational work in chemical engineering. It was definitely worth my time, and was a really good learning experience. I would definitely recommend the REU to other people. ■



Dean

My Research at University of Minnesota

by Brionna Bennett



Bennett

I spent my summer at the University of Minnesota doing research in the Department of Surgery. There, I looked at the effect of methamphetamine on the gut epithelial barrier. Through my experience, I was able to meet many inspiring and knowledgeable individuals and other like-minded students. I was able to learn about the University's graduate programs, and all they had to offer. We were able to take the GRE, have mock interviews with department heads, enhance

our personal statements, and talk about graduate programs. More importantly, I was able to create a support system that will help me in my future endeavors. Honestly, I could not have asked for a better way to spend my summer! ■



Bennett

My Summer Research Experience

by Autumn Leggins

This summer, I had the amazing chance to work with Dr. Nicholas Grosseohme in the Winthrop Chemistry Department through the Summer Undergraduate Research Experience (SURE) Program. I worked on designing and making E. Coli expression plasmids that use the Golden Gate Cloning Strategy.

In a few months, I was able to experience how research works and how every day in the lab is different from the last. I got to see that there can be days where so many tasks need to be done in a single day that it seems impossible to complete everything. Then there were days where I would come in, start a reaction or transformation, and then have nothing else to do for my project for the majority, if not the remainder, of the day. I had to wait anywhere from a few hours to a whole day for reactions or transformations to be com-

pleted and they needed to be finished before I could move on. Because of this, I often found myself helping with other projects, doing background research for my own project, or working on designing parts for the E.coli expression plasmids. There were days where everything worked perfectly and the results were what was expected and other days where nothing seemed to go right and the results were not what was desired. I got to feel the disappointment of something not working and the happiness of actually completing some of the goals of our project by the end of the SURE Program. Ultimately, it was a unique and a highly-recommended experience for those majoring in the STEM fields and even non-STEM majors that have an interest in STEM fields. ■



Leggins

Five Eagle STEM Scholars Participates in the McNair Program

Five Eagle STEM Scholars, Jordon Lewis, Olivia Manley, Theresa Melendez, Jesslyn Park, and Leigha Stahl, participated in the McNair program during the summer. These Scholars, along with other McNair Scholars from Winthrop, presented their research at the 43rd Annual SAEOPP McNair/SSS Research Conference in Atlanta. They competed against fellow Scholars from universities including, but not limited to, UC Davis, University of Florida, University of Illinois, UNLV, LSU, Rider, and USC.

The title of *Olivia Manley's* presentation was "Biophysical characterization of Nur from *Streptomyces coelicolor*." Her mentor was Dr. Nick Grosseohme.

Jordan Lewis, Fall 2013 Cohort, was a third place award winner for his Life Science oral presentation at the 43rd Annual SAEOPP McNair/SSS Research Conference in Atlanta.



Lewis

"The Impacts of Beach Re-nourishment on the Distribution and Abundance of *Escherichia Coli*"

His faculty mentor was Dr. Matthew Heard, PhD Biology.

See **MCNAIR** page 5

WILLIAMS continued from front

nology, gaining insight into the role of CD8+ T lymphocytes in the event of influenza infection in mice. I enjoyed this experience, taking advantage of any and all learning experiences that were presented to me by various other people working in the lab, such as a graduate student investigating infection in human tissues. Not only was I able to gain experience in a new field of research, but I participated in volunteer opportunities through St. Jude. Engaging in Night Live, where I along with several other people coordinated activities for the inpatients, was a very fulfilling time for me while at St. Jude this past summer. I believe that being able to interact with patients and being able to contribute to the research that is helping them to lead normal lives for the past two summers has ultimately changed my life for the better. Not only was I able to have meaningful interactions with patients and those who I worked with in the laboratory, but I was also able to network and build friendships with many of the students that participated in the program. Research is an amazing time to network, learn outside of the classroom and discover the many opportunities that a career in science can offer you. I am very fortunate to be able to be a part of the Eagle STEM Scholars program and to be a Biochemistry student at Winthrop. Otherwise, I would not have had such amazing experiences over the past few summers. ■

by Shiannea Gathers

Smaller universities, like Winthrop, allow students many opportunities, such as conducting research, that are not as accessible at larger institutions. I was fortunate this past semester to be asked by two of my favorite professors to conduct research with them during the summer. Before my research experience, I was not as excited about the possibility of doing research. I spoke with a lot of my fellow classmates who were passionately involved in research and enjoyed the overall experience. I could never understand how they could be so enthusiastic about basically trial and error until I embarked upon my own research experience this summer.

My research experience was one of the best decisions I have made while attending Winthrop, for I have learned so much in my few months of conducting research. It was great to be sur-



Gathers

rounded by likeminded students who were driven and enjoyed talking about science as much as I did. In the process, I also made deeper connections with my research mentors, Dr. Frost and Dr. Heard. Most importantly, I loved working on a project that allowed me to combine two different fields of biology, microbiology and ecology, and work at the beach. The goal of my research was to determine temperature tolerance of environmental isolates of *Escherichia coli*. Basically, we collected

environmental strains of *E. coli* from the beach, exposed them to varying temperature conditions, and recorded their colonial growth.

I am very appreciative of my summer research experience. Not only did it help me find a topic I enjoyed researching and fell passionate about, but I also discovered a possible career interest in microbiology and the pathogenicity of disease-causing microorganisms. Now I understand why my fellow colleagues were so excited to talk about their research. It is something you pour endless hours of work into that in the end makes you a stronger student for doing it. That is why I recommend that every student get involved in research while you can. I promise it will change your outlook on life and the remainder of your college career. ■

My Summer at University of Cincinnati

by Adaeze Aninweze

This summer, I had the opportunity to work at the University of Cincinnati in the Chemistry department. My research focused on finding a quantification method for pseudouridine modifications in RNA. By the end of the summer, the project was successful on synthetic RNA. Final work on the project was to apply it on biological RNA, which we believe will also be effective. UC is a research based campus, so it is set up differently than Winthrop University. I had a chance to work alongside graduate students and learn more about their lifestyle. This helped me clarify my career goals. ■



Aninweze

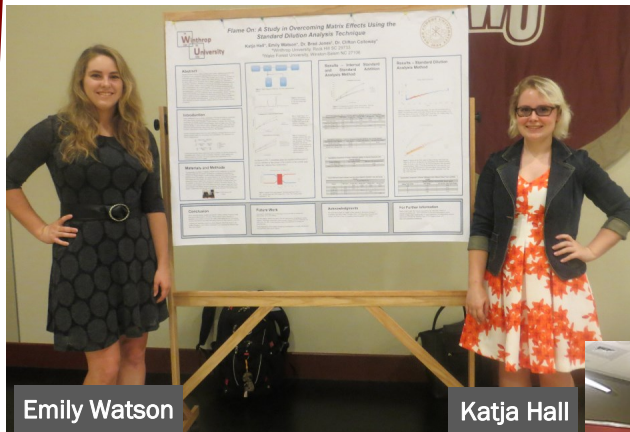
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Theresa Melendez's presentation was "Biological Evaluation of Novel Benzisoxazolo[2,3-a] Pyridinium and Quinolinium Tetrafluoroborates as Anticancer Agents." Her mentor was Dr. Takita Sumter.

The title of *Jesslyn Park's presentation* was "Expression, purification, and crystallization of an endoxylanase from *Bacteroides vulgatus*." Her mentor was Dr. Jason Hurlbert .

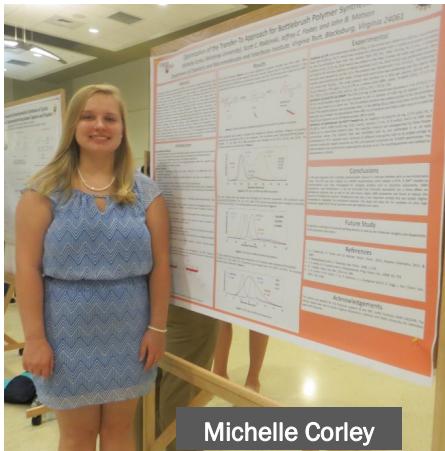
Leigha Stahl's presentation was titled "Creating a microcosm to examine salinity tolerance of *Escherichia coli* in beach sand." Her mentors were Dr. Victoria Frost and Dr. Matt Heard. ■

Eagle STEM Scholars Presenting Posters of their Summer Research

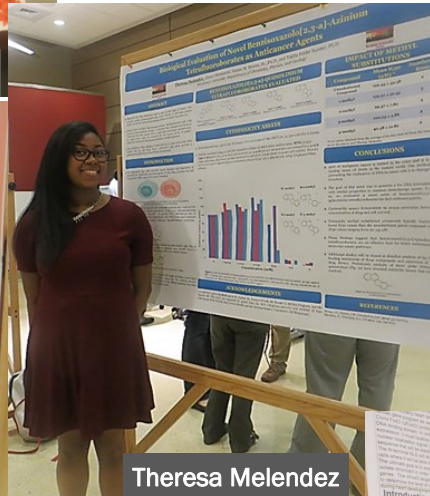


Emily Watson

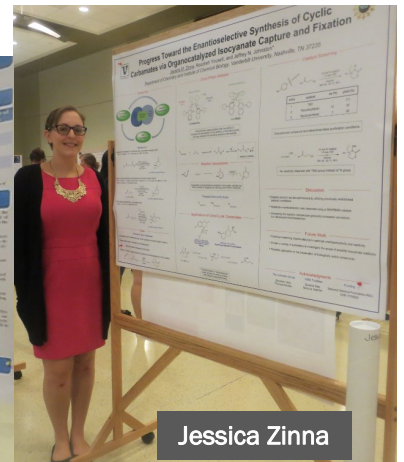
Katja Hall



Michelle Corley



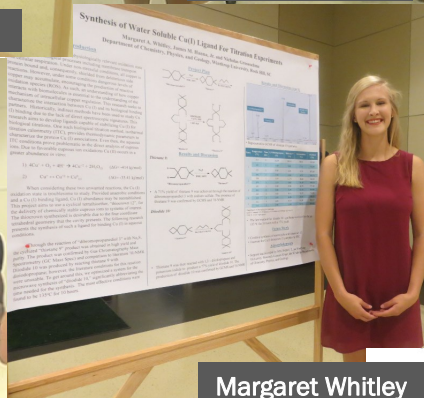
Theresa Melendez



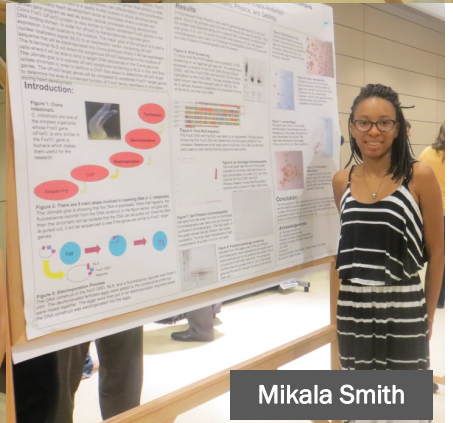
Jessica Zinna



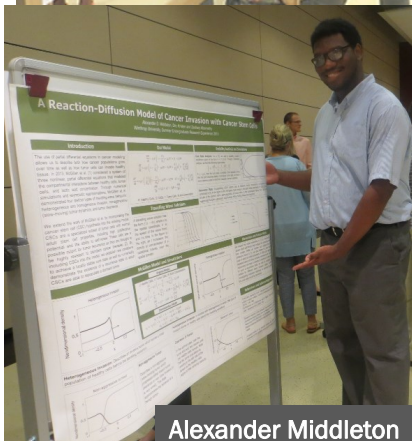
Adaeze Aninweze



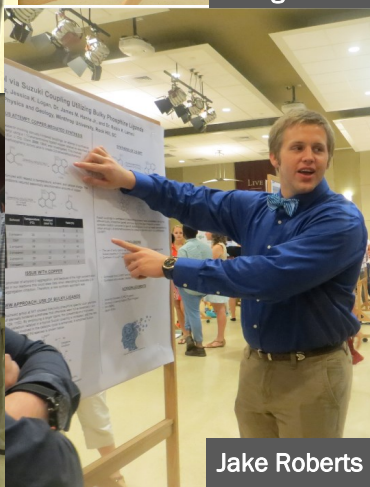
Margaret Whitley



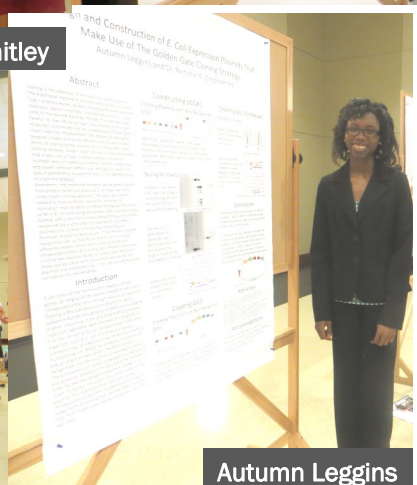
Mikala Smith



Alexander Middleton

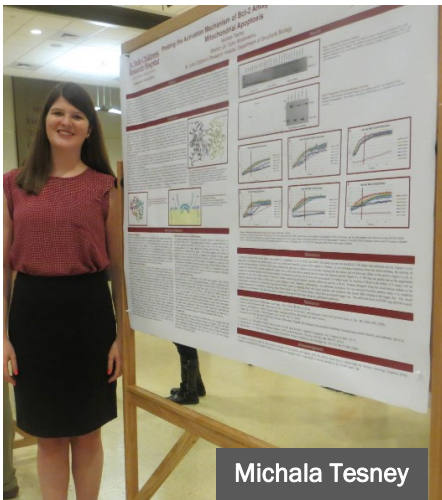


Jake Roberts

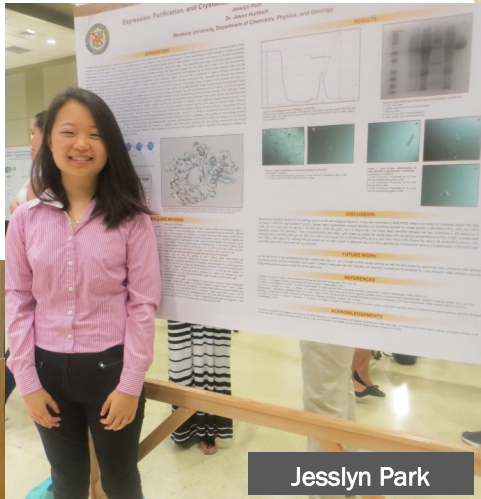


Autumn Leggins

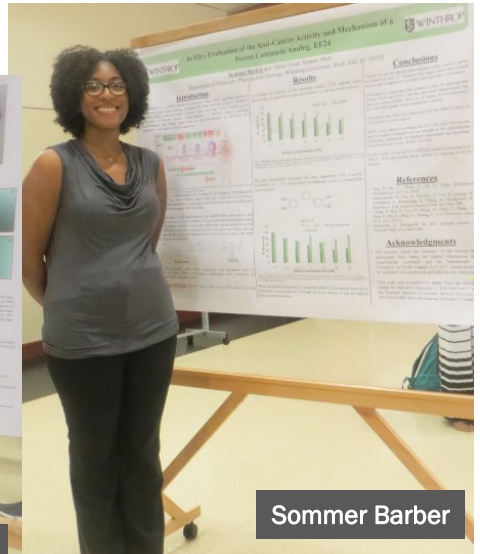
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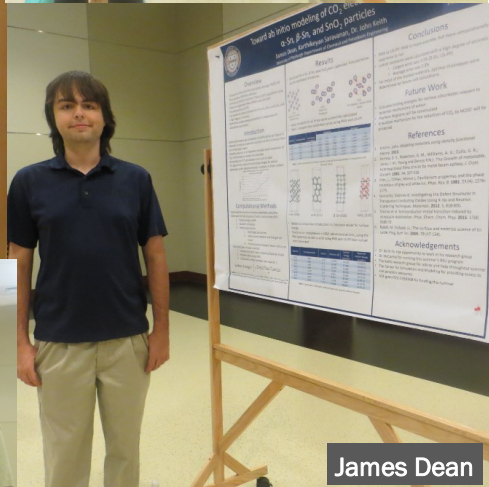
Michala Tesney



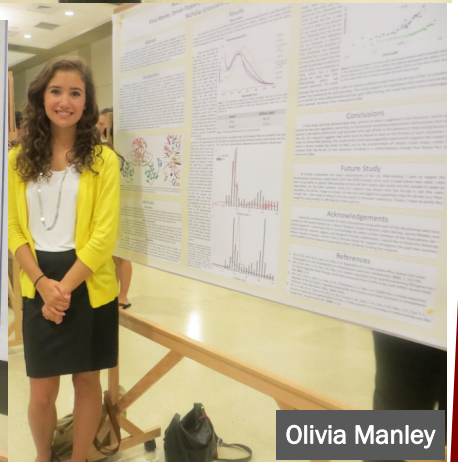
Jesslyn Park



Sommer Barber



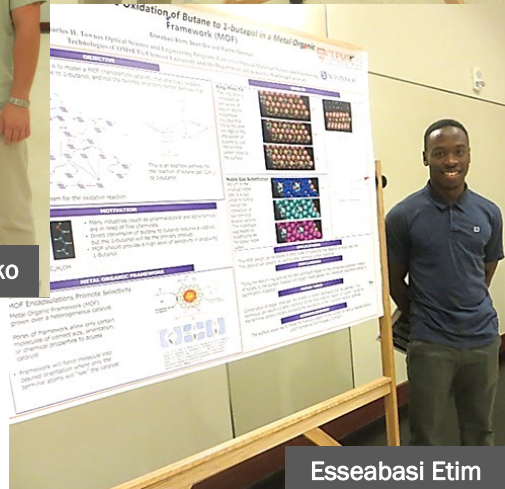
James Dean



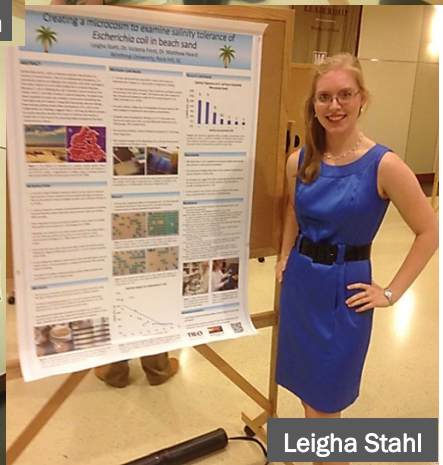
Olivia Manley



Davis Plasko



Esseabasi Etim



Leigha Stahl

My Research Experience

by Jordan Lewis

This was my second year doing research in the Ecology Department on Campus with Dr. Matthew Heard. We studied the effects of erosion and beach renourishment on bacterial levels on Coastal, SC beaches.



Lewis

Erosion is a common issue in many coastal areas around the world, especially the South Eastern United States. Left unchecked, it can have many adverse effects on these communities. One way that erosion is commonly combat-

ed is through a process called renourishment. During renourishment projects sand is dredged from other areas and replaced along beaches and coastlines in the erosion effected areas. This renourishment can save economic interest in these areas, but not much research has gone into how renourishment can affect the microbial life on the beach. The purpose of our project is to evaluate how microbial properties may change after renourishment projects, using a recent renourishment at Folly Beach, SC as a study area. ■



Lewis

Summer Research at St. Jude

by Michala Tesney

This summer I was a part of the Pediatric Oncology Education (POE) program at St. Jude Children's Research Hospital. I was fortunate



Tesney

to work in the structural biology department in Dr. Tudor Moldoveanu's lab for eleven weeks. I focused on the structural and functional analysis of the effector protein, Bcl-2 Antagonist Killer (BAK), and how it is involved in mitochondrial apoptosis. The POE program also provided a Lunch & Learn series where speakers from the hospital and speakers from related fields came and educated us on the clinical research and basic science research of different types of cancer. The program also allowed us to shadow and volunteer at the hospital which were wonderful experiences. Meeting all the other students, who were already in medical school, allowed me to network and learn about medical school. If anyone wants to go into oncology research or medical school, I highly recommend this experience. I could not have asked for a better summer! ■

Logan continued from page 2

fects. Through this program, I was able to gain valuable experience as well as to glimpse the life of a chemistry graduate student. While in Boston, I was also able to visit Merck which is one of the top bio-tech pharmaceutical companies. This trip solidified my plans to work for such a company following graduate school. Other fantastic experiences included attending a Red Sox v. Yankee game, exploring the Freedom Trail, shopping on Newbury Street, and witnessing the amazing Fourth of July fireworks display on the Charles River. ■

Eagle STEM Scholars Program

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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.