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Spring 2019 Undergraduate Research and Creative Inquiry Symposium Book of Abstracts

North Carolina Agricultural and Technical State University

NORTH CAROLINA AGRICULTURAL
AND TECHNICAL STATE UNIVERSITY

BOOK OF ABSTRACTS SPRING 2019 NC A&T STATE UNIVERSITY UNDERGRADUATE RESEARCH & CREATIVITY SYMPOSIUM

1) **Aaron Phillips,** Junior, Biology, Faculty Mentor: Dr. Misty Thomas; Understanding the mechanism of silver resistance in Escherichia coli by evaluating mutations in CusS.

   Understanding the mechanism of silver resistance in Escherichia coli by evaluating mutations in CusS. Authors: Aaron Philips, Joseph Graves Jr. and Misty Thomas Background: Silver has been used as an antimicrobial agent for ages. However, bacteria have developed a method of resistance to combat silver as an antibiotic. The CusS protein allows a bacterium to sense the presence of silver in order to activate expression of an efflux pump required for the removal silver from within to cell to extracellular matrix. Under normal exposure to silver this system is adequate, however, when silver concentrations become too high, the system becomes overwhelmed and kills the bacterial cell. Our previous work has shown that mutations in the cusS gene lead to silver resistance, and therefore the goal of this project is to understand how these mutation lead to changes in the mechanism of this protein and therefore resistance to this potent antimicrobial agent. Research Question: To elucidate the underlying molecular mechanisms leading to silver resistance in Escherichia coli by studying the change in function of CusS associated with silver resistant mutations. Methods: The cusS gene was previously cloned into a pET19b expression vector and transformed into E. coli for overexpression. For expression we begin with growing bacterial overnight cultures and subsequent large scale (1L) subculturing. After the subculture reaches an optical density of 0.5 at 600nm protein expression is the induced using IPTG. After overnight expression at room temperature, cells are harvested through centrifugation and stored at -80oC. Cells are then lysed using sonication and centrifuged to separate the soluble and the insoluble fractions. Results: As expected, we see expression of the CusS protein in the insoluble fraction of the insoluble fraction. This was expected, as CusS is a membrane bound protein and therefore we expected expression in the insoluble membrane fraction. Future Directions: To study functional changes functional changes associated with each CusS mutation, we will continue to purify CusS into into styrene malic-acid lipid nanoparticles to stimulate the natural environment of the membrane and then subsequent purification using its histidine-tag and affinity chromatography. Broader Impact: Understanding CusS protein can lead to advancements in antimicrobial medications. It can also help combat antibacterial resistance especially in regards to silver which is not extremely prevalent currently in nature.

2) **Adiya Moore,** Senior, Biology, Faculty Mentors: Dr. Misty Thomas and Dr. Scott Harrison; Too much of a good thing? Differential gene expression in Escherichia coli associated with the evolution of resistance to heavy metals.

   DNA sequencing of experimentally evolved iron (II) resistant strains of Escherichia coli (E. coli) K-12 MG1655, identified 21 genes which selectively swept the populations. The goal of this study is to analyze the differential mRNA expression patterns of 50 selected genes (based on gene networks associated with the 21 genes found in DNAseq) using the nanoString technology. For this study, we used three different lines of E. coli K-12

MG1655 with 5 replicates of each all grown in standard DMB media. We used E. coli K-12 MG1655 grown in standard DMB media as our control, an experimentally evolved iron (II) resistant strain, that is maintained in 1750 Âµg/mL iron (II) sulfate and an experimentally evolved silver resistant strain (Tajkarimi et al. 2017), subsequently evolved to then become iron (II) resistant maintained in presence of 1750 Âµg/mL iron (II) sulfate. Strains were then grown into lag, log and stationary phase in presence and absence of iron (II) sulfate, RNA was extracted and quantified then sent to nanoString (https://www.nanostring.com) for quantification of gene expression patterns of our 50 selected genes.The differences observed in growth rates of the different strains and under stress of iron sulfate indicated that there is likely a changed in gene expression between the different strain/conditions tested. Overall, the iron resistant strains responded by own regulating the iron regulator protein gene fur and iron transport genes. In addition, the iron resistant strains, in the presence of iron, downregulated genes that play a role in survival and reproduction. This accurately correlates with lower fitness levels shown during the growth of these strains; which may be a method these strains use as a defense until the environment is suitable for growth.

This study will provide further information regarding how E. coli can adapt and evolve in presence of heavy metals such iron and silver and understanding these mechanisms before they appear in nature is a proactive approach to addressing an inevitable problem. The limitations in our study are that nanoString technology is cost-effective method and cuts down on data analysis, there is the likely possibility that we are missing out on some key expression findings. Therefore, subsequent to the nanoString experiments we will then analyze the sample samples using RNA-seq in order to get a complete view of all differential expression under our tested conditions.

3) **Ahmeer Majied**, Senior, Environmental Science, Faculty Mentor: Dr. Vicki Foust; The Deep Dive

   The goal of this research was to analyze and assess the NCAT campus dumpsters and provide recommendations for reducing cost of dumpsters, adjusting quantity of dumpsters, placement of recycling dumpsters, and adjusting pick up schedule of dumpsters.Students were split into teams and assigned to different quadrants.Teams assessed the fullness of the dumpsters in there quadrants twice a week for two months and recorded results in a google form.In the duration of this research we observed some inconsistency/issues for each quadrant.However, we were able to create alternative solutions that will help resolve current campus dumpster issues.

4) **Alexis, Roach,** Senior, Laboratory Animal Science, Mentor: Dr. Jia Qiang He; Comparing the Rate of Proliferation and Cardiac Differentiation between B6- and MRL- Mouse Embryonic Stem Cells

   Previous studies crowned the MRL mouse as a â€œsuper healingâ€• strain due to its superior capacities to fully regrow an ear punch wound and repair damaged bone cartilage; however, the ability to regenerate cardiac tissue following myocardial infarction remains to debate. The present study aims to determine whether mouse embryonic stem cells (mESCs) derived from the MRL mouse strain (MRL-mESCs) will have a higher proliferation rate than those derived from the most commonly used B6 mouse strain (B6-

mESCs). Additionally, we will determine whether MRL-mESCs have a higher efficiency of cardiac differentiation into beating cardiomyocytes (CMs). To this end, both MRL- and B6-mESC lines were cultured on gelatin-coated plates with daily mESC medium change. To remove any potential contamination of fibroblasts originally from the mouse embryonic feeder layer, the mESC colonies were mechanically dissected with a needle under a microscope. These pure colonies were passaged every 3-5 days, at which time they were counted to determine proliferation rate. To induce cardiac differentiation, mESCs were seeded in a 96-well conical tube array and cultured for 5 days to form embryoid bodies (EBs). The EBs were then plated and driven toward the cardiac lineage with cardiac differentiation medium. 14 days after the EBs were plated, they were examined to determine the efficiency of cardiac differentiation. Our preliminary data indicates that B6-mESCs appear to have a higher proliferation rate than the MRL cells. The ongoing experiments aim to increase the sample size for statistical analysis.

5) **Alexys Riddick,** Senior, Chemistry Faculty Mentor: Dr. Misty Thomas; <u>Deciphering the mechanisms of silver resistance in Escherichia coli</u>

Background: Silver has historically been used as an antimicrobial agent in medical and health settings, but due to its widespread use, the threat of resistance is eminent. The potential mechanisms of silver resistance are not well understood, however, our previous work using experimental evolution have shown that mutations within genes that control major outer porin synthesis (ompR), purine synthesis (purL), RNA polymerase (rpoB) and native copper/silver homeostasis (cusS) may contribute to silver resistance in Escherichia coli. Research Question: This study focuses on understanding the impact of identified mutations in the histidine kinase cusS in the mechanism of silver resistance by setting up the no-SCAR (Scarless Cas9 Assisted Recombineering) CRISPR genome editing technique in the lab for mutant analysis. Methods: Molecular modeling of three of our detected mutations; L12R, T14P and R15L show that they are located near the N-terminus cytoplasmic tail and the fourth N279H is located near the C-terminus in the dimerization domain. Using the no-SCAR CRISPR genome editing technique we are incorporating these point mutations into the cusS gene in the genome of E. coli. First, we designed primers to create a cusS guide RNA in the pKD plasmid using polymerase chain reaction (PCR) to amplify two portions of the plasmid and circular polymerase extension cloning (CPEC) to join the PCR fragments. The pKD-gRNA plasmid was confirmed to be intact after using gel electrophoresis and subsequently transformed into DH5ï• ¡ cells. The pKD plasmid was then transformed into the competent cells containing the cas9 plasmid. The cells containing the pKD and cas9 plasmid will then be induced to produce Cas9 in order to cut the genome, transformed with ssDNA template with the appropriate mutations in order to induce homologous directed repair and insertion of the mutation. Future Directions: After mutant cell lines are confirmed through sequencing we will then do a phenotypic assessment by performing MIC assays for silver resistance as well as trying to understand the fitness cost of these mutations by performing growth and competition assays with the mutants. Broader Impact: Two-component response systems have been proposed to be a potential target for drug development and therefore this work will help us

to better preventively understand the mechanisms of silver resistance before it is widespread in nature and possibly have the opportunity to keep it under control.

6) **Angelica Hood,** Sophomore, Industrial and Systems Engineering, Faculty Mentors: Dr. Hilda Goins, Dr. Tonya Smith-Jackson; Inclusive Practices in Alzheimerâ€™s Research: The Geographic Exclusion

   The south is the highest ranking geographic region with death rates recorded related to Alzheimerâ €™s Disease. Often and sometimes, the phrase â€˜Alzheimerâ€™s disease €™ is used as the umbrella term that describes the process of mental deterioration of persons who are usually 55-85 years or older. Those affected exhibit a wide range of negative behaviors such as agitation, disengagement, and unpredicted outburst. The decline in the use of everyday skills can make it difficult for the caregiver to attend to and properly care for the person suffering from the disease. In return, this puts an immediate strain on the caregiver, which can result in improper care of the person with dementia. The Behavioral and Environmental Sensing and Intervention for Caregiver Empowerment (BESI) research team, comprised of researchers and medical personnel from the University of Virginia, Carillion Medical Center/Carillion Clinic, and North Carolina A&T State University, records and assesses agitation episodes. Using caregiver centered technology, the purpose of this research is to eliminate or reduce the effect of agitation by determining which environmental factors are more prevalent during the episodes and communicating this information to the caregiver. Moreover, African Americans make up 58% of persons with Alzheimerâ€™s disease2. Therefore, it is important that when research is conducted, African Americans and all regions of the south must be considered. However, most of the families encountered throughout the BESI Project have been upper middle-class Caucasians located in Roanoke, Virginia.3 It can be inferred that there are numerous reasons why minorities have not been a part of Alzheimerâ€™s- related research. At the conclusion of this research, I will identify the key reasons why the Southern region of the United States reports a sharp incline of Alzheimerâ€™s related disease compared to other regions. Furthermore, I hope to identify why African Americans have not been exposed to research studies such as the BESI Project, while identifying new methods to connect with African American Communities.

7) **Angelo Walker,** Junior, Biomedical Engineering, Faculty Mentor: Dr. Uitenham; Synthesis and Characterization of Fluorescent Protein Nanoparticles to Image and Treat Cancer

   Fluorescent proteins are invaluable tools that enable tracking of gene expression, cell cycle, and cancer cells in living animals. Fluorescent proteins originated from the jellyfish Aequorea Victoria, which expresses the green fluorescent protein (GFP). Fluorescent proteins were awarded the 2008 Nobel Prize in Chemistry. Traditional fluorescent proteins are limited in wavelengths, consume oxygen, and produce a stoichiometric amount of hydrogen peroxide upon chromophore formation. Far-red fluorescent proteins are desirable for imaging deeper in living animals because less light is scattered, absorbed, and/or reemitted by endogenous biomolecules. Dr. Rodriguez developed a new class of fluorescent protein by evolving an allophycocyanin alpha-subunit from a cyanobacterium, Trichodesmium erythraeum. The selected protein was named small Ultra-Red Fluorescent Protein (smURFP), which is biophysically as bright as enhanced green fluorescent protein (eGFP). smURFP is currently the brightest far-red fluorescent protein available. Recently,

patented radioactive fluoride chemistry developed by Drs. Rodriguez & Richard Ting (Weill Cornell Medicine) was tested in humans with positron emission tomography (PET) imaging and allows for improved lymph node mapping compared to clinically used magnetic resonance imaging (MRI) and single-photon emission computerized tomography (SPECT) agents. These new chemicals labelled with radioactive fluoride can miss small anatomical features and require extensive synthesis for attaching drugs and/or dyes for photodynamic therapy. smURFP was evolved to express extremely well in E. coli and gram quantities are easily purified in a day. smURFP is extremely pH and temperature stable, which are excellent properties to develop materials for biomedical imaging of human anatomy and disease. I purified the fluorescent protein, smURFP, and synthesized fluorescent protein nanoparticles. Synthesis was optimized by varying protein concentration, protein cross-linker, and sonication time. Fluorescent protein nanoparticles were characterized by size and fluorescence. I encapsulated solvatochromic, fluorescent dyes to safely mimic cancer drugs, such as doxorubicin, and analyzed incorporation. smURFP nanoparticles easily encapsulate small molecule drugs. The smURFP is easily modified for photodynamic therapy and PET imaging. The smURFP nanoparticles should enhance PET signal to image small anatomical features and very small, metastatic tumors in humans. These nanoparticles encapsulate drugs and modification allows for photodynamic therapy for treatment.

8) **Aniya Tyson,** Physics, Faculty mentor: Dr. Jing Zhang; Temperature Variations and Changes Over the Antarctic Peninsula
There has been a significant amount of warming on the Antarctic Peninsula (AP) since the 1950s. In fact, the warming is so significant and known as the most rapidly warming area in the Southern Hemisphere. There is no set reason yet why this happens. With literature reviews, the possible causes of warming have been explored. It is found the enhanced South Atlantic high and deepened Amundsen Sea low can lead to a warming trend across the west coast of the AP due to the enhanced northerly flow (warm advection) brought by these two pressure systems. NOAA's Advanced Very High-Resolution Radiometer (AVHRR) satellite retrievals were used to detect the temperature variations over the AP for the period of 1982-2000, it is found that the satellite retrieved temperatures correlate well with the station observations over the AP particularly for the cold season with less cloud cover. Also, the temperature of the east coast of the AP correlates poorly with the temperatures on the west coast. In a synthesis study of Antarctic temperatures, the warming trend over the AP is more significant in the months from March to August. In conclusion, even though there is no concluded reason why there is a significant warming trend in the area of AP, however, different simulation experiments can be designed to further explore the AP warming based on the possible mechanisms given by the early studies.
9) **Breon Henley,** Senior, Civil Engineering, Faculty Mentor: Dr. Stephanie Luster-Teasley; Polymer Comparison in Controlled Release Oxidation Pellets
The purpose of this research project was to compare the effectiveness of different polymers used in biodegradable Controlled-Release Oxidation Pellets. Controlled-release pellets are used to administer an oxidant encapsulated in a polymer in which the polymer releases the oxidant through its permeable membrane over time opposed to all at once. This method can be used to treat wastewater over time in a way that does not disturb vegetation and has no adverse effects on the water itself. For this research project, the polymers chosen were Polyvinyl acetate(PVAc) and

a mixed polymer makeup of poly (ethylene oxide) (PEO) and Polycaprolactone (PCL). The oxidant chosen to be observed was Potassium Permanganate, KMnO4. Together, the KMnO4 and the chosen polymers remediates bacterial contamination as well as hydrocarbon contamination. in water. This method was analyzed by measuring the absorbency and concentration of the oxidant released from the pellets in deionized water over a time span of three hours and at 24 hours.

10) **Brooke Jones,** Biology, Faculty Mentor: Dr. Antoniette Maldonado-Devincci; Social interaction with an alcohol-intoxicated peer alters behavior in adolescent male and female rats.

Alcohol readily facilitates social interactions and this effect plays an important role in adolescent drinking behaviors. During adolescence, there is an increase in social directed behavior in animals, which mimics adolescent human behavior. The goal of the present experiment was to conduct a detailed analysis of social and non-social behaviors that are altered following social interaction with an alcohol-intoxicated peer in adolescent male and female Sprague Dawley rats. Results show that ethanol intake and ethanol preference were increased in adolescent females, but not males, that socially interacted with an alcohol-intoxicated peer. We observed decreased social play and increased social contact in both males and females that socially interacted with an alcohol-intoxicated peer. Adolescent females that socially interacted with an alcohol-intoxicated peer showing greater social investigation relative to adolescent females that socially interacted with a non-intoxicated peer. In contrast, there were no differences in non-social behaviors, including rearing and self-grooming following social interaction with an alcohol-intoxicated peer. Together, these data indicate that the increase in ethanol intake observed in females that socially interacted with an alcohol-intoxicated peer may be due to changes in social investigation.

11) **Bryce White,** Biology, Faculty Mentor: Dr. Antoniette Maldonado-Devincci; Chronic intermittent ethanol exposure lowers brain corticosterone levels in male C57BL/6J mice.

Alcoholism and withdrawal can seriously affect the brain, including altering regulation of steroids and hormones. Neuroactive steroids are important for learning, memory and stress responses. Previous research showed that acute ethanol exposure increased hippocampal levels of the neuroactive steroid corticosterone, but not allopregnanolone (3α,5α-THP). Corticosterone and 3α,5α-THP are both progesterone-derived neurosteroids. Based on this, we hypothesized that chronic intermittent ethanol would induce compensatory increases in corticosterone in the same brain regions where we previously observed decreased 3α,5α-THP. The present study examined how chronic intermittent ethanol exposure altered brain corticosterone levels in subregions of the nucleus accumbens, amygdala, and hippocampus. Male C57BL/6J mice were exposed to four cycles of chronic intermittent ethanol vapor or air over four weeks. Eight hours following the last ethanol-vapor or air exposure cycle, mice were euthanized, brains collected, cut into 40 μm sections, and immunohistochemical analysis was conducted to visualize brain corticosterone immunostaining. Data indicate that corticosterone immunostaining was increased by 31.0±13.8% ($p<0.02$) in ethanol-exposed mice compared to air-exposed controls in the nucleus accumbens core. However, no change was observed in the nucleus accumbens shell. In the lateral subregion of the amygdala, there was a 22.1±12.0% ($p<0.05$) decrease in corticosterone immunostaining in ethanol-exposed mice compared to air-exposed mice. However, there was no change in the basolateral or central nucleus subregions of the amygdala. In the CA3 subregions of the hippocampus, corticosterone immunostaining was decreased by 21.44±12.2% in in ethanol-exposed mice, but no change in the CA1 subregion of the hippocampus. Together, in the present

work we observed compensatory changes in corticosterone responding in the nucleus accumbens core and in the CA3 subregion of the hippocampus. However, in the lateral amygdala we observed a decrease in both corticosterone in the present work and 3α,5α-THP in previous work. These data indicate specific subregions of limbic brain structures show compensatory changes in corticosterone levels, where we previously observed changes in 3α,5α-THP. Currently, other limbic brain structures and a longer withdrawal time point are under investigation for assessment of changes in brain corticosterone levels following chronic intermittent ethanol exposure.

12) **Camille England**, Senior, Faculty Mentor: Dr. Vicki Foust; Recycling with Pride: A Feasibility Study Validating Infrastructure and Engagement as Recycling Best Practices

According to the Department of Energy Quality, North Carolina Agricultural and Technical State (NCAT) University is recycling less than ten percent of its waste. Recycling with Pride has conducted a feasibility study to validate infrastructure and engagement recycling best practices through planning and implementing simultaneous recycling pilots in three different campus buildings: Administrative (Fort IRC), Residence (Pride Hall), and Academic (Carver Hall). To conduct this study, the incorporated of best practices for recycling infrastructure and engagement were implemented in each building. Data was collected using Google forms to capture daily recycling fillage and contamination rates. Throughout the study there was a consistent increase in recycling rates and a decrease in contamination rates.

13) **Courtney Richard,** Senior, Food and Nutritional Science, Faculty Mentor: Dr. Ramine Alexander; Antioxidant Activity of Mango (mangifera indica) Kernel Extract

An extensive amount of research has been conducted to prove that the regular consumption of fruits and vegetables provide health benefits. These health benefits are due to the antioxidants found within the fruit, which are known to have anti-inflammatory, anti-cancer, and anti-aging effects. One commonly consumed fruit is the mango, which is often used to manufacture fruit juices, smoothies, and fruit cups.The kernel of the mango is rich in antioxidants, but is typically disposed of because it can not be eaten raw and is not a commonly consumed food. By measuring the antioxidant activity in a sample of mango kernel extract it can be determined if mango kernel can be used as a natural antioxidant supplement or ingredient for food enrichment. Using mango kernel would also reduce waste production and provide an additional source of revenue in agriculture. Methodology: To determine the antioxidant activity of mango kernel total phenolic amount (TPA) and total antioxidant capacity (TAC) assays were used. The mango kernel extract was first dissolved in 1ml of water, then TPA was measured using Folin-Ciocalteu`s phenol reagent and then compared against gallic acid equivalents. The mango kernel extract was also dissolved in 1ml of water before TAC was determined by ABTS and DPPH radical decolorization assays and data was measured (in mg) against vitamin C and BHT equivalents. Findings: Measuring the antioxidant activity of mango kernel extract using 2,2'-azino-bis(3-ethylbenzothiazoline-6-sulphonic acid (ABTS) and 2,2-diphenyl-1-picryl-hydrazyl-hydrate (DPPH) showed a significant increase in antioxidant activity in high

concentrations of mango kernel extract (MKE). TAC measurements showed increasing amounts of phenols in higher concentrations of MKE. Conclusions and Implications: Based on the findings, mango kernel is high in antioxidants, which suggests that mango kernel, a byproduct, could potentially be used as a natural fortificant to increase antioxidant properties in foods that donâ€™t have high antioxidant content.

14) **Darius Herbert,** Senior, Chemistry, Faculty Mentor: Dr. Ming Dong; Structural analysis of human Branched Chain Aminotransferase

The human branched chain aminotransferase proteins (hBCAT), hBCATm (mitochondrial) and hBCATc (cytosolic), catalyze the transamination of the branched chain amino acids (BCAA), leucine, valine and isoleucine, to their respective Î±-keto acids and glutamate. Subsequent oxidation of the resulting Î±-keto acids, by the branched chain Î±-keto acid dehydrogenase complex (BCKDC), generates acyl-CoA, which enters the TCA cycle. Mitochondrial BCAT (hBCATm) is found in the pancreas, kidney, stomach and brain, is thought to be responsible for the majority of transamination outside the central nervous system. Meanwhile, the cytosolic isoform (hBCATc) is predominantly expressed in the brain and the peripheral nervous system, as well as the placenta and ovary. These enzymes play significant roles in amino acid metabolism and whole-body nitrogen shuttling, in particular with respect to the de novo synthesis of the neurotransmitter glutamate in the brain. Interestingly, the transamination is regulated by the redox center CXXC motif of the protein, where the mutants of the redox center leads to a compromised hBCAT activity. Our goal is to have a deeper understanding of the redox regulation with structural analysis.

15) **Davis Ashley**, Psychology, Faculty Mentor: Dr. Maldonado-Devincci, Antoniette; Adolescent intermittent ethanol alters behavior in adulthood in an animal model of binge alcohol exposure.

More than 90% of alcohol consumed by young people is in the pattern of binge drinking. This pattern of alcohol consumption occurs during a critical developmental period when the adolescent brain is undergoing dramatic maturational changes that can influence long-lasting changes in behavior control and affective behaviors in adulthood. Sex differences in the influence of adolescent binge alcohol exposure have been observed in rodent models. This study's focus is to investigate the long-term impact of binge alcohol exposure during adolescence in males and females. We exposed fifty-seven C57BL/6J male and female mice to adolescent intermittent ethanol (AIE) vapor inhalation exposure from postnatal day (PND) 28-41. Specifically, on PND 28-29, 32-33, 36-37, and 40-41, adolescent mice were exposed to vapor inhalation of volatized ethanol, or air as a control, for 16 hr a day/overnight. Each cycle consisted of two consecutive days of ethanol, or air, exposure followed by two days of non-exposure. Mice underwent an abstinence period from PND 42 until testing in adulthood. In adulthood, we assessed behavior in the open field testing to examine changes in general exploratory behavior and affective behaviors of anxiety-like behavior. Data were analyzed by two way ANOVA for sex and exposure. Blood ethanol concentrations during AIE ethanol exposure were 295.8 ± 23.3 mg/dl for females and 269.1 ± 25.0 mg/dl for males. Using total distanced moved (TDM) as a measure of general exploratory behavior, adolescent male and female mice that were exposed to AIE showed lower TDM compared to their air-exposed controls. Additionally, ethanol exposed males exhibited more boli compared to air exposed males, an effect absent in females. When using the center zone as a

proxy for anxiety-like behavior, there was no difference in the number of entries to the center zone or the amount of time spent in the center. Together, these data indicate that AIE alters behavior in adulthood in male and females.

16) **DestinA Riggins,** Senior, Biology, Faculty Mentor: Dr. Misty Thomas; Genomic resequencing of Iron (II) resistant strains of Escherichia coli

Bacterial resistance to antibiotics have caused an increase in usage of heavy metals as antimicrobials in an attempt to control the rate of antibiotic resistance. However, very few studies have been done to address the use of heavy metals and the genetic adaptations that occur as a result. Understanding the genetic changes that results from adaptation will help to elucidate the mechanism of resistance used by gram-negative organisms. Research objective: To assess the genetic changes that result in the genome of E. coli as a result of adaptation of iron (II) resistance. Methods: Evolved strains were pellet by Dr. Ewunkem and sent to us for extraction and sequencing. Extractions were done using the methods outlined in the standard Omega Bio-teck Bacterial DNA Extraction Kit protocol and eluted in 50mL elution buffer. DNA samples were then quantified using the fluorescent based dsDNA kits from Promega and measured using a quantifluor. mLibrary preps were conducted using the DNA flex kit from illumine and sequenced on Illumina MiSeq at JSNN. Fastq files were then processed using the Breseq pipeline to look for variation. Results: Genomic sequencing shows single nucleotide changes in ptsP which is involved in nitrogen metabolism, fecA which is a ferric citrate outer membrane transporter, ilvG involved in valine biosynthesis and finally in rpoB, the beta-subunit of RNA polymerase. Conclusions: The majority of genes identified to carry mutations are primarily involved in metabolism, indicating that these strains may be decreasing metabolic rates in order to potentially prevent entry of excess iron into the cell. In addition, the mutation in fecA may indicate that transport of iron into the cell may be decreased also in order to prevent survival. Future directions: Due to the requirements of high levels of efflux, metal resistance is often associated with antibiotic resistance. Therefore, the next goal is to take these iron resistant strains in order to see if they are also resistant to common antibiotics. Broader Goals: By understanding mechanisms of metal resistance before they appear in nature makes it easier to develop methods to counteract resistance before it is prominent.

17) **Destiny Belton,** Psycology, Faculty Mentor: Dr. Antoniette Maldonado-Devincci; Social influences in an adolescent animal model of polysubstance drug abuse.

Social and non-social interactions are subject to influence when drugs and alcohol are used during adolescence. During adolescence, there is a significant increase in social interaction and risk taking in humans and in animals. Recently, there has been a rise in polysubstance use with many times substance use disorders beginning to develop during adolescence. The present study used the demonstrator-observer paradigm to assess the interaction of social influences and cocaine exposure on adolescent animal behavior to serve a model of human adolescent social behaviors. The present experiment was designed to determine if social interaction with a cocaine injected same-sex peer altered social and non social behaviors and subsequent voluntary alcohol intake. Each adolescent rat was socially isolated for 45 minutes. After 45 minutes of social isolation, the demonstrator (non-experimental animal) was administered cocaine (5.0 mg/kg or 20.0 mg/kg) or saline (0.0 mg/kg). The demonstrator and observer (experimental animal being tested) were reunited and were allowed to socially interact for 30 minutes. Their behaviors were

video recorded and analyzed offline. Social behaviors quantified included social play, social investigation, and social contact. The non social behaviors quantified included rearing, as a measure of general exploratory behavior, and self-grooming, as a measure of non-socially directed behavior. The data suggest that social investigation increased and social play decreased in a dose-dependent manner in both males and females, with no differences in social contact. For non-social behaviors, in the control groups, males showed higher rearing tendencies compared to females, and social interaction with a cocaine-injected peer increased social grooming, regardless of sex or dose. There was no difference in ethanol consumption or preference following social interaction with a cocaine-injected peer in males or females. Together, these data suggest that social interaction with a cocaine-injected peer alters social and non-social behaviors, but not ethanol consumption in an adolescent animal model of passive social influences.

18) **Edward Dickerson,** Sophomore, Bioengineering, Faculty Mentor: Dr. Sharon Wellman; Restoration of Joint Motion by rhPRG4 in Mutant Mice that Recapitulate CACP Syndrome in Humans

The CACP syndrome is a rare autosomal recessive condition caused by mutations in the PRG4 gene, which encodes a lubricating glycoprotein present in the synovial fluid as well as the surface of articular cartilage. At the present time, there is no cure or specific treatment for CACP syndrome. The skeletal component of the CACP disease begins at birth or early adolescence and worsens with age. Lubricin (rhPRG4) is a surface-active glycoprotein that plays a key role in preventing cartilage damage in healthy synovial joints. The purpose of this study is to investigate if joint functionality percentages are altered from the diagnosis of lubricin (rhPRG4) in the synovial cavity located in the knees and understand gait disturbance in an animal model of CACP syndrome. Current work in the lab is determined to seek if lubricin will increase the joint functionality percentages of the mice as well as eliminating any foreseen discomfort and hardship related towards gait. A machine called DigiGait was used to show the mice's gait parameters. Before receiving the injection, the Prg4-/- mice were placed on the machineâ€™s treadmill for control purposes. Areas of focus range from changes in stride length to paw angel percentiles. The same Prg4-/- mice were injected with lubricin in both of their knee joints and placed back on the DigiGait. This procedure was repeated study exactly how long the lubricin is effectively benefiting the miceâ€™s gait. Each possible treatment data phase was analyzed via calculated percentiles, always comparing new gait activity to the controlâ€™s gait activity. There has been an increase and a decrease in some of the parameters, with the mice showing better strength, control, and authority of their synovial joints after the injection. This study has significant implications into understanding the development of CACP syndrome, as well as, articulating a movement dedicated towards increasing the healthfulness of those affected by CACP syndrome. Preserving the functionality of the human body is essential, and it is important to understand what else can be done scientifically to keep the joints of the human body feeling marvelous and valuable.

19) **Evan Pardue,** Senior, Biology Faculty Mentor: Dr. Robert Newman; Discovery of Novel Gene Candidates involved in Orsay Virus Replication in C. elegans

Until the discovery of Orsay virus, there were no known viruses found to naturally infect the nematode Caenorhabditis elegans. Orsay virus infection in C. elegans provides a unique model to effectively study virus-host interactions in a laboratory setting. Upon infection, Orsay virus exhibits a subsequent decrease in the intracellular lipid droplet area within the intestinal cells of C. elegans. Our previous results lead us to believe that the C. elegans lipid droplets are important for the replication of Orsay virus, so we hypothesize that decreasing the intracellular lipid abundance within C. elegans intestinal cells will lead to a decrease in Orsay virus replication. To this end, we performed an RNA interference screen, which utilized exogenous feeding RNAi to knockdown target genes involved in lipid production and the lipophagy pathway. Total Orsay virus replication was quantified via qRT-PCR, and results were normalized to rps-20, a cellular gene unrelated to Orsay virus infection. In parallel, C. elegans that have undergone RNAi knockdown were fluorescently stained with Lipidtox and Nile Red. C. elegans contain two primary lipid storage granules, neutral lipid droplets and lysosome-related organelles, so using Lipidtox and Nile Red was necessary to show the overall distribution of lipid storage granules as compared to control worms that had not been subject to RNAi. Our results illustrated that one gene known as sbp-1, a sterol regulatory element-binding protein involved in lipid metabolism, confers a ~2.5-log decrease in Orsay virus replication. These studies show a correlation between decreased intracellular lipid abundance and decreased Orsay virus replication.

20) **Fredisha Nelson**, Senior, Animal Science, Faculty Mentor: Dr. Ralph Noble; JBS/Pilgrim's Internship

21) **Gabriel Faulcon,** Freshman, Animal Science, Faculty Mentor: Dr. Uchenna Anele; Use of fungi and solid state fermentation to improve the nutritive value of corn stover

Digestibility and efficient use of crop residues by cattle is limited by the presence of lignin. However, solid state fermentation (SSF) of these residues with white rot fungi (WRF) results in the breakdown of lignin with concomitant release of nutrients and bioactive compounds which could benefit cattle productivity. Batch culture technique was used in the present study to evaluate the potential of utilizing SSF with WRF to improve dry matter (DM) digestibility of corn stover in ruminants. Five dietary treatments consisting of mixtures of corn stover and Kudzu in varying ratios (100:0, 75:25, 50:50, 25:75 and 0:100) were inoculated with Pleurotus ostreatus and subjected to SSF for 0, 35 and 77 days. Treatments consisted of mixtures of corn stover (C) and Kudzu (K) as 1) 100C:0K, 2) 75C:25K, 3) 50C:50K, 4) 25C:75K, or 5) 0C:100K, fermented for 0, 35 and 77 days. The study was arranged as a 5 x 3 factorial design with 3 replicates. Treatment effect ($P<0.001$) and treatment x fermentation time interaction ($P<0.001$) were noted on in vitro DM digestibility (IVDMD). On day 77, treatment 4 had the highest ($P<0.001$) IVDMD value while treatment 1 had the lowest ($P<0.001$) IVDMD. The was no difference ($P>0.05$) between treatments 3, 5, and the control. Numerically, the ranking of their IVDMD values from the highest to the lowest is: 4>2>5>control>3>1. Based on our results, subjecting crop residues to SSF removes the limitation that lignin typically place on their utilization in ruminants.

22) **Heaven Jordan,** Senior, Food & Nutritional Sciences, Faculty Mentor: Dr. Heather Colleran; The Effects of a 16-Week Exercising Program on Inflammatory Markers in Human Milk

Exercising during pregnancy is prominent for lowering systemic inflammation. Information on the effects that exercising has on human milk inflammatory markers is limited. Thus, it is critical to closely monitor both the control group and the exercise group post-partum to analyze the pro- and anti-inflammatory signals in human milk. A consistent exercising program has been found to reduce the proinflammatory markers within human milk, but specifically within colostrum. An exercising program has also been found to increase the number of fractalkine concentrations within human milk, which may foster neurodevelopment and neuroprotection in newborns. Post-baseline measurements randomization into either the exercise group or control group. The exercise protocol included a 60-minute exercise, at a maximum heart rate intensity of 65-80%, three days per week. The exercise intervention included both aerobic and strengthening training. The control group was instructed to avoid structured exercise and both groups were instructed normal dietary intake. Both groups were also given multivitamin supplements that contained 100% RDA, including 400 IU of vitamin D and 400 mcg of folic acid. mature human milk proinflammatory and anti-inflammatory cytokines (fractalkine, interleukin [IL]â€“1Î², IL-6, IL-8, IL-10, interferon [IFN]â€“Î³, and tumor necrosis factor [TNF]â€“Î±) will be measured using Luminex xMAP technology.

23) **Jada Elleby,** Senior, Sociology, Faculty Mentor: Dr. Tobin Walton; "Your Hair Isn't Appropriate, This is too Tight: How are African American Girls being Targeted in United State School Dress Code Policies?"

The purpose of this research is to examine how the United States school systems uses contemporary policies, and dress codes in attempt to increase discipline and academic performance. In 1969, the U.S. Supreme Court passed a law that implemented school dress code policies due to the Tinker vs. Des Moines Independent School District. The present research analyzes how dress code policies in Guilford County school systems effect students differently according to gender and race. We will investigate how the dress code policies are used as a notion of control by specifically observing how these policies are targeting African American girls by not considering their culture and somatotype.

24) **Jared Via,** Senior, Biological engineering, Faculty Mentor: Dr. Abolghasem Shahbazi; Industrial Hemp: Determining Growing Conditions in North Carolina

Industrial hemp (IHP) is a multi-purpose crop delivering seeds, fibers and bio-active chemicals that has the potential for a number of uses and markets. Legalization of production of IHP in North Carolina has made it necessary to establish a databank on best management practices (seed variety, planting practices, soil type, nutrient management and pest management). The objective of this research is to determine the effect of different nutrient management and IHP cultivars on cannabidiol (CBD) production. Two varieties (Therapy by Oak City Hemp and Cherry Otto by Flat River Hemp) and four different fertilizer rates (F1: 0%; F2: 33%; F3: 66% and F4: 100% of nutrient solution General HydroponicsÂ©) was used in this study. The transplants of each IHP varieties were planted early June 2018 using a randomized complete block split-plot experimental design with fertigation rate as the main plot factor and IHP variety as the sub-plot factor.

Preliminary results indicated that the Therapy variety yielded 0.01 % tetrahydrocannabinol (THC) and 6.2% CBD at F1; 0.08 % THC and 3.86% CBD at F2; 0.1 % THC and 5.5% CBD at F3; and 0.07 % THC and 6.51% CBD at F4. Cherry Otto yielded 0.05 % THC and 3.2% CBD at F1; 0.05 % THC and 5.4% CBD at F2; 0.09 % THC and 3.48% CBD at F3 and 0.07 % THC and 3.86% CBD at F4. Our IHP production information will provide first-hand information for growers to develop new markets for potential IHP products. Keywords: Industrial hemp, CBD production, fertilizer rates Topic areas: Plant Health and Production and Plant Products, Renewable Energy, Natural Resources, and Environment

25) **Jasmine McNeill,** Senior, Sociology, Faculty Mentor: Dr. Tobin Walton; Childhood, Drugs and Abuse

The research design I chose to attempt to answer this question is the best for researching my topic because I have access to the appropriate population, and a sampling technique that will ensure and maintain all of the studyâ€™s participants full anonymity and confidentiality. By having participants answer a few questions about their childhood experiences and exposure to drugs I will be able to identify patterns in the data and make connections to their adulthood drug use. Because it is a short survey that I plan to personally hand out, I can be sure that my participants are completely informed of the research question and projected goal. In making the survey myself, I have the total control to only include questions that are relevant to the study and will be useful in analyzing my data. This will allow me to collect data specific to the core concepts of my study including illicit drugs and alcohol and parentâ€™s attitudes toward drugs and alcohol. I will also use the interview data gathering technique as well, in doing this, I will be able to ensure that all of the participants have given voluntary consent to participate. The surveys will provide me with the statistical data needed to draw a conclusion, and the interviews then, will be used as an opportunity to gain a better understanding of participantsâ€™ answers and better enable me to apply my findings to the bigger, general population. In doing this I am able to eliminate the possibility of collecting data that is useless or ineffective to the study.

26) **Jeffrey Shelton,** Sophomore, Chemistry, Faculty Mentor: Dr. Checo Rorie; Fluoride containing compounds elicits a differential cytotoxic response on human breast cells

Sodium fluoride (NaF) is a commonly used preventive agent in many dental products, used to aid in the prevention and decrease of dental caries. Sodium fluoride (NaF) along with sodium hexafluorosilicate (F6Na2Si) and fluorosilicic (H2F6Si) acid solution are added to public drinking water to increase the accessibility of fluoridation to the public to help reduce the incidence of dental caries. However, previous observations and studies have revealed that the overconsumption of fluoride may lead to fluorosis in teeth and bones, and that high concentrations of these fluoride containing compounds show detrimental effects to cellular health. Previous studies showed that elevated levels on NaF caused toxic effects on C. Elegans and some human cell lines. Here we wanted to investigate the cytotoxic effects of fluoride compounds on the human breast cancer cell lines HCC70, HCC1806, and HCC1500. We revealed that all of the fluoride containing compounds elicited both a dose and time course cytotoxic response on the human breast cancer cell lines. We then exposed the breast cell lines to 10uM of all three fluoride containing compounds, NaF, F6Na2Si, and H2F6Si for 24hrs and revealed a differential cytotoxic effect on the cells and

between the different compounds. Light microscopy revealed that NaF had the greatest physical toxic effects on the cell lines, while the other fluoride containing compounds had very little physical effects. Interestingly, cell viability trypan blue exclusion assays revealed that H2F6Si had the greatest cytotoxic effect on the breast cell lines resulting in over 90% death. These studies reveal that while fluoride at low concentrations may help to prevent dental caries, at high concentrations fluoride containing compounds may also cause cytotoxic effects on human breast cells and may provide implications that these compounds could potentially be used as treatment options for breast cancer.

27) **Jemari Johnson,** Sophomore, Industrial and Systems Engineering, Faculty Mentor: Dr. Hilda Goins; Data Structuring in Alzheimer's Research

Cognitive function is defined as a personâ€™s performance in objective tasks that require conscious mental effort. Cognitive impairment occurs when a person has trouble performing objective tasks such as remembering, learning, or concentrating. Research has shown that environmental factors such as heat, glare, and noise are known to be stressors of people with cognitive impairment. Behavioral and Environmental Sensing and Intervention (BESI) for caregiver empowerment is a team of researchers from the engineering and medical fields tasked with understanding the environmental factors that influence agitated behaviors in People with Dementia(PWD). BESI is a cyber-human system compromising a tablet for inputs by the caregivers, sensors placed in different locations in the home, a wrist-worn wearable device for the PWD, and a base station in the home. The BESI system collects large amounts of environmental data using dispersed relay stations that extract data from the home of the PWD. This data describes audio, light and other ambient stimuli inside the home. However, in order to understand how environmental factors impact agitation states, it must be understood what combination of factors cause agitation in PWD. BESI then uses this data combined with caregiver inputs to understand how to minimize or prevent agitation in the PWD, which is a major source of stress for caregivers. To analyze this data, it must be structured in a manner that is easier to work with. To structure the data, I prep large amounts of raw data, organize the data and reduce the data in an attempt to understand how environmental factors cause stress. The data structuring process is a key input to model the data using statistical models and machine learning to understand what environmental factors cause agitation in PWD. These methods can be utilized in medical research and other research studies, and will advance our ability to design and develop effective cyber-human interventions for caregivers of PWD.

28) **Joshua McDuffie**, Junior, Civil Engineering, Faculty Mentor: Dr. Shideh Dashti; Experimental study on the seismic response of embankments on liquefiable soils improved with stone columns

Over the past few decades, methods used to reduce the liquefaction hazard in vulnerable areas have increased in number and complexity. On this subject, numerous studies have shown the insertion of granular columns to be an effective mitigation technique against settlement and lateral deformation by structures founded on liquefiable soil profiles. Granular columns are constructed by the insertion of coarse aggregate into the soil by means of compaction and vibration. The effectiveness of granular columns as a mitigation technique has been shown to involve three mechanisms: 1) ground densification during

column installation; 2) shear reinforcement added by column stiffness, and 3) enhanced drainage capacity. There is, however, a lack of understanding concerning the extent to which each of the mechanisms contribute to the overall mitigation and what factors are improved by the process. Being able to comprehend the relative contributions of the mechanisms would lead to the development and refinement of a more efficient stone column mitigation system design. We used reduced scale centrifuge modeling to examine the influence of the three distinct aspects under controlled conditions and compared them to an unmitigated system. The system of interest was a 4 m tall gravel embankment founded on dense Monterey sand (Drâ‰ˆ90%) with a liquefiable layer of Ottawa sand (Drâ‰ˆ40%) between it and a denser layer of Ottawa sand (Drâ‰ˆ90%). The columns inserted had an area replacement ratio (Ar) of 10% and were modified as needed to isolate each mechanism. The experimental results will provide insight into the influence of this ground improvement technique on key engineering demand parameters of interest in design, such as acceleration and settlement. In a larger scope, it will also allow for the calibration of numerical models and advance understanding involving the ground improvement method based on granular columns.

29) **Jourdan Dickens,** Sophomore, Biology, Faculty Mentor: Dr. Misty Thomas; Purification of the CusS protein into liquid nano disks

Silver is an antimicrobial agent that helps reduce the rate of bacteria growth. Silver kills bacteria by interacting with the cell wall and membrane, as well as disrupting DNA replication, transcription, and translation. Previous work using experimental evolution found four mutations leading to silver resistance in the *cusS* gene.The purpose of this research is to determine if any of the mutations in the *cusS* gene will change the function of the CusS protein and to determine if these changes will indeed make the bacteria resistant to silver. How do mutations in the *cusS* gene change the function of the CusS protein? How do these changes make the bacteria resistant to silver? The wild-type and mutant *cusS* genes were previous cloned into a protein expression vector. These samples were used to grow overnight cultures and then subsequently used to inoculate 1L cultures and grown to an optical density of 0.5 at 600nm. Once this was reached, cultures were induced with 1mM IPTG overnight at room temperature. Samples were then run on an SDS-PAGE gels to test for expression of the wild type protein. The wild type protein was successfully purified into the insoluble fraction of the cell lysate. After purifying the wild type CusS protein, the CusS protein would be isolated from the membrane to study it biochemically by inserting the CusS protein into a liquid nanodisk. Lipid nano disk keeps the membrane proteins in their natural form to be studied. This research will be completed again using the mutant type CusS protein to compare the function from the wild type CusS protein. Two-component response systems have been proposed to be a potential target for drug development and therefore this work will help us to better preventively understand the mechanisms of silver resistance before it is widespread in nature and possibly have the opportunity to keep it under control.

30) **Kelyah Spurgeon,** Junior, Biological Engineering. Faculty Mentor: Dr. Lijun Wang; The Role of Transcription Factor YY1 in the Expression of SNX3 and CPNE1.

The analysis of interactions between protein and DNA in the chromatin environment is essential to better understand the mechanisms governing gene expression in eukaryotes. Hybridization Capture of Chromatin-Associated Proteins for Proteomics (HyCCAPP) is a

novel technology that identifies proteins bound to specific region of the genome. The HyCCAPP method enables sequence-specific capture of DNA using complimentary oligonucleotides followed by identification of the proteins bound to that region using mass spectrometry. In our studies, we investigated sequence variants in the promoter regions of the human genes CPNE1 (Copine-1) and SNX3 (Sorting-Nexin-3). CPNE1 on chromosome 20 is important for calcium-dependent cell membrane association and is associated with non-small cell-lung cancer in humans. SNX3 on chromosome 6 is involved in protein trafficking. Mutation of this gene is associated with microcephaly and microphthalmia. According to the literature, transcription factor YY1 (Yin Yang 1) has an activating effect on CPNE1 and repressing effect on SNX3 in their wild type forms. The goal of our analysis was to verify the change in expression due to mutations in the YY1 binding region in the promoters of these genes. Then, using HyCCAPP we will identify YY1 and other proteins involved in regulation of the mutated forms of SNX3 and CPNE1.

31) **Kyle Barrentine,** Junior, Psychology, Faculty Mentor: Dr. David Hachen; Can personality impact the management of networks?

College students with larger networks tend be extroverted, and consequently have lesser depressive symptoms. Despite this, there is a dearth of research on how extroversion levels can impact the management of a network. Can the mismanagement of a network cause depression, and can extroversion â€“ or lack thereof â€“ play a significant role? The current study sought to address this question with 3 hypotheses; (1) can extroversion predict network size, (2) can depression scores predict extroversion and network size, and (3) can a variation in network size due to extroversion attribute to depression scores. For this study, researchers utilized the Net Health data set, which included behavioral and network data from a large (n = 714) majority Caucasian (65.6%) sample of college students from a private religious Midwestern university. A simple, and multivariate linear regression were conducted to test these hypotheses. Residuals were used to assess the variation of network size due to extroversion. There was a positive significant effect found between the residual term and extroversion (b = 0.972, p = < .001), which supported the hypotheses. This research suggests that limiting a social network may benefit a college student. For college students who are introverts, there is an apparent need for them not overemphasize friendships, as this may create additional stress which could hinder academic performance.

32) **Lasha Hicks**, Senior, Animal Sciences, Faculty Mentor: Dr. Jenora Waterman; Take the risk

33) **Lexis Deshazor-Burnett,** Junior, Biology, Faculty Mentor: Dr. Checo Rorie; CRISPR-Cas9-Mediated Knockout of Histone Demethylase KDM6A in Pancreatic Cancer

Clustered Regularly Interspaced Short Palindromic Repeats(CRISPR)-Cas9 originates from a system in bacteria used to protect them from invading phages and plasmids. CRISPR for genome editing involves the usage of a Cas9 protein and a single guide RNA (sgRNA) that form a complex and target the complementary sequence indicated by the sgRNA. CRISPR-Cas9 genome editing causes double strand breaks and creates random insertions and deletions causing an out of frame transcript. We sought to knockout KDM6A, a histone demethylase, located on the X chromosome. KDM6A is a tumor suppressor gene and is frequently mutated or lost in pancreatic

cancer. In pancreatic cancer, KDM6A loss, leads to activation of oncogenes, such as Î”Np63, MYC, and RUNX3, due to the deregulation of the COMPASS-like complex. In order to study the molecular mechanisms in human tumorigenesis, we sought to use CRISPR-Cas9 genome editing to knockout KDM6A in difficult to transfect pancreatic cancer cell lines. To achieve this, we will clone into the lentiCRISPR_V2 lentiviral vector to infect the pancreatic cell lines. In pancreatic cancer that retains KDM6A, we aim to determine if CRISPR-mediated knockout of KDM6A causes aberrant activation of oncogenes such as Î”Np63, MYC, and RUNX3, and squamous-like metastatic pancreatic cancer to develop.

34) **Mariah Bush,** Physics, Faculty Mentor: Dr. Jing Zhang; Southern Annular Mode, Foehn Wind, and Larsen C Ice Shelf
The Antarctica Peninsula (AP) has undergone a rapid increase of temperature within the recent decade. One of the leading factors that causes the warming is known as Southern Annular Mode (SAM). SAM is described as the north to south movement of westerly wind belt that circles the Antarctica. Forced by the westerly wind belt, the local mesoscale winds, known as Foehn winds, are frequently occurring on the east side of AP, where the Larsen ice shelves are attached to the ice sheet over AP. Once the Foehn wind event occurs, it is creating significant warming to the leeward side of AP slope due to adiabatic heating. The data we used to quantitatively explore the warming impacts of SAM and Foehn winds on the Larsen C ice shelf is the newly released ECMWF reanalysis-5 (ERA5). For the study period of 1979-2018, our study indicates that when SAM is in strong positive phase, surface temperatures over Larsen C ice shelf increase along with an increase in the Foehn wind events.
35) **Maria Ford,** Junior, Biology. Faculty Mentor: Dr. Misty Thomas; Assessing the Impact of Media on Antibiotic Production
The antibiotic crisis has come about due to the amount of antibiotics used, soon resulting in antibiotics that will no longer work to treat bacterial infections. When bacteria can no longer be killed by antibiotics, it is called antibiotic resistance and it is the cause of the antibiotic crisis. ESKAPE pathogens (Enterococcus faecium, Staphylococcus aureus, Klebsiella pneumoniae, Acinetobacter baumannii, Pseudomonas aeruginosa, Enterobacter species, and Mycobacterium tuberculosis) are at the forefront of the antibiotic resistance crisis. The ability of soil bacteria to produce antibiotics against ESKAPE pathogen safe relatives (Escherichia coli, Staphylococcus epidermidis, Enterobacter aerogenes, Acinetobacter baylyi, Mycobacterium smegmatis, Bacillus subtilis, Enterococcus raffinosus, and Pseudomonas putida) on different types of agar was tested. It was predicted that if the antibiotic-producing soil bacteria are placed on different types of media, then it will affect their production of antibiotics because different media offers different nutrients for growth and bacteria do not typically grow the same on different types of media. Bacteria was isolated via serial dilutions of soil samples from various locations. Each isolate was plated with each ESKAPE pathogen safe relative on Luria-Bertani Agar (LBA), Reasonerâ€™s 2A Agar (R2A), Trypticase Soy Agar (TSA) and Potato Dextrose Agar (PDA) plates and their ability to produce an antibiotic was observed. Antibiotic production was measured by the millimeters of growth clearance between the isolates and the ESKAPE relatives. In the results of the experiment, the bacteria did produce varying

amounts of antibiotics depending on what media it was plated on. Overall, the soil bacteria produced the most antibiotics on LBA and the least antibiotics on PDA. This directly corresponds to the bacteriaâ€™s ability to grow on each media. This study shows that the media that is used does have an effect on a bacteriaâ€™s ability to produce an antibiotic.

36) **Matthew Trotter**, Senior, Computer Science, Faculty Mentor: Dr. Jung Hee Kim; Measuring Collaborative Behavior in COMPS Student Problem-Solving Discussions

This project attempts to observe and measure collaboration between students who are working together to solve problems in a computer programming class. Collaborative problem-solving is among the that K-12 education is endeavoring to teach and measure, and appears in the most recent PISA international comparison of educational achievement. In COMPS (Computer Mediated Problem Solving) exercises students work together via online typed-chat. The communication is recorded and stored for further analysis. Using student dialogue files, the main research activity consists of manually classifying student dialogue according to four categories of collaborative utterance. The four categories are: sharing ideas, negotiating ideas, regulating problem solving, and maintaining communication. In concert with other researchers, we are using the hand-labeled data to attempt to train computer text classifiers to identify these behaviors. From there we will count the different behaviors and look for patterns of interaction. This is expected to reveal the conversational fingerprints which are characteristic of successful and unsuccessful student collaborations. This research may be useful to more easily measure collaboration within a group and to obtain a better understanding of how collaboration aids understanding and learning.

37) **Mercer Butts**, Freshman, Animal Science, Faculty Mentor: Dr. Uchenna Anele; Sustainable livestock production through efficient use of crop residues

Small- and medium-scale cattle farmers are constantly faced with the challenge of maintaining economic viability in the face of changing seasons and cattle feed. Their dependency on forage resources means that strategies that maximize the use of forage resources as well as minimize inputs while maintaining acceptable levels of cost of beef cattle is the way to go. Combinations of Kudzu, a common invasive species and corn stover were subjected to solid state fermentation with Pleurotus ostreatus and compared with grass hay for their nutritive value using the in vitro gas production technique. Treatments consisted of mixtures of corn stover (C) and Kudzu (K) as 1) 100C:0K, 2) 75C:25K, 3) 50C:50K, 4) 25C:75K, or 5) 0C:100K, fermented for 0, 35 and 77 days. The study was arranged as a 5 x 3 factorial design with 3 replicates. In vitro gas production was measured at 3, 6, 24 and 48 h of incubation using rumen fluid from 2 dairy cows fed standard diet at the CAES University Farm. In vitro gas data were fitted to a non-linear equation to calculate asymptotic gas (M), rate of gas production (k) and lag time (L). Interactions ($P<0.05$) between treatments and fermentation time were noted for M, k and L. Asymptotic gas was highest ($P<0.05$) for 0C:100K and 100C:0K on day 77. Results show that the treated corn stover was comparable to the control which is a good quality hay. Typically, corn stover has lower digestibility compared to grass hay but the inclusion of Kudzu before treating with Pleurotus ostreatus resulted in a superior by-product which can be utilized by limited resource farmers to maximize profit.

38) **Mercer Butts**, Freshman, Animal Science, Faculty Mentor: Dr. Uchenna Anele; Effects of plant nutraceuticals on in vitro fermentation of dairy feed

Hibiscus sabdariffa L. (Malvaceae) is an important plant that is widely distributed in tropical and subtropical regions around the world. Different parts of the plant are rich in polyphenolic compounds such as anthocyanins, chlorogenic acid, delphinidin 3-monoglucoside, caffeoylshikimic acid, gamma-tocopherol (lipid-soluble antioxidant), cryptochlorogenic acid, delphinidin and flavonoids such as gossypetin, kaempferol, hibiscetine, quercetin, sabdaretine and their derivatives. Based on the phytochemical properties of *H. sabdariffa*, it has been used extensively as a beverage, antioxidant, anti-obesity, anticholesterol, anti-cancer, etc. We hypothesize that *H. sabdariffa* can modulate rumen function to improve feed efficiency in dairy cows. We conducted an in vitro batch culture fermentation to evaluate the effects of calyces, flower and seeds from *H. sabdariffa* on gas production and dry matter disappearance of alfalfa hay, corn silage and calf starter feed.

39) **Myah Bynum,** Senior, Sociology, Faculty Mentor: Dr. Tobin Walton; Does cheap labor have a correlation with the population increase of private prisons?

This study will determine if cheap labor is a potential cause of the increase of private prisons. The increased rate of private prison populations has been steadily rising for the past 10 years. This study is aimed at researching the specific rules and regulations to facilitating a private prison. Itâ€™s important to study the history of the population increase, that way, long standing patterns will cease to exist or be revised.

40) **Myla Barker,** Senior, Environmental Studies, Faculty Mentor: Dr. Vicki; Foust Recycling with Pride: A Feasibility Study Validating Infrastructure and Engagement as Recycling Best Practices

According to the Department of Energy Quality, North Carolina Agricultural and Technical State (NCAT) University is recycling less than ten percent of its waste. Recycling with Pride has conducted a feasibility study to validate infrastructure and engagement recycling best practices through planning and implementing simultaneous recycling pilots in three different campus buildings: Administrative (Fort IRC), Residence (Pride Hall), and Academic (Carver Hall). To conduct this study, the incorporated of best practices for recycling infrastructure and engagement were implemented in each building. Data was collected using Google forms to capture daily recycling fillage and contamination rates. Throughout the study there was a consistent increase in recycling rates and a decrease in contamination rates.

41) **Olajide Olatidoye**, Senior, Chemistry, Faculty Mentor: Dr. Marion Franks; Synthesis and Characterization of 2â€™- Hydroxychalcones

Chalcones are known to be anit-bacterial, anti-microbial, anti-HIV, anticancer, anit-malarial, antioxidant, anti-inflammatory, and anti-viral agents. They are a class of compounds that have chemical activities that activate biological pathways in order to inhibit carcinogenesis. They are also known to have cancer chemopreventive properties. Cancer chemoprevention is the use of natural and synthetic molecules to inhibit the process of carcinogenesis. A chalcone can undergo 1,4-Michael addition with soft nucleophiles through itâ€™s enone system. Many biological systems utilize the Michael addition to activate chemproventive pathways and anticancer responses 2 . In this work, 2â€™-hydroxychalcones were of interest because they have increased 1,4-Micael acceptor activities. The 2â€™-hydroxy substituent is able to hydrogen bond with the carbonyl

oxygen of the enone system in order to increase the compoundâ€™s reactivity toward soft nucleophiles. The 2â€™hydroxychalcones that were synthesized using several types of aldol condensation reactions. Using various derivatives of synthesized chalcones , we have increased the free radical scavenging ability in the compounds in order to improve chemoprevention. Synthesized compounds were characterized via 1 H-NMR.

42) **Paris Parsons,** Junior, Biology, Mentor: Dr. Misty Thomas; Antibacterial activity of a new silver-based antimicrobial spray

Background : Escherichia coli has previously been shown to evolve and develop resistance to a variety of antibacterial agents including silver. Silver (Ag) has been used as an antimicrobial agent since 1000 BCE; and silver nanoparticles are widely used today in food packaging and surgical garments. In presence of silver, bacteria have the ability to maintain homeostasis through expression of the cusCFBA efflux system, although upon exposure to high concentrations silver is extremely lethal. In our previous work, we evolved silver resistant strains of Escherichia coli K-12 MG1655 and will use these here in this study to evaluate new silver based antimicrobial cleaning sprays. Objective : Analyze the minimum inhibitor concentration (MIC) of four silver-based compounds using both a WT strain of E. coli K-12 MG1655 and a silver resistant strain. Methods : The experiment follows a MIC assay protocol. Make a stock concentration of silver: 10g/L 1:100 dilution of the stock (100uL of silver + 9.9mL of LB media) â€“ this will be used for all of the assays (LBAg) = 0.1g/L = 100 mg/L = 100 ug/mL. Take the OD reading of bacterial culture and dilute it to 0.05 to use for MIC (OD) x (how much of your bacteria to add) = (0.05) (2000uL) Add 100uL of LB media into column 1 of a 96 well plate (rows A-C and F-H) (control). Add 95uL of LB media into column 2 of the plate (control). Add 95uL of LB media to columns 3 through 11. Add 95uL of LB and 95 uL of compound to column 12. Take 95uL out of column 12 and add it to column 11, mix up and down by pipetting (100 ug/mL final Ag). Repeat this serial dilution method up to column 3. Take 95uL out of column 3 and discard it. Designate rows A-C to k-12 strain and rows F-H Ag resistant bacteria. Add 5uL to every well that has media EXCEPT for column 1. Put in the Tecan-HP plate reader, select plate ID: BD Falcon 96 Flat Bottom Transparent Polyethylene Terephthalat, and take the OD at 600nm. Put in the incubator to shake for 24 hours. After shaking for 24 hours, take an OD reading at 600nm. Conclusions : Results show that compound C, inhibits the growth of the WT strain at a compound concentration as low as 1.5625% and Ag resistant strain at 3.125%. Compounds A, B, and D are controls and display growth inhibition significantly higher than that for compound C. Inhibition of bacteria growth required elevated concentrations of 12.5-50% from those particular compounds. The MIC for WT strain is 50% concentration and 3.125% concentration for the resistant of Compound A. The MIC for both WT strain and Ag resistant strain is 25% concentration of Compound B. Compound D inhibits growth of WT strain at 25% concentration and Ag resistant at 12.5% concentration. Future Directions: Test MIC levels of the four compounds on a variety of other bacterial species to gain a broader view of their effectiveness across gram-negative and gram-positive bacteria.

43) **Renee Waters,** Senior, Psychology, Faculty Mentor: Dr. Maldonado- Devincci; The BTBR mouse model of autism spectrum disorder shows impairments in cognition and social memory

Autism spectrum disorder (ASD) is characterized by social impairments, communication deficits, and increased repetitive behaviors (NIMH, 2018). It is also often associated with cognitive deficits (Matson and Shoemaker, 2009). Neuroimaging studies of ASD humans have identified abnormalities in the hippocampus (Schumann et al., 2004), a brain region involved in social behavior and cognition. Since ASD has been associated with cognitive impairments and social deficits, we hypothesized that BTBR mice, an idiopathic mouse model of ASD, have deficits in hippocampal-related behaviors. Consistent with the literature, BTBR mice were less sociable in the 3-chamber social test than controls (Mcfarlane et al., 2008). While control mice spent more time with novel than familiar mice, BTBR mice spent equal amounts of time with the novel and familiar mice. In the social recognition test, mice are exposed to a novel mouse in trial 1 and after a delay period re-exposed to the same, now familiar, mouse in trial 2. Control mice had normal social memory as measured by their decreased interaction times with the familiar mouse in trial 2, however the BTBR mice spent equal amounts of time interacting with the exposed mouse in both trials. We further confirmed another report (Seese et al., 2014) by showing that BTBR mice had cognitive impairments in the object location test such that they were not able to discriminate between a novel and familiar location of the object. Ongoing work is exploring whether physical exercise can improve ASD-related impairments in sociability, social memory, and cognition in BTBR mice.

44) **Simone Blaylock,** Senior, Chemistry, Faculty Mentor: Dr. Marion Franks; Emporium Abstract Blaylock

The Chemistry Department at North Carolina A&T State University (NCAT) used an emporium model to improve student learning in General Chemistry 1 (CHEM 106) course. Student learning was measured by a nationally accredited standard test and compared to students in a traditional teaching model. The ALEKS (Assessment and Learning in Knowledge Spaces) software package while being present in the emporium laboratory. Preliminary findings suggest that students who participated in the emporium courses and completed the assignments did better on standardized hour exams and nationally standardized tests that were given.

45) **SophiaHassan**, Junior, Biological Engineering, Faculty Mentor: Dr. Vicki Foust; Recycling with Pride: A Feasibility Study Validating Infrastructure and Engagement as Recycling Best Practices

46) **Steven Sessoms,** Senior, Architectural Engineer, Faculty Mentor: Dr. Vicki Foust; The Deep Dive: A Dumpster Assessment At NCAT

The goal of this research was to analyze and assess the NCAT campus dumpsters and provide recommendations for reducing cost of dumpsters, adjusting quantity of dumpsters, placement of recycling dumpsters, and adjusting pick up schedule of dumpsters.Students were split into teams and assigned to different quadrants.Teams assessed the fullness of the dumpsters in there quadrants twice a week for two months and recorded results in a google form.In the duration of this research we observed some inconsistency/issues for each quadrant.However, we were able to create alternative solutions that will help resolve current campus dumpster issues.

47) **Suhani Ramchandra**, Faculty Mentor: Dr. Misty Thomas; From Filthy Impure to Functional Cures

Antibiotic resistance is a growing issue because of the increased and inappropriate use of them. The ESKAPE pathogens *(Enterococcus faecium, Staphylococcus aureus, Klebsiella pneumoniae, Acinetobacter baumannii, Pseudomonas aeruginosa, Enterobacter species, and Mycobacterium tuberculosis)* are a group of deadly pathogens with rapidly growing multi-drug resistant properties and are most common in hospital settings. In order to prevent infection by these organisms, scientists are needing to discover novel drugs and antimicrobial agents to fight against the antibiotic crisis. Previous antibiotics have been attained from soil bacteria, which is why the next antibiotic will most likely come from this source. Here we have isolated antibiotic producing bacteria and used that to evaluate the effects of culture medium on the production of their antibiotics. We hypothesize that culture media does affect the ability of bacteria to produce an antibiotic. Each medium has different nutrients which stress the bacteria in different way to encourage antibiotic production. This project tested how much antibiotic was produced against the ESKAPE pathogen safe relatives on four different types of agar: Luria-Bertani Agar (LBA), Reasoner's 2A Agar (R2A), Trypticase Soy Agar (TSA) and Potato Dextrose Agar (PDA). The bacteria were obtained through dilutions of soil samples. First, the bacteria were swabbed onto the four culture media. After the bacteria grew, the plates were streaked with the ESKAPE relatives and their ability to produce an antibiotic was assessed by measuring the growth of the amount of antibiotic produced. The soil bacteria were successful at producing antibiotics and their production was dependent upon the type of culture medium used. This is important in understanding how culture medium affects antibiotic production using soil bacteria because the next antibiotic will most likely come from soil. This allows us to create new techniques for the detection and isolation of new antibiotics to fight the antibiotic crisis.

48) **Sydney Townsend,** Sophomore, Biology, Faculty Mentor:Dr. Misty Thomas; Deciphering the mechanisms of silver resistance in Escherichia coli

Background: Silver has been used medicinally since 750 AD. Itâ€™s widespread use as an antimicrobial agent in medical and health settings has made the menacing threat of resistance more possible in the near future. While there is little known about the mechanisms of silver resistance, our previous work shows mutations within specific genes that may contribute to resistance in Escherichia coli. These genes include cusS which controls silver homeostasis through expression of the CusCFBA efflux pump, ompR which is required for porin synthesis, purL which is involved in purine synthesis, and rpoB the RNA polymerase beta-subunit. Research Question: This study focuses on evaluating cusCFBA efflux pump expression in Escherichia coli strains that are either silver resistant or harbor single cusS mutations. Hypothesis: Both resistant and single mutant strains harboring cusS mutations will exhibit an increase in expression of genes associated with the cusCFBA efflux pump operon. Method: We began by growing 10mL cultures of up both silver resistant and single cusS mutant strains of E. coli acquired from our previous work in presence and absence of silver. RNA was then extracted from each sample using the Monarch RNA extraction kit from NEBÂ® and quantified using a QuantifulorÂ® from Promega. Each sample was then diluted to a final concentration of ~300ng/uL. RT-PCR was then used to evaluate gene expression of target genes. We first looked at the housekeeping gene cysG to ensure normalized expression across samples, then we evaluated cusC expression to assess expression of the efflux pump. Results: Assessment of

our cysG data showed equal expression across all samples indicating its validity as a control for this experiment. cusC expression show up regulation in some of our cell lines and a decrease in expression in others. Future direction: We will now evaluate expression of other genes in the operon as well as porin expression through looking at ompC and ompF also using RT-PCR. Broader Impact: This study will help us to understand the mechanisms of silver resistance before resistance becomes widespread in nature, in an effort to have measures in place as it becomes more prominent.

49) **Synphane Gibbs**, Sophomore, Faculty Mentor: Dr. Ming Dong; Enhancing Therapeutic Efficacy of Platinum Based Drugs by Pharmacologically Inhibiting PARP in Ovarian Cancer

Ovarian cancer is the 5th leading cause of cancer-related death in women. The standard treatment includes platinum-based therapeutics which rely on inducing DNA damage mediated apoptosis. Unfortunately, poly (ADP-ribose) polymerases (PARPs), which play an important role in cellular DNA repair, Â are overexpressed in ovarian cancer cells. PARPs are hypothesized to reduce and delay the effect of chemotherapies that induce DNA damage such as Carboplatin in cancer treatment. In this study, we tested the hypothesis that inhibiting PARP activity would increase efficacy of platinum-based chemotherapeutics. We tested this by evaluating the effect of Carboplatin on OVCAR-3 cells in combination with the PARP inhibitor - Niraparib Tosylate. The effects of Carboplatin with Niraparib Tosylate were analyzed by measuring toxicity (MTT and crystal violet), DNA damage (comet assay and immunoblot analysis) and cell death markers (immunoblot analysis). Our data suggest a synergetic effect of Carboplatin and Niraparib Tosylate by enhancing Carboplatin toxicity to cancer cells.

50) **Valorie Chasten**, Senior, Food and Nutritional Sciences, Faculty Mentor: Dr. Salam A. Ibrahim; Developing a screening system for identifying efficient inhibitors of the choline kinase of Streptococcus pneumonia

Gram-positive pathogens such as Streptococcus pneumoniae can have deleterious effects on both human and animal health. Antibiotics and antimicrobials have been developed to treat infections caused by such pathogens and to prevent food contamination. However, resistant strains emerge continuously. Thus, new strategies for controlling Gram-positive pathogen growth must constantly be developed. Putative inhibitors of Gram-positive isoforms of the enzyme choline kinase have been shown to block the growth of S. pneumoniae. However, the strength of inhibition and the mechanism of action of these inhibitors on S. pneumoniae choline kinase (sChok) is unknown. The aim of this project was to establish a system for screening sChok inhibitors by characterizing their strength of inhibition and determining their mechanisms of action. The sChok enzyme was expressed in BL21(DE3) cells and enriched using IMAC chromatography. The LDH/PK system of quantifying kinase activity was adapted for use with sChok. Inhibitor strength was determined by calculating IC50s. A simple comparative kinetic method was applied to determine inhibitor mechanism of action. The Km choline and Km ATP of sChok were 164.247 +/- 59.92 ÂµM and 144.523 +/- 17.8 ÂµM, respectively, while the Vmax choline and Vmax ATP was 103.562 +/- 9.125 and 67.5896 +/- 2.352, respectively. Two promising sChok inhibitors were identified: MN58 and 717, with IC50s of 500 uM and 0.2 uM respectively. MN58 and 717 had competitive and uncompetitive mechanisms of action, respectively.

51) **Victoria Martin,** Junior, Chemistry, Faculty Mentor: Dr. Zerihun Assefa; The Effect of Phosphorylation on Histone Tail Recognition by Epigenetic Reader Protein HP1

The study of epigenetics deals with the factors that turn genes on or /off at the right time. Proper maintenance of post translational modifications (PTMs) on histones is a critical feature of epigenetic regulation. Dysregulation is implicated in numerous diseases, including several types of cancer. The structure of chromatin and the degree to which DNA is packaged determine which genes will or will not be expressed. DNA is wrapppped around histone octamers in order to form the nucleosome, which then tightly packs together to form chromosomes. Post translational modifications are used to control genes turning on and off by binding to other proteins. These PTMs are recognized by non-enzymatic reader proteins. In this study, we investigate the effect of two PTMs: methylation and phosphorylation. The focus of our study is binding trimethyllysine on histone tail 3 to the HP1 chromodomain in the aromatic cage. One of the tyrosines in the aromatic cage can also be post translationally modified to phosphotyrosine. Reader proteins that bind methylated lysine have a common motif of an aromatic cage in which cation-Ї€ interactions are the driving forces for binding methylated lysine. We aim to determine the influences that phosphorylation has on binding via two strategies: by studying the complex HP1 protein itself along with a Beta-Hairpin model system. We have hypothesized that the cation- interactions would be weakened overall due to the phosphorylation of tyrosine. After running cCircular dDichroism experiments on the B-hairpin model system, the data suggests that the B-hairpin containing phosphotyrosine was less folded and less stabilized, therefore data received supported our hypothesis.

52) **Breanna Jackson,** Junior, Civil Engineering, Faculty Mentor: Dr. Manoj Jha; Analyzing the Impact of Urbanization on Watershed Hydrology Using HEC-HMS

Hydrology is the branch of science that is concerned with the properties of water and its movement as it relates to land. Within hydrology, watersheds are often analyzed. A significant social and environmental concern is the conservation of land and water resources. This is due to the increase in population and degradation of natural resources (Verma et al, 2010). Rapid development contributes to water issues, pollution, and climate variability. Urban areas typically demonstrate an increase in peak flow of streams, which correlates to an increase in flooding. This research specifically utilizes a hydrologic model to further investigate the impact urbanization on watersheds. The goal of this research is to understand the concepts behind hydrology and watersheds utilizing HEC-HMS. ArcGIS and HEC-GeoHMS are utilized to establish watershed parameters and a Curve Number Grid. This data is then imported into HEC-HMS in addition to weather data in order to predict discharge. The research will correlate urbanization and streamflow, by comparing the watershed of a more urban area to an agricultural area.

53) **Sumer Samara**, Physics, Faculty Mentor: Dr. Yuh-Lang Lin; Impacts of Hurricane Maria (2017) on Puerto Rico

Hurricane Maria is known as the tenth-most destructive and powerful tropical storm to ever hit the Atlantic. The storm caused calamitous damage to the Dominican Republic and, most famously, Puerto

Rico. Originally beginning from an African Easterly wave in the week of September 10th, 2017, Maria developed gradually until reaching tropical storm levels, thereby escalating into a full-blown hurricane, and quickly intensifying into a Category 5 hurricane upon reaching the islands, then down to a Category 4. It progressed for about 3 days, quickly weakening as it made landfall on September 20th, eventually moving towards the Outer Banks of North Carolina, with remnants making their ways to the coast of Ireland and the United Kingdom. The hurricane caused extensive damage to the islands in its crosshairs, accounting for some of the worst tropical damage the United States has ever experienced. Thousands were killed both during and in the aftermath of Maria, there were billions of dollars in damages to roads, schools, and cities, and people went months with no power on the entire island of Puerto Rico. To this day, Puerto Rico and the Dominica, alike, are still reeling from the catastrophic effects of Hurricane Maria.

54) **Rafaela Airoldi,** Food and Nutrition Department, Faculty Mentor: Dr. Roberta Claro da Silva; Chemical composition of a human milk fat substitute produced by enzimatic interesterification

The study and development of new human milk fat substitutes (HMFS) have significant economic and industrial importance since the production of HMFS has relevance in public health in cases where breastfeeding is not possible. The objective of this study was to produce structured lipids HMFS (lard - LA and coconut oil- CO) added with polyunsaturated fatty acids (Single Cell Oils - SCO). The individual oils and four different blends (A-50% CO + 50% LA, B - 50% CO + 50% SCO, C -50% LA + 50% SCO and D – 33% CO + 33% LA + 33% SCO) were interesterified using Lipozyme RM IM as catalizador. The oils and blends were analyzed by fatty acid composition (FA), triacylglycerol (TAG) composition and regiospecific distribution. The FA composition of the pure lipids showed a promisse source of FA to produce HMFS. The interesterifcation of blend A increased TAGs with 38, 40 and 42 ECN. The blend B showed an increase in the percentages of TAGs with 32, 38 and 42 ECN and also presented a new TAG with 40 ECN. The blend C showed 33 peaks of triacylglycerols with a broad distribution of triacylglycerols with TAGs from 32 to 52 ECN. The main triacylglycerols present are those with 44, 46 and 48 ECN groups, which are present in the three oils studied.The blend C after interesterification showed 73.9% of the saturated fatty acids esterified at sn-2 position, while unsaturated fatty acids preferentially occupied the sn-1,3 positions, as in human milk fat.

55) **Na'eema Jakes,** Journalism and Mass Communication, Mentors: Dr. Kim Smith and Dr. Tira Murray; Surviving RKelly:" A Framing Analysis of Tweets by Black Women

This study explored frames generated by black women who tweeted in the "#survivingrkelly" hashtag while watching the Lifetime cable TV series "Surviving R. Kelly" on Jan. 3, 2019. We analyzed 286 out of 2,651 tweets that fit the criteria for frames in our coding sheet. R&B artist Robert Kelly is accused of sexually molesting underage girls dating back nearly 20 years. The "empowerment for sexual abuse survivors frame" comprised nearly one out of three tweets. In this frame, black women tweeters provided links to resources or advice to help victims of sexual abuse. Twenty-seven percent of their tweets framed Kelly as an accused "sexual predator." Twenty-four percent of the tweets framed the underage girls he allegedly abused as "victims." Frames as potential tools for swaying public opinion for or against Kelly during the "Metoo" Movement, and their implications for black women, who are historically more likely to be victims of sexual abuse compared to women overall, were also discussed.

56) **Jadarius McCoy,** Junior, Journalism and Mass Communication, Faculty Mentor: Dr. Maria (Xueying) Zhang; Twitter as a News Medium: A Correlation Analysis of Uses and Gratifications with Survey

With advanced interactive search options aiding in finding specific news topics, social networking sites have emerged as a continuation to traditional media as an important news platform. An example of these sites is Twitter, on which users can receive alerts when a news organization has tweeted or released news on a breaking story. Users can also tweet and reach thousands of other users instantly. Drawing on Use and Gratification theory, this study used Twitter as an example, aiming to compare social networking sites with traditional media such as television, newspaper, and radio in serving as a news platform from a user's perspective. An online survey was conducted with Qualtrics. 40 participants volunteered and reported significant higher trust of Twitter as a news platform than traditional media, including TV, radio and newspaper. Correlation analysis further suggested that the more participants reported using twitter, the more they perceive it as useful for news ($N = 40$, $r = .35$, $p < .05$). However, such correlation was not observed with traditional news media such as TV and radio. Age was also significantly correlated with perceived usefulness of a news platform such that the younger the user, the more likely s/he perceived Twitter useful ($N = 40$, $r = .84$, $p < .01$), and less likely perceiving TV ($N = 40$, $r = .32$, $p < .05$) and print media ($N = 40$, $r = .40$, $p < .05$) as useful. Theoretical and practical implications for journalism and news business were discussed.

57) **Jalan Gunning,** Donecia Dunk, Journalism and Mass Communication, Faculty Mentor: Dr. Maria (Xueying) Zhang; Coping with Media Stereotype of African American Women: A survey study of A&T students

For years, African American women have been portrayed in mainstream media in a false light. From the 50's, African American women have been portrayed as maids and helpers to different families. Fastword to today's media, reality t.v. has become more prominent and has created the stereotype that African American women are "ratchet", loud, and always acting out. However, majority of who plays in these reality T.V. shows are African American women themselves. This study conducted a survey on A&T campus examining how female students perceive the negative stereotype of African American women on today's mass media and how they cope with stereotypes. Results suggested that (1) participants reported rarely having an African American role model in the media; (2) they deliberately go against the stereotypes of the media portrayal by prayer and discussing with friends; and (3) the perceived scope of possibility for young African American women was negatively affected by mass media portrayal. These findings confirm cultivation media effect theory. The results have significant implications on how to boost young female African Americans' self-identity.

58) **Taylor Smith,** Journalism and Mass Communication, Faculty Mentor: Dr. Maria (Xueying) Zhang; The Misrepresentation of People of Color In Society: A Survey Study of Awareness of Stereotype and Negative Treatment

In United States, racial stereotypes have had an extremely damaging influence on the development of people of color for decades. Using an online survey, this study investigated whether American people are aware of major types of negative stereotypes of people of color on media, such as being violent, being related with drug, being related with crimes or relying on welfare benefits. The survey also examined whether people of color are perceived to be treated negatively by US society. The results suggested strong awareness of stereotypes and negative treatment. A significantly correlation between the awareness of stereotype and negative treatment of people of color were also detected ($r = .59$, $p < .05$). The results indicated several directions that our society could make the progress necessary to make the country a more perfect union.

59) **Kayla Rucker,** Devone Gainy, Journalism and Mass Communication, Faculty Mentor: Dr. Maria (Xueying) Zhang; Media Perception & The Effects of Media: How College Students Consume News and be Attached to Their Phones

The objective of our research was to examine how college students utilize digital media for news and how attached they are to their phones. We hypothesized that the more people consume entertainment news, the more they want to be informed of world news, the more people feel required to consume news because their job requires it, the more likely they feel attached to their phones. 40 participants were recruited using snowball sampling and the correlation analysis results supported all three hypotheses. Implications for journalism practice and users' wellbeing were discussed.

60) **Jessica Smith**, Junior, Animal Sciences, Faculty Mentor: Dr. Mulumebet Worku; Detection of Alu insertion polymorphism in human

The Alu insertions polymorphism are short stretches of DNA, which are the most abundant transposable polymorphisms that may reach over one million copies dispersed throughout the human genome. The objective of this project is to detect the Alu insertion in human genome using polymerase chain reaction (PCR). The DNA samples were extracted from the saliva of four humans. The PCR then was used to amplify the Alu insertions with the Biorad kit (PV92 PCR Informatics Kit). The PCR product was analyzed with gel electrophoresis. The results show the three types of Alu insertions.

61) **Imani Anderson**, Junior, Animal Sciences, Faculty Mentor: Dr. Mulumebet Worku; DNA Extraction from Sheep

DNA Isolation is the process of purification of DNA from a single or a collection of samples, using physical of chemical methods of separations. After isolation, the DNA can be used to study genes, which are segments of the DNA. In this study we isolated DNA from five sheep (st croix) from the NC A&T small farm using FTA card (Whatman® FTA® card technology). The DNA concentration and purity then were measured using a Nanodrop spectrometer. The results show that pure DNA for the five sheep was collected from the FTA.

62) **Darius Herbert,** Chemistry, Faculty Mentor: Dr. Ming Dong; Structural Analysis of the Redox Regulated human Branched Chain Aminotransferase

The human branched chain aminotransferase proteins (hBCAT), hBCATm (mitochondrial) and hBCATc (cytosolic), catalyze the transamination of the branched chain amino acids (BCAA), leucine, valine and isoleucine, to their respective α-keto acids and glutamate. Subsequent oxidation of the resulting α-keto acids, by the branched chain α-keto acid dehydrogenase complex (BCKDC), generates acyl-CoA, which enters the TCA cycle. Mitochondrial BCAT (hBCATm) is found in the pancreas, kidney, stomach and brain, is thought to be responsible for the majority of transamination outside the central nervous system. Meanwhile, the cytosolic isoform (hBCATc) is predominantly expressed in the brain and the peripheral nervous system, as well as the placenta and ovary. These enzymes play significant roles in amino acid metabolism and whole-body nitrogen shuttling, in particular with respect to the de novo synthesis of the neurotransmitter glutamate in the brain. Interestingly, the transamination is regulated by the redox center CXXC motif of the protein, where the mutants of the redox center leads to a compromised hBCAT activity. Our goal is to have a deeper understanding of the redox regulation of hBCAT with structural analysis.

63) **Jackson Wiles**, Junior, Physics, Faculty Mentor: Dr. Jing Zhang; Evaluation of the Snow-Ice Enhanced Weather Research and Forecasting Model

The performance of the snow-ice enhanced Weather Research and Forecasting (WRF-ice) model was evaluated for the simulation of a mesocyclone at a 5-km resolution for the period of October 23-25, 2017 over the Antarctic Peninsula (AP) using the Moderate Resolution Imaging Spectroradiometer (MODIS). MODIS data is acquired from two satellites known as Terra (MOD) and Aqua (MYD). Two types of MODIS products are used in the evaluation, including the Land Surface Temperature (LST) and Ice Surface Temperature (IST). Based on the availability of MODIS data, the hours used in the evaluation against MOD were 11.5-15.5 Universal Time Coordinated (UTC) for daytime and 08-12 UTC for nighttime. In the evaluation against MYD, the daytime hours were 18-22 UTC and nighttime of 02-06 UTC due to different orbital times of the Aqua satellite. The LST product is configured on a 0.05 degree latitude/longitude climate-modeling grid (CMG), and the IST product is on a 4-km resolution Equal Area Scalable Earth Grid (EASE-Grid). Both of the two products are combined to the WRF-ice domain using the closest point interpolation

64) **Xavier Warren,** Sophomore, Mechanical Engineering, Faculty Mentor: Dr. Michael Atkinson; African Easterly Waves and Tropical Cyclone Genesis

African easterly waves (AEWs) are key summertime weather systems that prevail over tropical North Africa and the Atlantic. These waves are known to impact daily rainfall over the continent and also tropical cyclones (TC) downstream over tropical Atlantic. Several past studies show that AEW form over East Africa in association with deep convection (REFERENCE). The propagate westwards at about 10 degrees per day and are characterized by wave lengths of 2500-4000km. They grow and amplify over West Africa in association with midtropospheric wind stream known as African easterly jet. Daily rainfall and Convective development and strengthening is associated with propagation of AEWs. On average, about 60 waves form and propagate westwards from tropical Africa towards the Atlantic. These waves serve as precursors to TC-genesis (REFERENCE). About half of TC and about 80% of hurricanes form in association with AEWs (REFERENCE). However, only a small percentage of AEWs are known to spawn TCs over eastern Atlantic. Some AEWs tend to serve as precursors, most don't. We do not know why some trigger TCs and some don't. Starting with a case study, this study investigates the environmental conditions that facilitate AEWs enhancing into tropical cyclones.

65) **Chelia Thompson**, Junior, Physics Engineering, Faculty Mentor: Dr. Solomon Bililign: What Happens to Nighttime Power Plant Emissions

The performance of the snow-ice enhanced Weather Research and Forecasting (WRF-ice) model was evaluated for the simulation of a mesocyclone at a 5-km resolution for the period of October 23-25, 2017 over the Antarctic Peninsula (AP) using the Moderate Resolution Imaging Spectroradiometer (MODIS). MODIS data is acquired from two satellites known as Terra (MOD) and Aqua (MYD). Two types of MODIS products are used in the evaluation, including the Land Surface Temperature (LST) and Ice Surface Temperature (IST). Based on the availability of MODIS data, the hours used in the evaluation against MOD were 11.5-15.5 Universal Time Coordinated (UTC) for daytime and 08-12 UTC for nighttime. In the evaluation against MYD, the daytime hours were 18-22 UTC and nighttime of 02-06 UTC due to different orbital times of the Aqua satellite. The LST product is configured on a 0.05 degree latitude/longitude

climate-modeling grid (CMG), and the IST product is on a 4-km resolution Equal Area Scalable Earth Grid (EASE-Grid). Both of the two products are combined to the WRF-ice domain using the closest point interpolation method for further verification. Comparisons among surface temperatures from MODIS MOD, MYD, as well as WRF-ice during the simulation period showed significant differences between the MOD and MYD land surface temperature. For this reason, additional quality assurance was added to fine tune the MODIS LST used for the evaluation. However still more discrepancies were found in the WRF-ice evaluation against MOD, either excessive warm or cold conditions. Furthermore, MODIS is not able to provide data over cloud covered area. Future research and studies on cloud interference within MODIS products would be beneficial to the user community to understand how more quality control could accurately depict the data taken from each tile grid over a given region.

66) **Kamaria Bush,** Senior, Biology, Faculty Mentor: Dr. Scott H. Harrison; Mutational Changes Across Pathways for Different Euryarchaeal Lineages

he domain Archaea is in need of additional scientific investigation, so that our understanding of this variety of life may further approach levels of knowledge comparable to the two other domains, Eukarya and Bacteria. The archaeal phylum for which most genomic data exist is Euryarchaeota. This phylum is found both in diverse environments and in association with human and other eukaryotic hosts. We analyze the following question for differentiating Euryarchaeota lineages: as a gene changes in a pathway, do other genes also change in this same pathway? For homologous genes that are shared across the Euryarchaeota, we hypothesize that levels of genetic sequence differences between homologs, that are specific to different phylogenetic groupings, will be clustered based on pathway associations. Furthermore, we expect that pathway associations that are characteristic for different phylogenetic groupings will provide insights on environmental and host adaptations. We examined 113 fully sequenced genomes from the phylum Euryarchaeota, through the use of the Department of Energy Joint Genome Institute Integrated Microbial Genomes and Microbiomes (IMG/M) system. From our analysis, 2529 KEGG Orthology (KO) gene-based functions were identified from 113 fully sequenced genomes of Euryarchaeota, and 173 of these KO functions had full representation across all 113 fully sequenced genomes. These 173 KO functions mapped to 80 different KEGG Pathways, ranging from 1 KO function identified within a specific pathway to 44 KO functions identified within a specific pathway. Almost half of the associatively mapped KEGG Pathways had just a single identified KO function. There were on average 3.5 gene-based functions per pathway (median: 2; SE: 0.074). We investigated the ten pathways with the greatest number of functions, ranging from 8 to 44, which overall related to core metabolic pathways, DNA replication, and protein-coding gene expression. We then evaluated genetic variation across a chosen subset of three genera of Euryarchaeota, each genus of which appeared to have a similar degree of divergence based on distance trees that were generated within IMG/M. We report on those instances consistent with levels of genetic differences that are specific to different phylogenetic groupings, and have furthermore found these levels to be clustered based on pathway associations. This evidence supports a conclusion for how levels of genetic divergence can help to distinguish diverse varieties of Archaea. This finding is guiding us in a future direction for studying how these levels of genetic divergence relate to characteristic phenotypes and adaptations for these genera where, for instance, host association appears to be a factor that modulates levels of genetic differences for some pathways.

67) **Selena Williams**, Senior, Biology, Faculty Mentor: Dr. Scott H. Harrison; Comparisons of Phylogenetic Tree Branch Lengths and Topologies of Influenza Virus Protein Sequences

Influenza is a virus that has been known to infect thousands of individuals due to its ability to adapt to vaccines and other environmental changes. This virulence is partly due to the surface proteins hemagglutinin (HA) and neuraminidase (NA) that allow the virus to bind to its host and replicate. Studies have focused on these proteins, because their mutations directly influence the performance of the flu virus in host infection, but other proteins are also important in the growth and replication of the flu virus. Intracellular proteins, such as PB1 and PB2 are important for mRNA transcription processes in the virus. We compare HA to PB1 and PB2, to test whether branch lengths are longer for the HA gene, which is expected to have a greater degree of diversifying selection. For additional study, we different types of influenza: A, B, C, and D. Types A and B are more virulent to the population, while C and D are less virulent. We compare Type A and Type C to test the correspondence between how virulence relates to asymmetry of tree topologies. We have found that branch lengths vary as expected, and that Type A exhibits greater asymmetry compared to Type C.

68) **Tiamber Goode**, Senior, Psychology, Faculty Mentor: Dr. Anna K Lee; Toxic Masculinity in Men and Behavior

The psychology of men and masculinity is a prevalent topic in todayâ€™s society. Various studies show the relationship between men and toxic masculinity exhibiting in various negative behaviors such as : sexual aggression, intimate partner violence, social support, depression, and child maltreatment. Social media and social networks may also positively or negatively affect mental health and mediated relationships between masculine paradigms. Masculinity is a performance that is influenced by gendered expectations.

69) **Lillian Livengood,** Junior, Mathematics, Faculty Mentor: Dr. Liping Liu: Mathematical Modeling of Tropical Cyclogenesis in the North Atlantic Basin

Tropical cyclones are dangerous, so it is useful to be able to predict the number that will occur in a given month. Previous studies have identified four environmental factors that can be connected to tropical cyclogenesis: potential intensity, vertical shear, relative humidity, and absolute vorticity. Here, we use two different approaches in our attempt to find a mathematical model to predict the number of tropical cyclones that form in the North Atlantic Basin. First, we assist Ph.D. student Justin Riley, supervised by Dr. Yuh-Lang Lin of the Department of Physics and the Department of Environmental & Energy Systems at NC A&T, in his research on a genesis potential index to predict monthly variation in tropical cyclogenesis. Second, we attempt to develop a statistical model relating Justinâ€™s data on the four environmental factors to the National Hurricane Centerâ€™s data on the number of tropical cyclones that formed each month from 1979 to 2011 in the North Atlantic Basin. The findings of our study will help us better forecast the number of tropical cyclones that may form each month in the North Atlantic Basin.

70) **Robert Moore,** Sophomore, Faculty Mentor: Dr. Misty Thomas; The effect of media-type on antibiotic production

Background: There has been little done to combat the antibiotic crisis in the past 30 years. The diminishing antibiotic production is due bacteriaâ€™s rapid resistance to the antibiotics. Bacterial resistance is due to the overuse and abuse of antibiotics within agriculture and human welfare. Pharmaceutical companies reject

funding to support new antibiotic production, that ordinarily become ineffective after a few years of manufacturing. It is predicted that there will soon be no antibiotics to combat even the simplest bacterial infections. The ESKAPE pathogens (Enterococcus faecium, Staphylococcus aureus, Klebsiella pneumoniae, Acinetobacter baumannii, Pseudomonas aeruginosa, Enterobacter species, and Mycobacterium tuberculosis) are most commonly associated with nosocomial infections and contribute to the antibiotic crisis. The goal is to find potential bacteria capable of combating the ESKAPES. Soil bacteria have been included in the antibiotic production in the past. We have 32 bacteria isolates derived from soil capable of antibiotic production, in hopes to find the effect of media on the antibiotic production. Hypothesis: We hypothesize that if isolates are placed on different media, then antibiotic production will be affected as diverse responses will be observed, because different media provides different nutrients altering antibiotic production. Methods: The ability of soil bacteria to produce antibiotics against ESKAPE pathogen safe relatives on different types of agar was tested. Bacteria were isolated via serial dilutions of soil samples from various locations. Each isolate was picked and patched onto swab plates of the ESKAPE relative on one of Luria-Bertani Agar (LBA), Reasonerâ€™s 2A Agar (R2A), Trypticase Soy Agar (TSA) and Potato Dextrose Agar (PDA) and their ability to produce an antibiotic was assessed by characterization of zones of inhibitions. After analysis, 32 producing isolates were selected for their ability to produce an antimicrobial agent on one type of agar and subsequently plated on all 4 types of media to assess the changes in zones of inhibition on each media type. Results/Conclusion: In conclusion, media type has a significant impact not only on antibiotic production for the tested soil isolates, but also on the amount of antibiotic activity and on which escapes are susceptible. Significance: To find potential antibiotics from bacteria derived from soil to combat the ESKAPES and antibiotic crisis. To present the affects of media selection on antibacterial production. To find the most optimal media for antibiotic production for different isolates.

71) **Donald Battle**, Junior, Computer Science, Faculty Mentor: Dr. Esterline Dempster; Shafer Theory Combination Rules in a Framework for Identity

Our research is focused on taking relevant information and using it to help form an identity hypothesis that could have been involved in a particular event. Information is gathered from different types of situations, constraint, utterance, and resource situation. Situation theory is involved when mentioning these types of situations. The Semantic Web and its standards, also used in our research, is used to maintain the structure of information from this theory. After encoding the given information, we will be able to apply Dempster Shafer Theory. Dempster Shafer theory is to help our identity hypotheses. Mass values are given to each person who could potentially be involved in the event. The mass range is from 0.0 to 1.0. The mass represents the amount of evidence the person is in. In our framework, we are interested in incorporating more rules to obtain accuracy. Because of flexibility, the programming language Python is used.

72) **Peng He**, Chemistry, Faculty Mentor: Dr. Peng He; Integration of Applications in Quantitative Chemical Analysis for Engineering Studies: Determination of Sulfate by Precipitation to Simulate Titration on Mars

Solid knowledge and deep understanding of quantitative chemical analysis are expected for engineering-major students to develop new quantitative analysis methods to address the current challenges. Applications of different quantitative analysis methods and relevant principles can be integrated to demonstrate quantitative analysis capability for realizing the problem solving in the wider world. We designed the

experiment â€œDetermination of Sulfate by Precipitationâ€• and the purpose of the experiment was to determine the unknown amount of sulfate (SO42-) through precipitation of barium sulfate (BaSO4). The sulfate was analyzed through gravimetric analysis, which quantitatively determines the amount of barium chloride (BaCl2) needed to precipitate the unknown amount of SO42- during the titration process. Three trials of titration of the unknown sample with the concentrated HCl and filtration of the precipitated BaSO4 were performed. The reaction of SO42- with Ba2+ was utilized to determine the unknown amount of sulfate by precipitation. â€œTitration on Marsâ€• in Quantitative Analysis Class Chapter 7 Titration shows that a robotic arm of Phoenix Mars Lander scooped up soil for chemical analysis on Mars. Although the chemical principle SO42- + Ba2+ â†' BaSO4 (s) is pretty simple, the meaning of quantitative analysis to explore Mars is significant.

73) **Taylor Martin,** Junior, Computer Science, Faculty Mentor: Dr. Esterline; The WebID Protocol Enhanced with Biometrics and a Federated Enrollment Protocol

We are currently working to integrate WebIDs and biometrics into the cyber security environment. This includes developing a strategy for user verification that considers simple and safe access. WebIDs provide these necessities when compared with the traditional username and password user authentication. However, with WebIDs, authentication data can be stolen if an attacker either gains direct access to the client's workstation or somehow acquires the client's unique certificate. This threat can be mitigated with the inclusion of biometrics to the authentication process since biometric information (e.g., fingerprints, iris scan) is unique and not easily copied. We first created an enrollment protocol that verifies whether a user has a WebID while attempting to access a service. If they have, we grant access to the service, and if they havenâ€™t, we enroll the user by accessing their own server.

74) **DejaneJames**, Senior, Communication Arts, Faculty Mentor: Dr. DaKysha Moore & Gary Guffey; The mythical and majestic Black family: Beating stereotypes blackish season 4

Even though the number of African Americans on television has increased, they are still dealing with some of the same typical stereotypes being portrayed about them on television. This is why being aware of and understanding the messages that you are receiving while watching television is important. The purpose of this research is to study how African American family culture is portrayed on television. The researcher conducted a thematic analysis to observe the most profound themes in the sitcom black-ish season 4. The three themes for this series are 1) parenting, 2) the overall image of African American culture from outside world, and 3) challenges of being a working mother.

75) **Caleb Carter**, Senior, Communication Arts, Faculty Mentor: Dr. DaKysha Moore & Gary Guffey; The Mindset of a Terminally Ill Patient: Living Without a Conscious Breaking Bad Season One

The average healthy human being will frown upon criminal activity. However, many are unaware of the psychological effects that a terminal illness may have on an individual. Terminally ill patients thought process is critically affected by the constant reality that death is imminent. The purpose of this study is to explore how terminal illness is addressed in Breaking Bad Season One. After analyzing the series using a thematic analysis; the researcher found three fundamental themes: 1) Illness and Financial Interest, 2) Fear-Human Disregard and Murder and lastly 3) Secrets and Family Distress.

76) **Trevor Surratt,** Junior, Bioengineering, Faculty Mentor: Dr. Simone M Smith; Molecular Biomarker Discovery in Aging and Injury Repair of Skin

The flexibility of cells to change their protein expression is critical in development, maturation, aging, and disease. The functional differences between young and old skin are known, but it is not clear what bimolecularly characterizes these groups and how we can harness molecular orchestrators of â€œyouthâ€• or â€œregenerationâ€• to better heal tissue wounds. This is the context for our research. Characterizing the proteins of young skin can point us toward biomarkers of healthy, regenerative connective tissue. The traditional subjective pursuit of wound healing molecules has given mixed results; here, we aim to use an objective method to find novel, unusual candidates for superior wound healing, possible orchestrators of the robust regenerative tissue health characteristic of young animals. Our central hypothesis is that young, regenerative (here, post-natal day 1, P1) skin will have unique, identifiable profiles of protein molecules compared to mature, reparative 6-month-old (M6) skin. We tested this hypothesis using a proteomic study design. In brief, we generated denaturing extracts of dorsal skin from the two groups of mice. Extracts were then subjected to proteomic identification using Mass Spectrometry. We analyzed the resulting data via in silico annotations (on UniProtKB and PubMed) to classify identified proteins into various physiological categories. We had hypothesized that molecules critical to development would be those upregulated in P1 and would give insight into novel regenerative players. We found that cell adhesion proteins previously not known to be decreased with age (e.g., selected cadherins, integrins, basement membrane proteoglycans, and collagens) were increased in young versus mature skin, as were proteins that controlled cell migration and cell junctions. In general, proteins preferentially expressed in the P1 skin were those annotated as relevant to cell migration, proliferation, wound healing, and development. In conclusion, the results indicate that protein profiles important for development are recapitulated to maintain the regenerative nature of very young versus mature skin. Our findings can impact the field of wound healing by spurring nano-delivery, topical treatment, placement in implanted scaffolds, or even depletion of our discovered biomarkers to aid wound therapy in connective tissues. Future studies will examine the western blotting profiles of these proteins and their therapeutic impact on injured connective tissue.

77) **RachelRichards,** Freshman, Biology, Faculty Mentor: Dr. Liesl Jeffers-Francis; Application of Silver and Phage on Bacterial Populations Significantly Decreases Its Size

ntroduction: The massive failure of traditional antibiotics over the 20th century is well known. This has led to researchers attempting new approaches to controlling multi-drug resistant (MDR) bacteria including ionic and nanoparticle metals and phage therapy. However, it is clear that no matter what single approach is deployed against bacteria that they can rapidly evolve resistance. Therefore, combination therapies have been developed for treatment of pathogenic bacteria and viruses. The goal of our research is to find combination therapies which are antagonistic, which means that they must result in evolutionary trade-offs. Our long-term goal is to determine if the application of two complementary antibacterial treatments, nanoparticle metal and bacteriophage, can successfully inhibit bacterial infections. Methods: Escherichia coli will be used to evolve T4 and T7 bacteriophage and silver resistant bacterial colonies. Once colonies of resistant bacteria are established, the colonies will be allowed to coevolve in the presence of bacteriophage and/or 2-5ug/ml of silver ions. To isolate phage resistant mutants classic â€˜spot testsâ€™ will be performed whereby individual colonies would indicate bacterial resistance to phage versus visible lawn clearing indicative of phage sensitivity. Confirmation of phage resistance will be measured by

performing a â€˜streak testâ€™. These phage/metal resistant colonies will then be serially passaged in 50 ml conical flasks. The passages will be repeated for the duration of the experiment (~20 days). Growth rates will be evaluated by measuring optical density throughout the experiment. We will also be able to monitor the genomic changes that occur in conjunction with the phenotypic changes by whole genome sequencing of the bacterial and bacteriophage populations during the course of the experiment. Additionally, we will assess the effect of metal/phage tradeoffs on antibiotic resistance/susceptibility. Results: Thus far we have isolated phage resistant Escherichia coli using the spot test and are confirming phage resistance using the steak test. We have also determined the optimal concentration of silver ions that we will use for the coevolution experiment by performing a minimum inhibitory concentration test (MIC). Experiments are ongoing. Conclusion: If an antagonistic trade-off is observed between silver and bacteriophage resistance in Escherichia coli, then this can be used as a means of sustainable antimicrobial combination therapy.

78) **Jacob Ademola Oludoyi ,** Senior, Industrial & Systems Engineering, Faculty Mentor: Dr. Albert Esterline; Exploring the use of Affordnaces for Interpreting Smart-home Data

Every day, we encounter objects from the Internet of Things (IoT), extended via internet connections that enable control, lots of collaboration, and monitoring. A smart home, with the help of IoT, enables the habitants to be monitored. How do you know the amount and type of data required to adequately monitor someone as they carry out various activities in the smart home? This research turns its attention to affordances; manifest possibilities for action provided by the environment. Examples include a door handle and a light switch. The thesis of this research with the affordances for the monitored and monitoring people being the same, little data can be used to monitor the interactions with affordances. A scaled down model of a floor in a smart home equipped with passive infrared (PIR) motion sensors allows interpretation of the habitantsâ€™ activities on that same floor.

79) **Amina Bradley**, Junior, Biology, Faculty Mentor: Dr. Misty Thomas; Understanding adaptation by elucidating the underlying changes in molecular mechanisms association with selection in two-component response systems.

Title: Understanding adaptation by elucidating the underlying changes in molecular mechanisms association with selection in two-component response systems. Authors: Amina Bradley, Joseph Graves, and Misty Thomas Background: Two component response systems (TCRS) are utilized by microorganisms to detect changes in the environment. This triggers a biological response such as cell division, metabolism, motility, or antibiotic resistance. TCRSs are the most commonly used mechanism by prokaryotic organisms to sense, respond, and adapt to their environment. They use a histidine kinase to sense an external stimulus and relay a message to the interior of the cell through autophosphorylation of a conserved histidine residue on the cytoplasmic domain of the protein. The histidine kinase then transfers a phosphate to a conserved aspartate residue on a response regulator, which regulates the activation or repression of transcription of specific genes. Although TCRS are the best-known system for bacterial acclimation, little is known about the role they play in adaptation. Research Question: Can phenotypic changes be predicted from genetics depending on which domain a mutation is acquired in a TCRS Hypothesis: All mutations acquired in sensor domains will be deleterious to function, thereby eliminating the protein's ability to respond and autophosphorylate. All mutations acquired in the N-terminal region or the cytoplasmic domain will give rise to a constitutively active protein. Method: We will evaluate the data in the Long-term Evolution Experiment generated by the Lenski Lab at Michigan State University using software make by the Barrick

lab (UT Austin) (http://barricklab.org/shiny/LTEE-Ecoli/) for mutations in TCRS identified in the Kegg database (https://www.genome.jp/kegg-bin/show_pathway?map=ko02020&show_description=show). We will then map each of these mutations to its specific domain and make predictions in the associated changes in function. Conclusion: It is very difficult to make predictions of resultant phenotypes from genetic determinants. Since TCRS are so vital in acclimations and adaptation, being able to predict potential phenotypes from genetic material could be vital in better understanding the inhabitants of a particular environment especially in circumstances where many microbes are unculturable. Future Directions: Incorporate identified mutations in specific domains of TCRSs in Escherichia coli to see if we can obtain the phenotypic response that was predicted.

80) **Adonis Rucker,** Sophomore, Civil engineering, Faculty Mentor: Dr. Lauren Davis; Mitigating Waste and Food Insecurities in Central Eastern North Carolina

As unemployment rates and poverty increase the number of households in North Carolina that are food insecure are proportional and continue to grow. To counteract the effects of food insecurity in North Carolina the Food Bank of Central & Eastern North Carolina operates as a distributor of donated food. They rely heavily on small farms, businesses, government agencies, and fellow citizens to create majority of their inventory. The biggest problem with this donation driven environment is supply and demand uncertainties. Food bank managers are oblivious to the frequency, amount, produce type, and condition their donations will come in. With the use of standard statistical techniques that will be performed using the program R we will accomplish a number of tasks. i) Perform moving average and Auto Regressive Integration Moving Average (ARIMA) to predict what will happen in subsequent months. ii) Compare moving average and ARIMA model to machine learning techniques. iii) Analyze when perishable and nonperishable foods are coming in and how much waste is being produced.

81) **Zila Sanchez,** Junior, Journalism and Mass Communication, Faculty Mentor: Dr. Maria Zhang; The effects of mass media in the perception of police brutality

As social media platforms and technological advances continue to change the mainstream trajectory into the digital age, many people are left fringing on their own polarizing views and skepticism of a brighter outcome when it comes to police brutality. The rise of social media has allowed the masses to consume coverage and videos of police brutality at rates much higher than ever before. The projectâ€™s purpose is to research the theory that mass mediaâ€™s coverage of police brutality has had an impact on the publicâ€™s perspective of policing, whether it be positively or negatively.

82) **Safa Imtiaz,** Senior, Biology, Faculty Mentor: Kelsie Bernot; Comparison of Service learning and Research Projects in an Introductory Biology Class

Kolbâ€™s experiential learning framework, states that students cycle continuously through four stages: concrete experiences, reflective observations, abstract conceptualization, and active experimentation. As students develop a broader understanding of these concepts, they are unable to recognize these experiences outside of the classroom. To further understand this, we added an inquiry-based service-learning activity to an honors introductory biology class. We used Kolbâ€™s framework by exposing students to community experiences, reflective observations, hypothesis creation, and future active experimentation. Students chose one of the three Service Learning (SL) organizations, cancer organization, Red Cross, or community garden and completed service- and related-learning activities. These activities were designed to clarify how the

students recognized and made connections from the classroom to the community. Some students had an alternative route and were asked to complete an inquiry-based research project (RP). These projects were designed to qualitatively and quantitatively study osmosis / diffusion in potatoes or antibiotic resistance in soil. Both the SL and RP projects were created to increase the students experience by motivating them to learn biology, gain scientific literacy skills, to make connections from their projects to the work they do in the classroom, and to deeply understand the courses learning outcomes. 11 sections through 7 semesters were analyzed with 287 students. 136 students from the SL project and 151 students from the RP project participated in the research. The students were asked to take pre-/post â€“ tests that were compared between the SL and RP sections. These tests described the motivation a student had in learning biology We compared students in SL and RP sections in their recognition of using biology in their everyday lives, by asking open-ended response questions on the Student Assessment of Learning Gains (SALG) survey. Codes for open-ended responses were developed by a combination of empirical analysis and published literature. The coding process was done by two individuals with integrated reliability of 0.68. Both the SL and RP sections were able to grasp the scientific communication through the projects whether it was designing a poster or writing a research paper. The SL group showed a higher rate in making connections between the work they did in the classroom and their service learning activity. Both sections were able to develop basic scientific skills through scientific literacy. Recommendations for future modifications of our SL and RP models will be discussed.

83) **Anjali Kumari,** Freshman, Biology, Faculty Mentor: Dr. Robert Newman; Using UTP/NDPK assays to measure Relative Activity of Mitogen-Activated Protein Kinases (MAPKs)

Mitogen-activated protein kinases (MAPKs) are key mediators of nearly all physiological processes, including cellular metabolism, inflammation, the DNA damage response, cell differentiation, and apoptosis. Recently, we found that reversible oxidation by low levels of hydrogen peroxide (H2O2) alters the global substrate selection of the canonical MAPKs, p38ï• ¡ and ERK2, using functional protein microarrays. To validate these differentially-regulated substrates and to gain insights into the biochemical mechanisms underlying H2O2-dependent changes in substrate selection, we are measuring the activity toward select p38ï• ¡ and ERK2 substrates in vitro. Due to its sensitivity and ability to measure ADP generation directly, we have previously applied the commercially-available ADP-Glo assay to measure changes in kinase activity following treatment with various concentrations of H2O2. However, the cost and time-intensive nature of the ADP-Glo assay is not optimal for undergraduate research where students often only have a few hours at a time to run their assays. Therefore, the aim of the current project is to develop an alternative activity assay that is faster and more cost-effective than the ADP-Glo assay while not sacrificing sensitivity or the ability to directly measure ADP generated. To this end, we have developed an assay based on the UTP/NDPK-dependent conversion of ADP to ATP. The NDPK/UTP assay, which utilizes two parallel experiments (i.e., water alone treatment compared to the UTP/NDPK treatment), conserves time by regenerating the lost ATP in the UTP/NDPK treated experiment and comparing the difference with the water alone treatment. The difference in the treatments demonstrates the magnitude of activity change by using the ATP present in the water alone treatment as the baseline to measure activity. Conversely, the ADP Glo assay requires the use of ADP Glo and Kinase Detection Reagent to deplete unused ATP and regenerate ATP demonstrating the relative activity of the kinase. Side-by-side comparisons between the NDPK/UTP assay and the ADP-Glo assay using either ERK2 or p38ï• ¡ show similar changes in kinase activity toward model peptide substrates following H2O2 treatment. Compared to the ADP-Glo assay, NDPK/UTP-based

detection of kinase activity reduces the time-to-detection ~3-fold (25 min for the UTP/NDPK assay vs. 80 min for the ADP-Glo assay). Importantly, the NDPK/UTP assay, which is also a fraction of the cost of the ADP-Glo assay, maintains similar sensitivity during kinase activity assays.

84) **Jesus Brito,** Junior, Industrial & Systems Engineering, Faculty Mentor: Dr. Hyung Nam Kim; Ethical Research Involving People with Visual Impairments

Today, people with visual impairments (e.g., low vision and blindness) have considerable limited access to many mainstream technology applications due to poor user interface designs. To enhance the user interfaces, a user study should be ensured to include end users (i.e., those with visual impairments) in all the design phases (i.e., a participatory design approach). However, the problem is that many researchers are not well trained to perform a responsible conduct of research that involves human subjects with disabilities, especially those with visual impairments. Therefore, this research conducted a literature review and provided a list of guidelines on how to conduct a responsible conduct of research involving those with visual impairments, leading to a user-centered design of information technology.

85) **Velencia, Senior,** Psychology, Faculty Mentor: Dr. Anna K. Lee; I Got This: Racial Trauma and Self-Efficacy in Students of Color and interest in S.T.E.M.

The united states continues to grapple with the underrepresentation of black and latino populations in science, technology, engineering and mathematics (STEM) workforce. A U.S. News Report (2015) argued the STEM workforce has seen minimal changes since 2001, despite interventions designed to direct more ethnically diverse students in STEM-related careers. Current interventions negate the role of racialization in public school context in shaping self-schemas within the context of math and science learning. Racialization describes how the social construction of race delineates groups from one another and grants privileges and access to resources in favor of whites or European americans. The impact of self-efficacy is also negated in that students confidence and interest in STEM related fields is impacted by racialization. The goal of this project is to explore how racialization impacted the self-efficacy and participation of black and latino students in STEM related fields and interest.

86) **Briar Tomeau,** Senior, Biology, Faculty Mentor: Dr. P. Smith; Response of Triple-Negative Breast Cancer Cell Lines after exposure to the Heavy Metal Mercury

Triple-Negative Breast Cancer (TNBC) accounts for 15 percent of all breast cancers. It is characterized by cancer cells that lack the expression of estrogen, progesterone, and HER2/Neu receptors. Heavy metals such as mercury have been reported to have toxic effects on living organisms including humans and may pose an increased risk to disease such as breast cancer. While environmental exposures to toxins such as mercury have been speculated to play a role in causing cancer, the consequences of mercury exposure on breast cells have not been fully assessed, and here we are interested in assessing the cytotoxic and molecular effects that mercury ions have on human breast cells. We exposed human breast cell lines to various concentrations of mercury and revealed a differential cytotoxic response. We used triple-negative breast cancer cell lines (HCC70, HCC1806), and a luminal A cell line (HCC1500) and revealed that they all had an increase in cell death as the concentration of mercury increased with a classic dose response using light microscopy and cell viability assays. We also performed a time-course over 48-72 hours revealing that even at lower concentrations the cells died as the time of exposure increased. We also verified using flow cytometry cell cycle arrest and cell death after exposure to mercury. In conclusion, mercury has a cytotoxic

effect on human breast cells and may pose a risk to increasing the genetic instability of breast cells, but it may also be possible in the future to take advantage of its toxicity to elicit the death of breast cancer. We plan on assessing the molecular response of the p53-microRNA pathway network in these breast cancer cells to mercury exposure to determine the role that it may play in its cytotoxic effects.

87) **Kateree Moore,** Senior, Applied Mathematics, Faculty Mentor: Dr. Yuh-Lang Lin; A Prediction on the Tropical Cyclone Intensification Using Logistical Model on Its Size

The prediction and forecasting of tropical cyclones (TC) in the United States has evolved significantly due to advancing technology over the years. However, according to the National Hurricane Center there has been no progress in predicting a cyclones change in intensity. Rapid intensification (RI) has been difficult to predict due to lack of knowledge on what physical processes controls these events. Rapid intensification is when a tropical cycloneâ€™s maximum sustained winds increase dramatically over a short period of time. In this study, a rapid intensification period is considered to be anything greater than or equal to 30kt over 24 hours. Previous study has discovered that there are some correlations between RI and the size of TC. Three parameters are used to classify the size of a tropical cyclone: radius of maximum wind (RMW), radius of outermost closed isobar (ROCI), and the average 34-kt radius. In this study we will use statistical models to predict the chance of RI from the size of the cyclone. We want to figure out if there is any correlation between the size of a cyclone and RI. We also want to quantify and classify storms by size and figure out the significance effect of the TC size over the RI. Lastly we create a statistical model to predict the probability of RI based on the TC size. The data for this study comes from the extended-best track (EBT) dataset. The data is separated into 24-h intervals between RI periods and Non-RI periods. Our techniques will be correlation analysis, logistic modeling, and regression models. Results shall indicate that there is correlation between storms that go under RI and its size. Smaller storms are more likely to undergo RI. There is also negative correlation between RMW and the average 34-kt radius with the change in intensity. However there is no correlation between ROCI and change in intensity. Our model will predict the significant variables that effect RI are RMW and the average 34-kt radius. Our investigation is to identify if size plays a role in a the rapid intensification of a tropical cyclone. This information is valuable for linking smaller storms to RI, thus will be useful for prediction of RI by using the TC size.

88) **Brian Blackmon**, Junior, Mathematics, Faculty Mentor: Dr. John Ward; Machine Learning Methods Applied to Facial Recognition

In this study, we investigate the different machine learning methods to analyze a dataset of digital face images. The objective of this study is to write an algorithm that will label subjects in the dataset, and then run the algorithm to correctly classify and recognize each individual image. The methods used to classify the images included: K-Nearest Neighbor (KNN), NaÃ¯ve Bayes, Support Vector Machine (SVM), Linear Discriminant Analysis (LDA), Principal Component Analysis (PCA), and a Convolutional Neural Network (CNN). Python and Matlab were the two programming languages used to analyze and process the data. Using the Python programming language, we were able to successfully analyze the image dataset and yield significant accurate results on the images. Initially, the data was running without preprocessing to observe which model would perform the most accurately on their own in this case. In an effort improve the performance, further analysis was conducted on the images that were the most challenging to classify. We concluded that the variance of facial expressions, lighting, and angle of the subjects lead to challenges for classification. As a result, image processing methods were implemented to improve accuracy and

efficiency. The use of linear discriminant analysis(LDA) alongside KNN yielded the best performance with results of 100% accuracy, as well as 100% accuracy when using NaÃ¨ve Bayes. KNN was deemed the favorable choice due to its simplicity and being more robust than any other method for this task.

89) **Adrienne Douglas**, Junior, Engineering Industrial and Systems Engineering, Faculty Mentor: Dr. Hyung Nam Kim;

User Centered Workflow Analysis For People With Visual Impairments At Home

User - Centered Workflow Analysis for People with Visual Impairments at Home Adrienne Douglas and Hyung Nam Kim Department of Industrial and Systems Engineering NC A&T State University Our research team aims to enhance the quality of life for individuals 65 years or older with visual impairments . In order to complete this goal, the team has been conducting systematic literature reviews to advance understanding of daily living activities among those with visua l impairments. Thus far, we have reviewed 17 research articles and selected 10 research articles that help us obtain the patterns of daily living activities among those with visual impairments at home , ultimately leading to a user - centered workflow analy sis that allows us to examine procedural aspects of daily activities and detect early changes in activities that may indicate any health problems among those with visual impairments at home.

90) **Stacey Lawson**, Junior, Psychology, Faculty Mentor: Dr. Anna K Lee; The Mental Health Effects of the Invisibility Syndrome in Undergraduate Students

The invisibility syndrome is a model that has been present within African Americans for decades. The invisibility syndrome is defined as when your feelings and beliefs that your personal talents, abilities and character are not acknowledged or valued by the larger society due to racial prejudice (Franklin, 2000). This purpose of this study is to explore the relationship between the invisibility syndrome and mental health, including depression, anxiety and stress, within African American males and female undergraduate students. It is hypothesized that the effects of the invisibility syndrome will lead to high levels of depression, anxiety and stress. This survey was administered online through Qualtrics using convenience sampling. The first page was used to explain to the participants what the purpose of the survey was and how to complete it. The following page consisted of the demographic questionnaire. The Invisibility syndrome scale included questions that were formulated by the researcher measuring characteristics someone experiencing invisibility syndrome symptoms would experience. Lastly the DASS 21 scale measured levels of anxiety, depression and stress. It was hypothesized that the effects of the invisibility syndrome will lead to high levels of depression, anxiety and stress. The statistical package used to analyze these results was SPSS Statistics. The results found in correlations showed there was a positive medium significance between the invisibility scale and the depression, stress and anxiety scale. Based on the t-test, the results support the hypothesis that higher recorded scores of invisibility lead to higher recorded scores of depression, stress and anxiety. The study aimed to identify the relationships between the invisibility syndrome in relation to the mental health (including depression, anxiety and stress) of African American undergraduate students. Findings suggest that the higher recorded scores of invisibility lead to higher recorded scores of depression, stress and anxiety.

91) **Kirstyn McLeod**, Senior, Psychology, Faculty Mentor: Dr. Anna Lee; A Different World: The Impact of Racial Trauma on Academic Success

This study will examine the effect that race related trauma and stress has on the mental health of older adolescents. To further investigate this concern, this study has been conducted to identify if racial related trauma has a correlation with poor mental health. The survey used in this study contained questions pertaining to growing up as a racial minority and the emotional effects it has fostered. Each item on the survey gave a scenario and participants were to rate their stress reactions to each specific occurrence using a 5-point scale (0= not at all, 1=slightly annoyed, 2=mildly annoyed, 3=distracted/preoccupied, 4=trouble functioning). Frequency of each occurrence was also to be rated using a 6-point scale (0=not at all, 1=on occasion, 2=several times a day, 3=several times a month, 4=several times a week, 5=several times a day). The results are forthcoming, preliminary analysis reveal that trauma plays a role in the overall mental health of African/Black and Latina/Latino Americans.

92) **Katia Jackson**, Junior, Psychology, Faculty Mentor: Dr. Anna K Lee; understanding college student's mental health seeking behaviors

INTRODUCTION: Mental health stigma deals with the belief of negative stereotypes of individuals who have a psychological disorder. Mental health stigma discourages and prevents college students from seeking out help in fear of the possibility that they will be judged, isolated, or misunderstood. Students who internalize mental health stigma will be likely to identify with one of more mental health seeking barriers: self-concealment, perceived public or personal stigma, negative attitudes towards seeking professional help or perceived family and community stigma than those who do not internalize mental health stigma. METHOD: This study uses quantitative methods that will be conducted through a survey that will measure attitudes towards mental health. The self-concealment scale (SCS) will be used to measure attitudes about self-concealing. The Attitudes Toward Seeking Professional Psychological Help Scale (ATSPPHS) will be used to measure attitudes about seeking help for mental health concerns. The Attitudes towards Mental Health Problems Scales (ATMHP) will be used to measure external shame/stigma awareness perceived by family and community members, and the Stigmatizing of Attitude Believability Scale will be used to measure mental health stigma. RESULTS: We hope to find significant correlations between negative attitudes towards mental health and lower help-seeking attitudes. CONCLUSIONS: Findings will be discussed.

93) **Marqus Parker,** Junior, Applied Mathematics, Faculty Mentor: Dr. Seongtae Kim; Spatial Association Between Origin and Landfall of Hurricanes in the Atlantic Ocean

Tropical storms such as hurricanes, cyclones, and typhoons forming over warm areas near the equator in the ocean are studied by researchers since hurricanes can significantly impact physical and economical damages to communities and their inhabitants. Researchers study tropical storms for the prediction of path, intensity, and potential damage. Although advanced methods and technology allow researchers to track tropical storms in the ocean prior to its landfall, spatial dependency of hurricane paths remains little known. The purpose of this project is to study if there is a spatial dependency between the origin in the Atlantic Ocean and the landfall in the United States of hurricanes. To investigate spatial association between origin and landfall, we first define eight regions for the origin and five zones for the landfall. We map all historical hurricane data since 1851 on these defined regions using the National Oceanic and Atmospheric Administration (NOAA) data. We examine the spatial associations between the origin and landfall for the

entire hurricane season and for each month from June to December using various statistical analysis techniques. The results will be presented through contingency tables and map visualization methods. Our study will have spatial and temporal patterns of the hurricane paths, which allows for predictability of hurricane landfall in the United States. This research will provide some data-driven clues to accurately predict and map out a hurricane path before considering the use of a complicated mathematical model.

94) **Grace Smith,** Senior, Information Technology, Faculty Mentor: Dr. Sowells; Aggie Advisement

My team and I have created a webpage with a functional toolbar and links to other webpages that allow a student to compare their transcript to their currriculum guide. It informs the student on what classes they still need to take. This program will be effective because we will reassure students that they are not duplicating courses, or taking unnecessary courses. It will also automate what was once a strictly paper process, simplifying it for advisors and students.

95) **Hussah Aluwais,** Senior, Information Technology, Faculty Mentor: Dr.Sowells ; Aggie Advisement

Create a program that will improve the advising process. This program will allow students to view what classes they have taken, and the classes they still need to take. Our program will be effective because we will reassure students that they are not duplicating classes, or taking unnecessary classes.

96) **Jonas Caruthers,** Senior, Information Technology, Faculty Mentor: Dr. Sowells-Boone; Aggie Parking Lot System & App Integration

The problem that many college students, faculty, and staff are facing today is the amount of limited parking that is given to them in a college campus. Everyday people go to classes, teach lectures, and/or go to work to fulfill their needs and thus filling up available parking spots. Sometimes finding a parking spot can be quite a hassle, so much of a hassle that it makes you want to cram your between the parking spot. The purpose of this project is to help college students and faculty members who have to park on campus, find an open parking spot without having to drive around, up and down, multiple parking lots to find a place to park. Our solution is to create an application that students and faculty can use to easily search and find open parking spots on campus as well as designing a prototype parking lot that shows the appâ€™s real time functionality

97) **Bria Richardson**, Senior, Information Technology, Faculty Mentor: Dr. Gina Bullock; Cisco - Time Series Anomaly Detection

Develop a python script to capture live data from servers to look at CPU, memory, and load utilization. If there is an anomaly, it will look at the trends of events that has occurred in the past. This will eliminate false positives from occurring. If an event has never occurred before, this will be considered a real anomaly and an alert should be sent to Cisco personnel.

98) **Jalynn Gray,** Senior, Biology, Faculty Mentor: Dr. Perpetua Muganda; Differential Expression of Human Cytomegalovirus MicroRNAs in Triple-Negative Breast Cancer Tumors

Triple-negative breast cancer (TNBC) remains one of the most challenging subtypes of breast cancer. It is characterized by the lack of expression of the estrogen and progesterone receptors, as well as the human epidermal growth factor receptor 2 (HER2/neu). TNBC accounts for 15-20% of all breast cancer cases, and

possesses a high recurrence and death rate as compared to other breast cancer subtypes. The molecular basis of TNBC oncogenesis is currently unknown. Since cellular miRNAs have been implicated in TNBC oncogenesis, it is possible that viral miRNAs may also play a role in the aggressiveness and poor prognosis of these tumors. In fact, human cytomegalovirus (HCMV) antigens have been found preferentially in breast tumors as compared to normal controls. Thus, the objective of this research was to determine the prevalence and differential expression of HCMV miRNAs in TNBC tumors compared to control normal samples. We conducted a comprehensive profiling of known HCMV miRNAs in 57 TNBC basal tumors as compared to 16 control normal breast tissues. Publically available deep sequencing data obtained from the Sequence Read Archive database were analyzed utilizing the Chimira pipeline, Morpheus heat-map software, and graphical representation. Three HCMV miRNAs (UL22A-3p, UL59, US29-5p) were significantly expressed in 14-32% of the TNBC tumors, and not in control normal breast tissue. One HCMV miRNA (US25-1-5p) was significantly expressed in 21% of the TNBC tumors as compared to 6.25% of normal control breast tissue. The prevalence of US25-2-3p was decreased in TNBC tumors as compared to control normal cells; US25-2-3p was present in 50% of the control samples and 17.5% of the TNBC tumors. This is the first report on the differential expression of known HCMV miRNAs in TNBC tumors. Our findings suggest that these differentially expressed HCMV miRNAs may potentially play a role in the pathogenesis of TNBC.

99) **Shannon Walston**, Senior, Family and Consumer Sciences, Faculty Mentor: Dr. Lee; Low-Income Older Adults' Health Challenges and their Aging in Place

According to the AARP, the majority (88%) older adults want to age in place for as long as possible. Aging in place is defined as the ability to live in oneâ€™s own home and community safely, independently, and comfortably. However, older adults, particularly, those having low-incomes, may face challenges when pursuing aging in place due to their declining health. Thus, this study was aimed to examine how low-income older adultsâ€™ health challenges affect their aging in place. An interview with open-ended questions was conducted with 55 older adults (their annual income = less than $25,000), and a content analysis was employed to define health challenges. Results showed that the most frequently cited health challenges were related to blood (26) (blood pressure, blood clots, and circulation), followed by diabetes (22) and lungs/breathing (16). Health challenges were also discussed in terms of difficulties performing daily activities of living (23). Even though the majority experienced health challenges, they received little to no public assistance. Health concerns and difficulty performing daily activities along with limited resources are likely to negatively impact their desire to age in place. These findings reflect the need for more resources and programs geared towards low-income, older adults. Understanding the health challenges of low-income, older individuals and factors that influence their ability to age in place is beneficial in assessing the future needs of the older population.

100) **Amir Barnett,** Sophomore, Engineering: Pipeline Construction impacts on small mountain streams: evaluating stream geomorphology, water quality, and benthic macroinvertebrate diversity

The Mountain Valley Pipeline is a natural gas pipeline crossing through Appalachian karst geology and mountain streams posing environmental concerns. Deforestation and construction on mountain grades can increase erosion and release nutrients, which can affect small streams. By examining stream morphology, sediment deposition, water quality and benthic macroinvertebrate diversity we characterized four reaches in the Mill Creek watershed (Montgomery County, VA): two isolated from pipeline construction and one

on each side of the pipeline right-of-way. To identify physical stream health and relative impairment, we measured stream geometries and classified stream substrate to calculate relative bed stability. We installed embedded sediment samplers above and below the pipeline right-of-way to capture fine sediments for a comparison of quantity and composition. In addition, we measured water quality using a hand-held water quality sonde (YSI) and grab samples. We determined benthic macroinvertebrate diversity using modified procedures from the EPAâ€™s Rapid Bioassessment Protocol. Samples from above and below the pipeline crossing, with varying distances, were quantified and aggregated. Study results provided quantitative and visual evidence that the below pipeline stream was physically altered compared to upstream or isolated sites. The downstream site had greater sediment loads, evident in our bed sediment sampling and pebble counts, along with an impairment rating utilizing relative bed stability methodology. However, ecologically, the benthic macroinvertebrate community showed minimal variation by site and longitudinal distances. This study sufficiently establishes baseline information; further monitoring should evaluate physical stream properties and ecosystem health as pipeline construction continues and reclamation plans are implemented.

101) **Julia Meyarzum**, Sophomore, Sociology, Faculty Mentor: Dr. Stephanie Teixeira-Poit; Factors Predicting Attitudes Towards Government Support for Low-Income College Students

Low-income students do not have the same access to higher education as their wealthy counterparts. Students do not have the option of continuing their education if they cannot find the proper funding to attend institutions of higher educations. Research shows that lower-income students are not equipped with the financial tools to attend college or even apply to these institutions due to economic disadvantages.(Cox 2016). Lower-income students face barriers such as completing the Free Application for Federal Student Aid (FAFSA), which can be difficult for low-income students to navigate through.(Pulcini 2018). Low-income students who do enter the university system struggle to stay afloat due to various financial obligations such as books, groceries, and necessities. (Bastedo and Jacquette 2011). Lower-income students who receive government support may be more likely to overcome barriers to obtaining a college education. Our research questions: What factors predict attitudes towards government support for low-income college students? We conduct univariate and bivariate analyses of data from the 2016 General Social Survey, which consists of perspectives on social issues from 2,867 individuals in the United States. The dependent variable is attitudes towards government responsibility to give financial help to college students from low-income families. The independent variables include demographic characteristics and attitudes towards affirmative action policies.Demographic characteristics include gender, race, education, income, religion, and political party affiliation. Attitudes towards affirmative action policies are operationalized using two measures: (1) attitudes towards whether discrimination mainly accounts for differences between black and white people in employment, income, and housing, and (2) attitudes towards whether white people are hurt by affirmative action.Findings will help identify factors that predict attitudes towards government support for low-income college students. Recommendations will be made for interventions to help improve agreement that the government should be responsible for giving financial help to college students from low-income families.

102) **Kaylyn Reese**, Junior, Physics, Faculty Mentor: Dr. Solomon Bililign; Characterizing the Fractal-like Aggregates produced from Biomass Burning Aerosol (BBA)

Quantifying the radiative properties of aerosols produced from biomass burning (BB) are strongly dependent on two key morphological parameters of the aerosol: fractal dimension, ð□‘«_ð□’‡ and fractal pre-factor, ð□’Œ_ð□ŸŽ. The aggregates produced from the combustion of biomass fuel are fractal-like in

nature formed through diffusion limited aggregation(DLA) process. The aggregates are made up nearly-spherical monomers of almost the same diameter. The estimated number of monomers in the four aggregates used in this study are 170, 341, 480 and 750 with monomer diameter ranging from 50 to about 80 nm. The fractal dimension and the fractal pre-factor obtained are respectively, 1.68 and 3.97 which describe the morphology of the aggregate. For very compact aggregate, ð□‘«_ð□’‡>2 and ð□‘«_ð□’‡<2 for lacey aggregate.

103) **Mercer Butts,** Junior, Animal Science, Faculty Mentor: Dr. Uchenna Anele; Effects of plant nutraceuticals on in vitro fermentation of dairy feed

Hibiscus sabdariffa L. (Malvaceae) is an important plant that is widely distributed in tropical and subtropical regions around the world. Different parts of the plant are rich in polyphenolic compounds such as anthocyanins, chlorogenic acid, delphinidin 3-monoglucoside, caffeoylshikimic acid, gamma-tocopherol (lipid-soluble antioxidant), cryptochlorogenic acid, delphinidin and flavonoids such as gossypetin, kaempferol, hibiscetine, quercetin, sabdaretine and their derivatives. Based on the phytochemical properties of H. sabdariffa, it has been used extensively as a beverage, antioxidant, anti-obesity, anticholesterol, anti-cancer, etc. We hypothesize that H. sabdariffa can modulate rumen function to improve feed efficiency in dairy cows. We conducted an in vitro batch culture fermentation to evaluate the effects of calyces, flower and seeds from H. sabdariffa on gas production and dry matter disappearance of alfalfa hay, corn silage and calf starter feed.