2019

Fall 2019 Undergraduate Research and Creative Inquiry Symposium Book of Abstracts

North Carolina Agricultural and Technical State University

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FALL 2019 UNDERGRADUATE RESEARCH & CREATIVE INQUIRY SYMPOSIUM

LIST OF ABSTRACTS

1. **"The Impact of Stress Response on Anthocyanin Production in Creeping Bentgrass"**
Asha McElroy, Junior, Food and Nutritional Sciences; *aimcelroy@aggies.ncat.edu*
Dr. Eric Watkins
Anthocyanins are plant pigments of red, violet, or blue color in fruits, vegetables, flowers, and foliage. Anthocyanins can found constitutively, or production can increase as a result of stress, especially due to deficiency in phosphorus or in response to high levels of light. Phosphorus is a macronutrient necessary for plant growth, but phosphorus can have negative environmental impacts in water runoff. Creeping bentgrass (Agrostis stolonifera) is a turfgrass that is primarily used on golf courses, and can often be found with purpling leaves. However, if this is always and only due to phosphorus deficiency is unknown. My objective was to determine if both phosphorus deficiency and high light intensity had a major impact on anthocyanin production in 16 genotypes of creeping bentgrass. Two experiments were conducted under three levels of light. Condition 1 was no shade, 900 µmol m-2 s-1 of light; Condition 2 was 450 µmol m-2 s-1 of light, and Condition 3 was in the greenhouse as a control. In Experiment 1, the fertilizer applied did not contain phosphorus in a Hoagland's 0.5x fertilizer. In Experiment 2, 1000 µM phosphorus was added to the fertilizer solution. Results showed that genotypes, SP L93 A and LP L93 D produced significant amounts of anthocyanin in both experiments in all conditions compared to all other genotypes. Additionally, certain genotypes produced anthocyanins no matter the conditions and the environment. In conclusion, certain creeping bentgrass genotypes produced anthocyanins in all conditions due to their genetics more than the interaction between genetics and their environment.

2. **"Evaluating the long-term adaptive response of Streptococcus mutans to microgravity"**
Paris Parsons, Senior, Applied Cultural Thought; *pkparsons@aggies.ncat.edu*
Dr. Misty Thomas
Strategies for maintaining life on extended missions in space are becoming a priority for NASA and other agencies as the desire to explore and colonize planets like Mars increases. Life on the International Space Station (ISS) presents many microbial challenges to the humans that inhabit it. Genomic and phenotypic traits of Streptococcus, an organism that causes dental infections, is well studied on Earth but little knowledge exists on the organism's microbial changes on extended space missions. In this study, we evaluate the long-term (100-day) adaptive response of S. mutans to normal gravity (NG)(x4) and microgravity (MG)(x4) with the use of 8 High Aspect Rotating Vessel (HARV) which simulates the MG environment. In addition, we analyze the genetic changes that arise in response to MG by DNASeq as well as perform several assays including minimum inhibitory concentration (MIC), competition, and biofilm. Hypothesis: S. mutans cultured in a MG environment will develop genomic and phenotypic traits that will aid in virulence and resistance to antimicrobials than S. mutans cultured in a NG environment. Methods: HARVs inoculated with S. mutans and 10 ml of Brain Heart Infusion (BHI) media. HARVs are sub-cultured every 24-36hr with 10 ml of BHI. 5 ml of samples from each sub-culture are used in detecting possible contamination via microscopy, nanodrop, and plating. Noncontaminated samples are stored in glycerol stocks that call for 100 ug of sample to 400 ug of glycerol. The remaining of sample is centrifuged to collect cells. Glycerol stocks and centrifuged cells are stored at -80 Celsius. Stocks are used in case of future contamination, and cells are used for DNA seq. Results/Conclusions: The evaluation of S. mutans signified that growth rate is not a factor although the growth formation of biofilms is significant to survival. NG biofilms formed along the base opposed to MG biofilms formed sporadically throughout media, attaching to wall inside of HARVs. Not many bacteria resemble S. mutans; we were able to detect the presence of a contaminant specifically, staphylococcus. Plated S. mutans appear white, small and circular whereas staphylococcus appear yellow and grow at an increased rate. Under the microscope, S. mutans are tiny, circular and form in chains and staphylococcus are circular but, clump together to form in a larger colony. Future Direction: To evaluate the long-term (100-day) adaptive response of S. mutans to microgravity (MG) and the co-adaptation to microgravity and silver (MGAg) to better understand the consequences of using silver to filter potable water on the host microbiome. Significance: The ability to filter, recycle, and reuse water for extended missions is vital to sustaining life on the ISS. Silver is used as the primary biocide in the portable water dispenser (PWD) at a standard level of 400ppb although, the Environmental Protection Agency states no more than 100 ppb of silver to be considered non-toxic to human consumption. These studies will allow us to evaluate the rate and genetic mechanisms in which S. mutans may evolve resistance to levels of silver presently used as a biocide for potable water on the ISS. The acquired genetic data will also help in the potential development of treatments and/or control strategies to combat the dental issues that may arise in space due to this pathogen.

3. **"Horizontal Transmission of Cryptococcus neoformans in a Murine Model"**
Amina Bradley, Senior, Biology; *aabradley@aggies.ncat.edu*
Dr. Misty Thomas
Background- Cryptococcus neoformans is an opportunistic fungal pathogen which can cause a severe pulmonary infection known as cryptococcosis, which often progresses to fatal meningoencephalitis. Immunocompromised individuals, such as recipients of solid organ transplants and those who are HIV positive, are most susceptible. It is documented that Cryptococcus typically invades the body through inhalation of microscopic fungal spores from the environment, but less is known regarding whether cryptococcosis is a communicable disease. We wanted to test whether horizontal transmission would occur when an uninfected mouse inhaled or ingested fecal matter, from infected mice, in a caged environment. We hypothesize that as the infection disseminates throughout the gastrointestinal (GI) system we will see increasing amounts of Cryptococcus colony forming units (CFU) in the GI and in excreted feces. Methods-20 female BALB/c mice and 20 female C57BL/6 mice were obtained from Jackson Laboratory and housed in the animal care facility at the University of Massachusetts Medical School. The mice were divided into 10 cages with 4 mice per cage. Each group contained 2 mice infected with C. neoformans and 2 uninfected mice. Mice were placed in the same communal, closed environment under laboratory settings. The mice were given an orotracheal (OT) infection with a highly virulent strain of C. neoformans that stably expresses the mCherry fluorescent protein (KN99mCH). Fecal samples were collected every 3-4 days and at 50 days post infection (DPI) mice were sacrificed and lungs, brains, organs of the GI tract were harvested and plated. Results- From day 3-24 the number of fecal CFUs increases in OT infected mice until they died at approximately day 27. In the BALB/c population, 3 out of 10 uninfected mice acquired the infection. In the C57BL/6 population, 6 out of 10 uninfected mice acquired the infection. The mice were sacrificed at day 50 and their lungs, brains, and colon were harvested and plated. Quantitative culturing and fluorescence imaging demonstrate the capacity of C. neoformans to colonize various organs in the murine GI tract. Based on this data we can see that after Cryptococcus infection is established in the lungs it can disseminate to the GI before finally reaching the fecal matter. Conclusion- This study provides evidence that supports the hypothesis that uninfected animals housed in a communal environment with infected animals can acquire the infection through ingestion/inhalation of fecal matter. It also shows that C. neoformans can be detected in the fecal matter of an infected host, which could serve as a diagnostic in resource-limited settings. Based on this data we can also see that after cryptococcal infection is established in the lungs it has the potential to disseminate to the GI tract and be excreted in the fecal matter.

4. **"Elucidating the role of Protein Phosphatase 2A (PP2A) in modulating heterotrimeric G Protein Signaling"**
Malek Mitchell, Junior, Biology (UNC SPIRE Post-Doctoral Fellow); *msmitchell@aggies.ncat.edu*
Dr. Justin Watkins
G Proteins are a class of proteins that behave as molecular switches to connect external stimuli with changes in cell physiology and gene expression. Central to this set of proteins is the phosphorylation of REGULATOR OF G PROTEIN SIGNALING 1 (RGS1), an inhibitor of G protein signaling in Arabidopsis thaliana, which leads to its internalization and activation of the G protein pathway. While much progress has been made in discovering the kinases that act on RGS1, very little is known about the phosphatases that reverse this molecular switch. Based on a previous study that examined protein interactions with RGS1 in vitro, we discovered 4 candidate protein phosphatases that may interact with RGS1 to modulate G protein signaling. One of these proteins, ATB α, is a substrate specificity subunit of PROTEIN PHOSPHATASE 2A (PP2A), a heterotrimeric phosphatase with structural, catalytic, and substrate specificity subunits. We predicted that ATB α (PP2A) interacts with RGS1 in planta, modulating G protein activation. We utilized chemiluminescence-based assays to test the interaction between ATB α (PP2A) and RGS1 and to investigate how G protein interactions affect innate plant immunity. Our interaction assay showed a strong interaction between ATB α and RGS1. We also found that atb α null mutant demonstrated a dampened immune response in comparison to WT. Together, these findings confirm the predicted interactions between ATB α and RGS1 in planta, thereby regulating the RGS1-dependent plant immune response.

5. **"Observations on Dairy Management Practices and the Need for Cybersecurity"**
Le'Hendria Phillips, Junior, Animal Science; *lrphillips@aggies.ncat.edu*
Dr. Mulumebet Worku
Cybersecurity threats in agriculture could affect our food supply and pose a threat to national security. The objective off this study was to learn more about opportunities for smart technology and need for cybersecurity in dairy farming by conducting a survey of published literature. There are many opportunities to use smart technology in dairy farms. These technologies give data for better production and farm profitability. Cyber security is important for data security, milk safety, dairy farm profit and therefore food security.

6. **"Identifying galectin-3 variants in the genome of sheep, goats, and cows"**
Imani Anderson, Junior, Animal Science; *imanderson@aggies.ncat.edu*
Dr. Mulumebet Worku
Galectin-3 (Gal-3) gene encodes Gal-3 protein, which is a member of lectin protein family, plays an important role in immune response such as cell-cell adhesion, cell-matrix interactions, macrophage activation. Two Gal-3 variants have been reported in animals. The objective of this project is to identify the two Gal-3 gene variants in the genomic DNA of sheep, goats, and cows. Blood samples on FTA cards were collected from the animals. The DNA was extracted following the FTA manufacturer protocol. The concentration and purity of the extracted DNA were measured with Nanodrop spectrophotometer (the average concentration and 260/280 ratio are 2.7ug/ul and 2.07 respectively). The PCR reactions for the extracted DNA samples were conducted using primers specific for the two gene variants. The PCR results show that Gale-3 variants are present in the three species (Cow Ct=32.67, sheep Ct=28.08, and goats=27.3).

7. **"Detection of the gene encoding programmed cell death-1 (PD-1) in cow genomic DNA isolated form FTA cards"**
Sade Ford, Sophomore, Animal Science; *scford@aggies.ncat.edu*
Dr. Mulumebet Worku
Programmed cell death 1 (PD-1) encodes an immune checkpoint protein, expressed on white blood cells. Variation in PD-1 is associated with diseases. It is emerging as a target for therapeutics. In cows PD-1 blockade is a potential therapeutic strategy to control viral infection. Thus simple ways of detecting and charactering PD-1 are needed. The objective of this project was to detect the PD-1 gene in cow genomic DNA. Blood was collected from three Holstein Friesian cows on FTA cards. Genomic DNA was extracted following manufactures instructions (Whatman Inc.). The purity and concentration were evaluated using a Nanodrop spectrophotometer. Specific PCR primers for bovine PD-1 were used to detect and amplify the gene. Primers for the house-keeping gene GAPDH were used for controls. The FTA card was easy to collect blood and elute DNA for detection of PD-1. The average concentration of isolated DNA was 20.5 ng/ul and average purity ratio was 1.9. The primers used amplified PD-1 in individual DNA samples (Average CQ =20.94). The CQ for GAPDH was 20.64. Results will be validated by sequencing. This approach allows for the isolation of high quality DNA of sufficient quantity for detection of PD-1 in cow blood. This simple method for detection of PD-1 gene may be useful in larger studies to assess variation in PD-1 genes and their expression for possible application of targeted immunotherapy in cow health.

8. **"Detection of Olfactomedin 4 in cow genomic DNA"**
Amani Ambush. Senior, Animal Science; *asambush@aggies.ncat.edu*
Dr. Mulumebet Worku
Olfactomedin 4 (OLFM4) is an extracellular matrix glycoprotein that belongs to the olfactomedin family. It is involved in cell proliferation, differentiation, apoptosis, adhesion and the inflammatory response to pathogens. Olfactomedin-4 also serves as a pathogenic neutrophil subset marker. Studies are needed to identify and characterize neutrophils subsets in cows and genes involved in the inflammatory response to pathogens. This study aims to detect the OLFM4 gene in bovine genomic DNA. Blood was collected on to FTA cards, from three Holstein Friesian cows, at the NCAT Dairy farm. Genomic DNA was isolated using the manufacturers protocol (Whatman Inc). The purity and concertation of isolated DNA was evaluated using a Nanodrop Spectrophotometer. Specific primers designed for bovine OLFM4 were used to detect the gene with real-time PCR. Primers for the housekeeping gene GAPDH were used as controls. The average concentration of isolated DNA was 67ug/ul and the 260/280 ratio was 1.7. The OLFM4 gene was detected in all three samples tested (Average threshold cycle (Ct) = 29). Olfactomedin-4 might serve as a marker in cow blood. Samples will be sent for sequencing and designed primers will be used to evaluate factors affecting OLFM4 expression on neutrophils subsets in cows and their role inflammatory response to pathogens.

9. **"Effect of essential oils on Galectin-3 protein concentration in cow blood"**
Amethyst Johnson, Senior, Laboratory Animal Science; *arjohns3@aggies.ncat.edu*
Dr. Mulumebet Worku
Essential oils of plant origin are complex mixtures of volatile and semi volatile organic compounds that can modulate the immune response. Plant derived essential oils may be useful complementary or alternative medicine for the treatment of animal diseases. The objective of this study was to evaluate the effect of essential oils on the concentration of Galectin 3 protein (Gal-3) in cow blood. Blood was collected form three Holstein fresian cows at the NC A&T Dairy. One milliliter of blood was treated with 100 ul of lemon, cinnamon or clove oil. The packed cell volume (PCV), total viable and differential white blood cell counts were measured before and after essential oil treatment. Differential effects of oils were observed. The Gal-3 ELISA test results showed that treating blood with essential oil increased Gal-3 concentration by 11%, 12%, and 23% for cinnamon, clove, and lemon respectively. Continued studies are suggested to focus on different concentrations of essential oils, a more diverse group of animals and information including the effects on gene expression.

10. "**Differential Direct Microscopic Somatic Cell Counts in milk from dairy cows and St Croix Sheep"**
Jessica Smith, Senior, Animal Science; *jysmith@aggies.ncat.edu*
Dr. Mulumebet Worku
Milk contains varying number of white blood cells. These Somatic cells are the first defense against bacteria and are also determining the quality of milk. Direct Microscopic Somatic Cell Counts (DMSCCs) are an approved method for counting SCC in milk. The St. Croix sheep are known as 'Parasitic Pasture Vacuums' for their ability to clear a pasture of parasites reducing the need to worm sheep. They also show resistance to hoof rot. The ewes are good milkers and produce ample quantities of milk which is high in butterfat. The ewes are being milked for cheese production, in some regions of the United States. These animals are calm in roles in animal health and production. The objective of this study is to compare DMSCC in milk from St Croix Sheep compared to dariy cows. Milk samples (5 ml) were collected from (N=3 each) dairy cows and St Croix sheep at the NC A&T State University farm. Cell smears were prepared in duplicate stained using Wright's-stain and 100 cells were counted under a light microscope (). Cow and sheep milk samples contained 39 and 40% macrophages, 54% lymphocytes, and 25% neutrophils respectively. These data indicate differences or similarities in SCC in milk form St Croix sheep compared to cow milk that may impact milk quality and udder health that can impact food safety and animal welfare. Thus, further studies are warranted.

11. **"Effect of Exogenous Recombinant Galectins on Total Plasma Protein Concentration in Cow Blood"**
Kayla Alston, Freshman, Animal Science; *kaalston2@aggies.ncat.edu*
Dr. Mulumebet Worku
Galectins are soluble proteins that can be secreted from cells. Secreted Galectins interact with glycoconjugates and play important roles in regulating immunity. Changes in total plasma protein concertation serve as indictors of immune activation. The objective of this project was to determine the effects of three exogenous recombinant Galectins on the concentration of total plasma proteins in cow blood. Blood samples (1 ml each) from three cows were treated with either recombinant Galectin 3, 4, or 9 (50ug/ml 30 min 37C in 5% Co2). Controls were left untreated. Plasma was then extracted and diluted. The concentration of total plasma protein was determined using the Pierce BCA kit (Thermo Scientific Pierce, Rockford, IL). Results were analyzed using ANOVA. Treatment with all three recombinant Galectins significantly increased the concentration of total plasma protein (F=6.6, p-value=0.028). The average increases due to treatment with Gal3, Gal4, and Gal9 were 55%, 50% and 48% respectively. Exogenous galectins can modulate the levels of plasma proteins in cow blood. Further evaluations are needed to identify specific proteins and how they are regulated.

12. **"Development of a Time-efficient and Cost-effective Luminescence Assay to Measure the Relative Activity of Protein Kinases"**
Anjali Kumari, Sophomore, Biology pre-medical; *akumari@aggies.ncat.edu*
Dr. Robert Newman
The objective of this study is to understand the mechanisms of crosstalk between redox- and phosphorylation-dependent signaling. Due to its sensitivity and ability to measure ADP generation directly, the process was applying 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 nonoptimal for undergraduate research due to limited hours students have 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 maintaining sensitivity or the ability to directly measure ADP generated. Consequently, there has been the development of an assay based on the nucleotide diphosphate kinase (NDPK)/uracil triphosphate (UTP)-dependent conversion of ADP to ATP. The NDPK/UTP assay, which utilizes two parallel experiments (i.e., water alone treatment compared to the NDPK/UTP treatment), conserves time by using NDPK/UTP to regenerate the ATP consumed in the kinase assays and comparing the difference with the water alone treatment. The difference in the treatments corresponds to the magnitude of activity change by using the ATP present in the water alone treatment as the baseline to measure activity. Side-by-side comparisons between the NDPK/UTP and ADP-Glo assays, using either ERK2 or p38a, show similar changes in kinase activity toward model peptide substrates following H2O2 treatment. Compared to the ADP-Glo assay, NDPK/UTP-based detection reduces the time-to-detection ~3-fold and is also a fraction of the cost of the ADP-Glo assay.

13. **"Emerging Professional Identity Development in Freshman Architecture, Engineering, and Construction Women"**
Jacob Vanderpool, Junior, Construction Management; ***jrvander@aggies.ncat.edu***
Dr. Andrea Ofori-Boadu
Increasing the persistence of talented women into male-dominated architecture, engineering, and construction (AEC) professions could reduce prevailing workforce shortages and improve diversity. With only 2.8% of AEC professionals being women, identity theorists advocate that professional identity development (PID) could improve persistence. However, little is known about PID processes in undergraduate AEC women. As part of a nationwide National Science Foundation project, the purpose of this presentation is to examine emerging PID in 67 women enrolled in freshman AEC courses in five institutions. Data from open-ended questions in a recruitment survey are analyzed using the NVIVO software. Content and relational inductive open coding are conducted within each participant and across different participants. AEC industry views and industrial experiences reveal four increasing levels of emerging PID: Plain, Passive, Progressive, and Proactive. Although Progressive participants (51%) have some views about the AEC industry, the strongest views are from Proactive participants (28%) who have some AEC experience. Predictors of AEC-PID include love for math and art, inherent abilities, and pre-college association with AEC professionals. With 52% of participants having STEAM interests, an in-vivo code, Middle Ground, demonstrated participants' quest to combine STEM strengths with visual/performing arts in career decisions. Findings can guide AEC educational policy development that transform the recruitment, retention, and persistence of the next generation of AEC women. In the long term, this could reduce workforce shortages, improve diversity, and foster the innovation of gender friendly AEC products and services.

14. **"Investigating the physical interaction between the influenza A virus endoribonuclease PA-X and its target RNAs"**
Rachel Richards, Sophomore, Biology; ***rmrichards@aggies.ncat.edu***
Sharon Wellman
Influenza A virus (IAV) results in about 500,000 annual deaths globally. The host immune response to IAV can cause fatal lung damage. The IAV-encoded endoribonuclease PA-X contributes to controlling the host immune response. In model organisms, PA-X-deficient strains elicit a stronger immune response than wild-type strains and are typically more lethal. Recent work from the Gaglia lab has shown that PA-X specifically degrades spliced host mRNA through an unknown mechanism. Evidence also suggests PA-X interacts with host mRNA processing proteins, and is physically brought to spliced mRNAs for degradation. Based on this model, I hypothesize that the physical interaction between PA-X and a mRNA is sufficient for cleavage. I artificially tethered PA-X to mRNA by fusing PA-X to a bacteriophage λN protein and the mRNA of interest (spliced or intronless IFN-λ2 targeted reporter) to the λN target sequence BoxB. I expressed these components in HEK293T cells and quantified PA-X-mediated down-regulation of mRNA by RT-qPCR. I found that λN had no impact on normal PA-X function and therefore did not distort the data. However, the insertion of BoxB in exon 2 of the spliced IFN-λ2 mRNA reporter blocked reporter down-regulation by PA-X. A new location for BoxB insertion must be investigated before any further testing takes place, along with replication of the experiments for statistical analysis. Ultimately, understanding how PA-X degrades mRNA will allow us to better understand how influenza proteins can modulate the host immune response and what this means for the outcome of a viral infection.

15. **"Examining the Effects of MrgprB4+ Neuron Optogenetic Activation on Reward Behavior and Pup Vocalizations"**
Synphane Gibbs, Senior, Biology; ***slgibbs@aggies.ncat.edu***
Dr. Ishmail Abdus-Saboor
Gentle stroking from a family member or intimate partner can be rewarding. C-low threshold mechanoreceptors (C-LTMRs) are sensory neurons that respond to stroking of the skin at rates that are deemed pleasurable and are therefore implicated in soothing, comforting touch in humans. MrgprB4+ neurons in mice are a molecular subclass of CLTMR. Previous studies have demonstrated that chemogenetic activation of MrgprB4+ neurons promoted

place preference in mice. However, chemogenetic activation results in simultaneous, body-wide activation lasting tens of minutes to hours, which is not physiologically or ecologically relevant. Therefore, the aim of this study is to assess the effects of focally activating MrgprB4+ neurons on various behaviors (i.e. place preference and pup vocalization) through optogenetic activation. The optogenetic activation technique better mimics stroking, as it is focally and temporally restricted. In this study, we used cre-lox technology to generate mice that would allow us to optogenetically activate MrgprB4+ neurons by shining a laser onto the back skin during both an acute and conditioned place preference paradigm, and an acute maternal separation paradigm. Our results revealed that optogenetic activation of MrgprB4+ neurons did not promote place preference or reduce pup vocalizations. Overall, the results demonstrate that the current optogenetic technical paradigm to study rewarding behavior with MrgprB4+ neuron activation is not sufficient to evoke rewarding or positive valence behavior. In future studies, we can modify our optogenetic activation paradigm or target different molecular classes of CLTMRs in the context of reward behaviors.

16. **"Simulating the Magnetization Spin-flip of Catecholamine-type Neurotransmitters via the Ising Model"**
Akosua Johnson, Senior, Bioengineering; ***asjohns3@aggies.ncat.edu***
Dr. Ronald Gamble
The Ising Model is a mathematical model that represents a lattice of atoms, each having a dipole moment or spin. The model is used to predict the second order phase transition of spins in ferromagnetic or anti-ferromagnetic materials, as dictated by properties such as spin-spin interaction and applied magnetic field. The hypothesis of this experiment is to apply the Ising Model to pacemaker cells of the Sinoatrial Node (SAN). This node contains distinctive ion channels that initiate and propagate the action potentials responsible for the rhythmic impulses of the heart. The modified Ising Model will target Calcium-43 nuclei because they are the dominant ions for voltage dependent calcium channels which directly affect the electric rhythm of the heart. A Hamiltonian total energy function was derived from the computational Ising Model of simulated ferromagnetism. According to this modified model, the spin of the Calcium-43 nuclei are proposed to be flipped stochastically under an associated time-constant. The influx of these spin-flipped Calcium-43 nuclei should impede ionic transport with respect to catecholamine neurotransmitters such as dopamine, which directly affects heart rate. This reduction in neurotransmission activity is theorized to cause a decrease in the excitation of cardiac action potential generated from the L-type calcium channel. The modified Ising Model is being written in a combination of FORTRAN source code and MATLAB scripting language. If the modified Ising Model is proven correct, then introducing spin-flipped Calcium-43 nuclei to L-type calcium channels in the SAN could be used as an alternative to antiarrythmic agents.

17. **"Emissions of Air Pollutants from the 2019 Western United States Wildfires"**
Chelia Thompson, Senior, Physics Engineering; ***cthomps2@aggies.ncat.edu***
Dr. Solomon Bililign
Aerosol produced from natural and anthropogenic sources are an area of interest due to their impacts on climate and human health. On a global scale, open biomass burning from wildfire is a large contributor to the atmospheric aerosol loading. The burning conditions (high temperature flames versus lower temperature smoldering) can produce significantly different amounts of air pollutants like carbon monoxide, carbon dioxide, black carbon, ozone, etc. Using data from the FIREX-AQ 2019 joint campaign, I will talk about the emissions of different air pollutants and their dependency on burning conditions during the 2019 western US wildfires.

18. **Characteristics of Cement Pastes Modified with Plant-Derived Bio-Chars**
DeAndria Bryant, Senior, Construction Management; ***dmbryan1@aggies.ncat.edu***
Dr. Andrea Ofori-Boadu
Considering that cement production is a costly and energy-intensive process with detrimental environmental consequences, more sustainable alternatives such as plant-derived biomass could present economic and environmental benefits. The purpose of this study was to investigate the characteristics of cement paste modified with almond shell bio-chars (ASB), rice husk bio-chars (RHB), wood bio-chars (WDB), and peanut shell bio-chars (PSB). Bio-chars were obtained through the thermochemical processing of biomasses. Bio-chars were then dry-mixed with cement, and water was added at a water/cement ratio of 0.35 to form the pastes. Laboratory experiments (loss-on-ignition, specific gravity, setting, compression, and water absorption) and spectroscopic methods (FTIR, TGA, XPS, SEM, BET, and RAMAN) were used to analyze bio-chars and cement pastes. All bio-char modified cement pastes had an accelerated set compared to the control paste. This was attributed to the presence of amorphous silica and smaller bio-char particle sizes, which accelerated

chemical reactions and rapidly filled the pores within cement pastes. Direct relationships between bio-chars' carbon/silicon ratio and the compression strength of cement pastes confirmed that carbon interferes with the cement hydration process, while silica reacts with calcium hydroxide to form calcium-silicate-hydrate. With RHB having the lowest carbon/silicon ratio, the 10% RHB paste had the highest compression strength (72 MPa). Future research will investigate optimal plant-derived bio-char processing conditions for improved bio-char modified cement paste characteristics. Economic and environmental benefits can result from the application of plant-derived biomasses for partial cement replacement.

19. **"East-Side Project"**
Selah Grant Senior Landscape Architecture; *svgrant@aggies.ncat.edu*
William C. Harrison
Charlotte is the largest city in North Carolina. With nearly 800,000 people living and working in the Charlotte community, the city continues to grow. The city's focus areas are Housing and Neighborhood Development, Community Safety, Transportation, Economic Development, and the Environment. Despite some of Charlotte's initiatives, Charlotte struggles with growth in some of its areas; for my project, in particular, Eastway Street has been neglected for years. In 2003, the Mecklenburg County Parks and Recreation promised residents of Briarwood Community a neighborhood park, known as Eastway Park, with nine recreational fields, picnic shelters, a recreation center, tennis courts, and trails; however, the park has been left uncompleted and the neglection has resembled in the landscape. Neighboring Eastway Park is North Park Mall, a 1970's discount mall that went into foreclosure in 2014, and due to lack of interest in the area, it is still standing. Since the city growing light rail line (Lynx Blue Line), the cost of living in Charlotte is increasing as well. For example, 1100 apartment was built after the installation of the line rail; however, the prices of the apartment ranges from $1500-$2000 per month for a studio. There have been many developments around the transit with price ranges like 1100 apartments, such as the Collective, McCreesh Place, and 300 Optimist Park. Although this may be decent for middle-class individuals and couples, an average Charlottian annual income is 34k annually and live in families of four. Therefore, following from Charlotte's initiatives there could be more diverse living around the Lynx Blue Line, particularly for low-income families of three or more individuals. My project initiative is to support low and middle-income residents with the promises Charlotte-Mecklenburg County fails to fulfill. Creating a Transit-Oriented Community would be an impactful addition to the east-side of Charlotte. The Charlotte's Lynx Blue Line intersects through my area - Eastway Park and North Park Mall; the Lynx stop is 750 - 1500 feet from my site. The surrounding area is predominantly accompanied by middle-income residents of Blacks and Latinos backgrounds.

20. **"Identifying Hotspots of Future Animal Climate Control Needs in North Carolina"**
Anonymous, Senior, Animal Science
Dr. Natalie Nelson (North Carolina State University)
Swine and broiler production are two of the most prominent animal production sectors, and are increasing rapidly overtime with popularity. As global warming is progressing, there is a concern regarding the effects of temperature and humidity on animal production quality. This project utilizes data science tools to determine areas in which climate control for animal facilities will be an issue under future climate scenarios.The objective includes identifying the top two swine and broiler production counties as of 2017 in North Carolina, and evaluate how production in these counties may suffer from the effects of heat stress under future climate conditions.

21. **"Comparing SEI and SEIR mathematical models for multi-host Hendra virus dynamics"**
Michael Umelo Junior,Computer Engineering; *mnumelo@aggies.ncat.edu*
Dr. Suzanne O'Regan
The role of the environment in the transmission of pathogens has been an understudied research area. For this research paper, we look specifically at Hendra virus and how it spreads through the environment. Hendra virus is a zoonotic infection that is transmitted by flying foxes (bats) through their excretions and it can be lethal if it comes into contact with horses and humans. The key reservoir host of Hendra virus is Pteropus Alecto (black flying fox). Increased stress on black flying foxes due to loss of habitat can potentially increase their susceptibility to the virus, increase shedding of the virus into the environment and increase the rate of relapse. The dynamics of the virus in black flying foxes is unclear, but is hypothesized to follow Susceptible-Exposed-Infectious-Recovered-Susceptible dynamics (SEIRS) or Susceptible-Exposed-Infectious-Exposed-Infectious dynamics (SEIEI). We explore SEIR and SEI models to determine how this virus persists in the environment, the interactions between host susceptibility, shedding, relapse and environmental persistence,

and how these factors affect the risk of transmission to horses. Using these models, we calculate equilibrium prevalence in bats and the basic reproduction number as measures of transmission risk to horses. Our results suggest that when bats are allowed to recover, Hendra virus prevalence and risk of spread is lower.

22. **"Probing the Binding Mechanism of Dimethyllysine Reader Proteins"**
Balqees Khader, Junior, Biology; ***bkhader@aggies.ncat.edu***
Dr. Scott Harrison
Post-translational modifications (PTMs), such as methylation, are epigenetic mechanisms that regulate gene expression. Histones are known hotspots for PTMs. Lethal(3)malignant brain tumor-like protein 1 (L3MBTL1) and p53-binding protein 1 (53BP1) are "reader" proteins that recognize and bind dimethylated lysine (Kme2) on histone tails. Reader proteins bind to Kme2 using an "aromatic cage" that consists of multiple aromatic residues. In Kme2-reader proteins, this cage also includes an acidic residue such as an aspartic acid (D). Previous studies have been conducted to understand the contributions of individual residues to binding. Here, the aspartic acid was studied to determine its contribution to binding. Using site-directed mutagenesis and recombinant protein expression, we made mutants of both L3MBTL1 and 53BP1, changing the aspartic acid to alanine(A) and asparagine (N), with the 53BP1 aspartic acid to asparagine being a previously uncharacterized mutation. Using solid-phase peptide synthesis, we synthesized a Kme2 peptide substrate based on the histone 4 lysine 20 binding site. Isothermal titration calorimetry was used to measure the binding affinity of wild-type and mutant proteins with Kme2 peptide. It is expected that these mutations in 53BP1 and L3MBTL1 will decrease the binding affinity to H4K20me2 peptide, consistent with previous studies and indicating that this aspartic acid residue in the aromatic cage is important for binding in Kme2 reader proteins.

"Food insecurity in Greensboro"
Nadia Moore, Senior, Sociology; ***njmoore@aggies.ncat.edu***
Dr. Tobin Walton
"Food insecurity is the state of being without reliable food. It is important that everyone is being fed with the acceptable amount of food every day to survive. In Greensboro, it is estimated that 44 percent of people skip meals or cut down on their meal size because of food insecurity. Food insecurity has affected the people and communities of Greensboro in many ways. This study will explore how food insecurity has affected the city of Greensboro by focusing attention on the impacts to community organizations, relationships, and resources. This study will also focus on the lack of food assistance and fewer job opportunities. Through interviews and focus groups, information will be gathered from food banks and residents of food desserts to track the history of food insecurity and its impacts on communities within Greensboro, NC."

23. **"Respectability Politics in Hip Hop"**
Gayle Streeter, Junior, English; ***gestreeter@aggies.ncat.edu***
Dr. Jason DePolo
Research Question: What is respectability politics and how does it influence Hip Hop and the Black community? I conducted research on respectability politics and how it influences Hip Hop and the Black community. I obtained my information from authors such as Tricia Rose, Johnnetta B. Cole, Tupac Shakur, Ava Duveray, Amanda Moras, Guillermo Rebollo-Gil, and Bakari Kitwana. My information came from an article, a journal, a documentary, a panel discussion at Brown University, a prominent Hip Hop Artist, and a book. Furthermore, I discuss the meaning of respectability politics and how it is prevalent in Hip Hop and relevant to the Black community. The results of my research are not very shocking, as it reflects the current trends in media and society.

24. **"The Study of Hydroponics: Examination of the Hidden Half"**
Brianna Williams, Senior. Education; ***bgwilli1@aggies.ncat.edu***
Hayley Respress, Senior. Bioengineering; ***harespress@aggies.ncat.edu***
Dr. Tyrette Carter
The study of hydroponic systems has been utilized as one of the standard methods for plant biology research and commercial crop production for many years. It offers an alternative agriculture technique in which plants and/or crops grow in a water-based nutrient system, rather than soil. In this research, we present a hydroponic step towards sustainability that can easily be implemented in laboratories and especially in K-12

classrooms to assist students and teachers. This approach aimed at providing a method for teachers to use within their classroom in hopes of engaging students in learning and doing so in a cheaper and more convenient way.

25. **"Exercise Alters Gut Microbiota Composition and Function in Lean and Obese Humans"**
Quinton McCarter, Senior, Sports Science and Fitness Management; ***qmmccart@aggies.ncat.edu***
Dr. Marc Cook
Purpose: Exercise is associated with altered gut microbial composition, but studies have not investigated whether the gut microbiota and associated metabolites are modulated by exercise training in humans. We explored the impact of 6 wk of endurance exercise on the composition, functional capacity, and metabolic output of the gut microbiota in lean and obese adults with multiple-day dietary controls before outcome variable collection. Methods: Thirty-two lean (n = 18 [9 female]) and obese (n = 14 [11 female]), previously sedentary subjects participated in 6 wk of supervised, endurance-based exercise training (3 d/wk) that progressed from 30 to 60 minIdj1 and from moderate (60% of HR reserve) to vigorous intensity (75% HR reserve). Subsequently, participants returned to a sedentary lifestyle activity for a 6-wk washout period. Fecal samples were collected before and after 6 wk of exercise, as well as after the sedentary washout period, with 3-d dietary controls in place before each collection. Results: A-diversity analysis revealed that exercise-induced alterations of the gut microbiota were dependent on obesity status. Exercise increased fecal concentrations of short-chain fatty acids in lean, but not obese, participants. Exercise-induced shifts in metabolic output of the microbiota paralleled changes in bacterial genes and taxa capable of short-chain fatty acid production. Lastly, exercise-induced changes in the microbiota were largely reversed once exercise training ceased. Conclusion: These findings suggest that exercise training induces compositional and functional changes in the human gut microbiota that are dependent on obesity status, independent of diet and contingent on the sustainment of exercise.

26. **"Endothelial Dysfunction and Hypertension in African Americans: Overview of the Role of the Gut Microbiome"**
Corvonn Peebles, Senior, Sports Science Fitness Management; ***ckpeeble@aggies.ncat.edu***
Dr. Marc Cook
Hypertension is one of the most common cardiovascular disorders and is a critical public health/economic concern. African Americans have the greatest burden of hypertension and elucidating the causes of this racial disparity is important for amending and developing effective treatment strategies. Although studies have provided mechanistic insight concerning characteristics of endothelial dysfunction, which likely precedes hypertension in African Americans, our knowledge is limited concerning internal systems (i.e., gut) that may affect endothelial and vascular health outcomes. Recent studies report that the types, and balance, of microbes in the gut are significant contributors to health and disease. Gut microbial dysbiosis, an unhealthy and poorly diverse gut microbial profile, has been linked to hypertension and other diseases that may disproportionately affect cardiovascular health. Relative to hypertension, dysbiosis has been characterized as a reduced richness of short chain fatty acid (SCFA) producing microbes. SCFAs are significant metabolites produced by gut microbes beneficially impact cellular functions, specifically vascular smooth muscle and endothelial cells. Studies concerning the gut microbiome and cardiovascular disease are limited in humans and grossly underrepresent minority populations. This brief review will overview factors concerning the racial disparity in hypertension and provide insight into the potential role that gut dysbiosis may have in hypertension, highlighting the "gut-vascular axis" concerning cardiovascular health

27. **"Cross-sectional Analyses on the Relationship between Blood Pressure, Cardiovascular Fitness, and Body Composition in College Athletes"**
Tyneesha Moore, Senior, Sport Science & Fitness Management; ***tpmoore2@aggies.ncat.edu***
Dr. Marc Cook
Chronic exercise has been shown to reduce blood pressure (BP). However, athletes have an increased cardiovascular disease (CVD) risk because they train at elite levels that put an increased demand on the heart, which promotes higher BP and increased risk for cardiovascular changes such as left ventricular hypertrophy (LVH). Further, African Americans (AA) have a greater risk for developing high BP (hypertension) because of their racial/ethnic background. Hypertension is one of the major risk factors for CVD, is the most common CVD risk factor in athletes, and superimposes the risk of CV issues in AA athletes. This study was performed to investigate the relationship between BP, cardiorespiratory fitness, and body composition in male and female AA collegiate athletes with and without hypertension. In effort to identify physiologic variables related to high BP, we measured resting BP, cardio-metabolic fitness (maximal oxygen consumption: VO2 max), and body composition variables (body mass index, fat mass, fat-free mass, skeletal muscle mass, total body and extracellular water). Analyses of these factors related to athletic performance will aid in understanding the relationship between fitness, body composition, and hypertension risk in competitive athletes.

28. **"The Effects of Chronic High Fat Diet Exposure on Anxiety-Like Behavior in Male and Female C57BL/6J Mice"**
Brooke Jones, Junior, Biology; *bnjones5@aggies.ncat.edu*
Dr. Antoniette Maldonado-Devincci
Poor-diet knowingly has a great association with mood and anxiety disorders. To-date we have discovered an association with high-fat diet and anxiety-like behavior. In our lab we created an experience in which C57BL/6J mice are placed on a high-fat diet (45% fat) to determine its effect on anxiety-like and depressive behavior. For the first week, nothing is done to the mice then anxiety-like tests are run after the one week period. Rodents naturally have exploratory behavior in new environments, as well as an aversion to brightly illuminated areas. An experiment known as the light-dark test assess anxiety-like behavior. Animals showing high levels of anxiety will spend less time in the light chamber. There are two computer analyzed box chambers that are halfway sectioned into a dark box side and a light side in which an overhead lamp light shines. Mice are first placed into the dark box side with a blockade preventing light-side entrance. The mouse is first allowed to acclimate to the new space then the blockade is removed and the analysis begins. The mouse is allowed to travel into the light side and back into the dark side as it pleases. The results from the Light-Dark experiment relayed a significant difference in the distance traveled on the light side; control mice had a significantly greater distance traveled, averaging about 600 cm, compared to the high-fat diet mice, averaging about 150 cm traveled in the light. This data shows that high-fat diet mice averted traveling in the light.

29. **"Self-cleaning properties of ZnO/TiO2 thin film on glass slide substrate"**
Daria Thomas, Senior, Chemistry; *dthomas@aggies.ncat.edu*
Dr.Bishnu P Bastakoti
It is known that the ability of a surface to self-clean usually relies upon the hydrophobicity or hydrophilicity of the surface. Therefore, for a surface to achieve the self-cleaning ability, the surface microstructures must be regulated to promote free, spontaneous movement of any liquid droplets on the surface, allowing it to extract any contaminants from its surface. Here, a simple method for preparing an artificial self-cleaning surface is presented as the involved protocol involves spin-coating of glass slides with even layers of synthesized porous ZnO/TiO2 metal oxides. Pure porous ZnO and TiO2 were also prepared for comparison. Electron microscopy and contact angle measurements were used to characterize the porous film. The synergic contributions of ZnO and TiO2 phases are very effective for upgrading the photocatalytic performance. It is expected that the characterization of each slide in regards to each different porous material, will help to determine the ability of the surface to clean i.e. wettability.

30. **"A Descriptive Analysis of Food Insecurity in the U.S."**
Aliyah McCray, Junior, Supply Chain Management; *akmccray@aggies.ncat.edu*
Dr. Fafanyo Asiseh
Food insecurity continues to be a major global problem. More than 50 million Americans are considered food insecure. While food insecurity affects everyone, those most impacted by food insecurity are African Americans and Hispanics. Additionally, single headed households with children are food insecure. There are several negative effects that are associated with food insecurity. These include premature births among expecting mothers, low birth weights, and depression. Among adults, food insecurity is associated with anxiety, obesity, cognitive problems, and many other issues as well. This study used FoodAPS data to analyze the association between food insecurity and race. We also use an ordinary least square method to analyze the factors associated with food insecurity among different age groups of people. Finally, we estimate how government programs such as SNAP affects food insecurity in the U.S. Our results indicate that food insecurity was more prevalent among female-headed households than male headed households. Additionally, we found that food insecurity is highly prevalent among older adults and this was higher among blacks compared with Hispanics. Education decreased the likelihood for a person to be food insecure.

31. **"Food Consumption in Relationship with Family Type"**
Renata Gabriela Ruiz Rabadan, Senior, Economics; *rgruizrabadan@aggies.ncat.edu*
Dr. Lyubov Kurkalova
For this research our main objectives were to analyze the time patterns in food consumption in North Carolina by family type. The data used comes from the Bureau of Labor Statistics (BLS) quarterly Consumer Expenditure Surveys for 3 years (2015, 2016, 2017). Married couples with one child under age of six, the group of the largest sample size, is the only family type that showed a preference for fresh fruit and vegetables over the processed ones. We do not find a notable seasonality in food at home consumption. We also find that single consumers

have the highest food at home consumption, when compared to other family types. Regression analysis showed that the households with a female head spent significantly less on for food away from home, when compared to the households with a male decision-maker. We also find that the highest income class consumers spend significantly more on food away from home, when compared to the other income classes. We do find some effect of race on consumption, but this effect requires further studies.

32. **"Improving Machine Recognition of Collaborative Dialog Acts via Sentence Embeddings"**
Justice Parham, Senior, Computer Science, ***jjparham@aggies.ncat.edu***
Dr. Jung Hee Kim
This project attempts to train a computer to recognize linguistic dialogue acts within transcripts of students working together. In COMPS (Computer-Mediated Problems Solving) exercises students work together via typed-chat, solving problems in small groups in a computer science class. Student dialogue turns are classified according to four categories of collaborative utterance: sharing ideas, negotiating ideas, regulating problem-solving, and maintaining communication. Previous work constructed machine classifiers to recognize these four acts. It achieved F1 accuracy (a combination of precision and recall) ranging from 0.6 for recognizing sharing-ideas, to 0.3 for maintaining-conversation. This project attempts to improve the accuracy. The first approach is to preprocess the text with doc2vec, replacing topic modeling. Topic modeling treats sentences as unordered bags of words. In the new approach, two different sentences containing the same words will appear differently to the classifier, making it more likely that the software will be able to recognize the different conversational intentions of the speakers. Another approach will train the classifier utilizing the dialogue context of several previous turns. Patterns of collaborative dialogue acts are expected to reveal the conversational fingerprints on how students collaborate. This research advances toward promoting better student collaborative problem-solving exercises, more fully using student group cognition and collaboration skills, and potentially developing computer-monitoring of the student conversation groups.

33. **"Characterizing, Comparing, and Contrasting Patients' and Providers' Approaches to Endometriosis Management"**
Bria Massey, Senior, Computer Science; ***bpmassey@aggies.ncat.edu***
Dr. Noemie Elhadad
Patient-generated data (PGD) are emerging as the cornerstone of chronic disease management. Self-tracking tools have shown promise in supporting patients with their self-management needs, as many occur outside of doctor visits and throughout patients' daily lives. There is limited work, however, on the use of self-monitoring and self-tracking data as a means for building trust, ensuring shared decision making between patients and providers, and ultimately improving patient-centered care. Furthermore, there is limited knowledge for complex chronic diseases without clear treatment guidelines. Endometriosis is an enigmatic condition with an often-debilitating impact on patients: there are no bio-markers for providers to monitor patients' status, treatment response varies across individuals and patients are dissatisfied with the lack of success in their care. The rise of FHIR technologies provides new opportunities to inform the design of self-tracking artifacts for the goal of shared-decision making. We explore endometriosis specialists' and patients' perceived opportunities and challenges for using these tools. In particular, we (1) identify convergent and divergent needs across medical specialties for successful encounters; (2) assess from the providers' and patients' perspective, the ways in which they negotiate and align goals and expectations with each other, especially when both patients and providers have relevant knowledge; and (3) build engaging and actionable support tools that characterize, compare, and contrast the assessment, self-management, and decision-making practices of patients and providers at the point of care. Our work confirms that self-tracked data can act as powerful evidence to re-align knowledge and expectations between patients and providers.

34. **Healthy saturated fat substitute for ice cream**
Zandra Mikell, Senior, Food Science; ***zdmikell@aggies.ncat.edu***
Dr. Roberta Silva Oleogel
The new requirements imposed by the US Food and Drug Administration (FDA) to ban trans fatty acids and the increasing pressure to reduce saturated fats in food (FDA, 2018) pose a huge challenge to develop lipid bases that have compatible technological characteristics and similar sensory properties with the fats to be replaced and also it should be nutritionally adequate. In the formulations of ice cream, the application of oleogel is used to replace the lipid fraction, originally used the fat from the milk. The use of oleogels in these products will allow manufacturers to use polyunsaturated oils in the formulations, since currently used solid fats, such as milk fat or coconut oil, are monounsaturated and saturated, respectively (Pellegrini et al., 2012).

This will allow the incorporation of oils considered to be healthier, which may lead to health benefits. Waxes are the most efficient oleogelators because of their ability to start crystallization at lower concentrations, easy to find, and they are natural. In natural waxes, the chemical composition, polarity, chain length, and melting point of the dominant components determine the crystal morphology (Doan, 2018).

35. **"Holistic Cognitive Reserve Index (HCRI): A Comprehensive Method of Measuring Cognitive Reserve for Healthy African-American Adults"**
Jasmine Flowers, Senior, Chemistry; *jrflowe3@aggies.ncat.edu*
Dr. Grace Byfield (Research conducted through COAACH/Biology Department)
The concept of Cognitive Reserve (CR) is a relatively novel concept in the realm of cognition and memory. This theory pertains to the idea that the brain can actively compensate for various challenges pertaining to memory or cognition. Creating an approach to methodically measure the level of CR an individual possess is critical, because this could act as an indicator to predict an individual's chance of developing a form of Alzheimer's Disease, or a related dementia. The aim of this investigation was to systematically evaluate past and current Cognitive Reserve indices, and create an innovative, multivariable, and culturally appropriate adaptation that will then be applied to African American adults across North Carolina. While previous indices included variations of variables such as education, occupational attainment, and leisure activities, the proposed Holistic Cognitive Reserve Index (HCRI) takes this concept a step further, to include perceived social support, intellectual and leisure activities, along with the standard sociodemographic factors; age, gender, level of education, and occupational attainment. The results of the HCRI will be compared to the data of the Cumulative Stressors and Resiliency Index (CSRI), which is a tool that determines the extent of influence of environmental exposures, environmental hazards, pathogenic factors, and salutogenic factors based on where the prospective individual resides. Once the proposed index has been disseminated, and the data analyzed, the results will provide important insight into what factors could possibly influence CR, leading to alternate methods for measuring the CR of African American Adults, and other populations.

36. **"Early Intervention Services for children who are deaf and hard of hearing"**
Qubanae' Hudson, Senior, Speech Language Pathology; *Qchudson@aggies.ncat.edu*
Dr. Deana McQuitty
This study is a systematic review of investigations that seek and that examine Speech and Language early intervention of 112 children ranging in ages 1-5 years of age. It is also a review of existing data related to impacts and services for deaf and hard of hearing children. A total of 240 citations were identified in the hypothesis of the impacts of early communication skills for children who are deaf and hard of hearing. The 240 citations consist of theories about children who are deaf or hard of hearing. Participants were observed while being enrolled by 11 months of age were noted to demonstrate significantly better vocabulary and verbal reasoning skills at 5 years of age. Based on a perusal of literature, overall findings show only two out of the factors being tested explained the significance of the variance in language scores obtained at 5 years of age. Findings also revealed that that there are interactions between factors of family involvement and age of enrollment that influenced outcomes. Early enrollment has been beneficial to children across all levels of family involvement. Research shows that the most successful children in the study were the children with high levels of family involvement. Implications and future research will be discussed. Study limitations will also be presented.

37. **"Social Determinants and Its Effect on the Development of Diabetes"**
Tylar Lewis, Junior, Biology; *ttlewis@aggies.ncat.edu*
Dr. Kelsie Bernot
Social determinants of health are social and economic conditions that impact individual health status. The socioeconomic status of a person is the determinant factor in which this individual is able to afford food, housing, transportation, health care, etc. Those who have a lower status are more likely to have a lower life expectancy, lower self-reported health as well as more chronic illness. The lack of transportation in relation to diabetes was studied. To conduct this study, low income areas in Greensboro, North Carolina were targeted. During community events such as mobile market or community picnics, surveys were given out to the residents in these specific low-income areas (n=68). Within the targeted communities there were 22 (32.3%) households with diabetes and 12 (26.1%) residents that experienced lack of transportation. Chi-squared analysis suggests that lack of transportation and diabetes are independent, being that the asymptotic significance exceeded the p-value 0.05. Although there was no relationship discovered, individually, these two issues are still potential intervention points in our community. In fact, one outcome of our research is

that the apartment complex owner has requested replacement of a bench at a bus stop that had previously been removed, thus making it easier for individuals who have difficulty standing for long periods to obtain transportation. Looking at other social determinants such as food or housing security and their impact on diabetes could be our future direction.

38. **"Binge alcohol exposure increases depressive-like behavior in adulthood, but not during adolescence, in female C57BL/6J mice"**
Victoria Robinson, Junior, Psychology; ***vrobinson@aggies.ncat.edu***
Dr. Antoinette Maldonado-Devincci
Adolescence is a developmental stage in which important maturational changes occur in the brain and in behavior. With adolescent binge drinking still rising, various studies have examined its long-term effects. The present set of experiments aimed to determine the (Exp. 1) intermediate and (Exp. 2) long-term changes in depressive-like behavior following adolescent binge alcohol exposure in male and female mice. Male and female mice were exposed to binge alcohol during adolescence using a vapor inhalation model, in which mice were exposed to four intermittent cycles of alcohol; or air as a control; from postnatal day (PND 28-42). Mice were given at least one week between ethanol or air exposure and depressive-like behavior was assessed using the tail suspension test on PND 51, 65, and 79 in Exp 1 and on PND 70 in Exp 2. Data were quantified as latency to immobility and total time immobile over six minutes. On PND 51, the ethanol-exposed females showed higher latency to immobility compared to air-exposed female mice. In the following trials PND 65 and 79) air-exposed females showed a higher latency to immobility. Males did not show changes in latency to immobility at any test. There were no differences between any groups in total time immobile Exp. 1. In Experiment 2, females exposed to ethanol showed greater total time immobile on PND 70 compared to air-exposed females and ethanol-exposed males. Together, these data show that binge alcohol exposure during adolescence induces a depressive-like phenotype later in adulthood, but not during adolescence.

39. **"Evaluating the antibody response elicited by Nano-11-based swine influenza intranasal vaccine for pigs"**
Maria Ford, Senior, Biology; ***mlford@aggies.ncat.edu***
Dr. Misty Thomas
Swine Influenza is a viral respiratory infection of pigs caused by the swine influenza A virus (SwIV). It has been observed that more than 70% of pigs in the United States are infected by SwIV annually. Currently, commercial SwIV vaccines are administered by intramuscular injection, which promotes only IgG production instead of necessary mucosal IgA to reduce the nasal virus shedding and transmission to other susceptible animals. Objective: The aim of this study was to determine the antibody responses in bronchoalveolar lavage (BAL) fluid of pigs vaccinated intranasally with corn-based Nano-11 particle inactivated SwIV vaccine. It was hypothesized that the Nano-11 based vaccine will elicit the highest antibody response due to its favorable adjuvant properties and positive charge. This vaccine formulation contains the killed whole H1N2 SwIV antigen (KAg) and the nanoparticle, which serves as the carrier. Methods: To measure antibodies secreted into BAL fluid elicited by the Nano-11 based SwIV vaccine, indirect enzyme-linked immunosorbent assay (ELISA) and virus neutralization test (VNT) were performed. The experimental vaccine groups were mock, polyinosinic:polycytidylic acid [poly (I:C)] + challenge, and KAg Nano-11 with poly (I:C) + challenge. Results: Our results showed that KAg Nano-11 with poly (I:C) + challenge elicited higher levels of IgG and mucosal IgA antibody titers in BAL fluid samples and also had the higher virus neutralization titers compared to the mock virus challenged group. Conclusion/Future Directions: Inactivated SwIV delivered in corn-particles with an adjuvant poly (I:C) elicits superior humoral immunity. Further studies will be performed to associate these findings with the viral load analysis. This will give important insights that will directly benefit the food industry.

40. **"Connecting the Dots: NC A&T to Senegal"**
Victoria Williams, Senior, Mass Communication with a minor in Dance; ***vwillia1@aggies.ncat.edu***
Dr. Cheryl Stevens
As dance minor students in the Visual and Performing Arts Department, we traveled to Senegal, West Africa to conduct ethnographic field work. The purpose of traveling to Senegal was to study a variety of traditional and contemporary African dance forms. One objective was to analyze how aspects of the new dance forms learned related to the diasporan and traditional dances and techniques we studied before going to Senegal, in order to make research, personal, and cultural connections. Senegal has a history of attracting scholars and artist. In 1966, Senegal demonstrated its support of international artist and scholars when it hosted the First

World Festival of Negro Arts, driven by the directive of then president Leopold Senghor. Our group studied the traditional dance Sabar, one of the popular dances and drum rhythms of Senegal and Ivorian dance from the country of Cote D'Ivoire. Additionally, we studied the contemporary dance form Afrobeat and Germaine Acogny's Modern-African Dance Technique. Our group learned how the aforementioned dance forms evolved, how they are manifested in the culture today, and the possibilities of their future development. Our field notes were gathered through daily dance classes, photos, video recordings, interviews, journaling, and by adopting traditional living practices. Our findings equipped us with new knowledge related to holistic teaching and research methodologies that can be applied to various areas in the field of dance such as education, performance, choreography, research, and therapy. Traveling to Africa for the first time was a spiritually fulfilling and educational experience.

41. **"Binge Alcohol exposure during adolescence alters behavior in open field test in adulthood in male and female C57BL/6J mice"**
Myracle Jones, Junior, Psychology; ***mcjones3@aggies.ncat.edu***
Dr. Antoinette Maldonado-Devincci
Alcohol is known to effect the brain and cause behavioral changes including anxiety, depression, withdrawal, and tolerance. When studying the effects of binge alcohol exposure during adolescence on long-term changes on similar behaviors in adulthood, we used an animal model to examine this relationship. In the present work, we exposed adolescent male and female C57BL/6J mice to vapor intermittent ethanol exposure from postnatal day (PND) 28-42. Mice underwent abstinence until early adulthood (PND 43-69) and were subsequently accessed for behavior in the open field test, followed by tests for determining anxiety-like and depressive-like behavior. We expected ethanol to impact both the males and females in a similar manner. In the open field test we quantified distance traveled and rearing in the in entire area as a measure of general exploratory behavior and measures of distance and time spent in the center zone as a measure of anxiety-like behavior. In the open field, males exposed to ethanol defecated more than females exposed to ethanol and male and females exposed to air, indicative of anxiety. Both male and female mice exposed to ethanol moved less than those exposed to air. In contrast, alcohol had no effect on rearing, but females reared more than males. In the center zone, ethanol exposure did not alter center entries, center time, or distance traveled. Together, these data indicates that binge alcohol exposure during adolescence caused long-lasting changes differently in males compared to females, with males showing an anxiety-like phenotype in adulthood following alcohol exposure during adolescence.

42. **"Cognitive Performance in Low-Income African American Older Adults"**
Dextiny McCain, Senior, Psychology; ***dtmccain@aggies.ncat.edu***
Dr. Adrienne Aiken-Morgan
Associations between physical activity and previous research suggests physical activity (PA), especially aerobic PA, is related to better cognition; however, few studies have focused on lower income African American (AA) seniors, who may have barriers to PA engagement. The purpose of this study was to examine associations between cognitive performance and PA in a pilot sample of sedentary, AA adults living in senior housing communities in Durham, NC and Annapolis, MD (N = 50; mean age = 64.5 (SD= 10.42); 72% women). We hypothesized that aerobic PA would show a stronger relationship to cognitive performance. Participants were administered 8 tests assessing global cognitive status, attention/working memory, verbal memory, verbal fluency, and processing speed. The Community Healthy Activities Model Program for Seniors (CHAMPS), a self-report questionnaire measuring weekly frequency and duration of different PAs, was also given. Bivariate correlations showed significant associations between various types of PA and cognitive measures ($p < .05$). Next, linear regressions demonstrated PA significantly predicted cognitive performance: strength training was positively associated with global cognitive status and attention/working memory, while participating in yoga or tai chi was positively related to attention/working memory and verbal memory ($p < .05$). Lastly, stretching was positively associated with verbal memory ($p < .05$). These findings reject our hypothesis regarding aerobic PA. Only non-aerobic PA was related to cognition for this pilot sample. We conclude from this study that AAs seniors should participate in PA, regardless of type. Future research should investigate these relationships in larger samples and explore exercise interventions in underserved, senior AA communities.

43. **"Pushing Through Oppression: Struggle to Lead a Healthy Life as a Black Woman at an HBCU**
Jasmine Gibbs, Junior, Sociology; *jsgibbs@aggies.ncat.edu*
Dr. Jeannette Wade
Research states, those who embody the Strong Black Woman stereotype (SBW) are independent, strong, and self-reliant (West et al. 2016). The SBW script is passed through generations of Black women. (West et al. 2016). A drawback of the SBW stereotype is the mental and physical health implications (West et al. 2016). Research shows that the highest rates of overweight and obesity occur in Black women (Ogden et al 2014). Our question: Is this high rate of obesity the product of the SBW script? The focus of our study was African American Historically Black College women from ages 18-25. To conduct this research, a focus group was held. Participants were asked their opinion on the SBW stereotype and about their physical health. In particular, when asked three things that deter them from leading healthier lives, a participant claimed that "...beauty, mental health, and pushing through oppression..." hindered her the most. This participants reasoning was as follows "I know in society they don't expect a lot from Black women. Trying to prove them wrong is a goal. Sometimes that goal cannot be met, or sometimes you mess up, and then you end up being the stereotypical black woman instead of the black woman that you want to be, or you saw yourself being." After assisting in the research study process, I would like to be a part of further research into the emergence of the SBW stereotype and how it became an expectation of women in the black community.

44. **"The analysis and interpretation of agricultural wastewater treatment data"**
Jasmine Gibson, Junior, Biological Engineering; *jgibson@aggies.ncat.edu*
Dr. Godfrey Gayle
In North Carolina alone, there are 2,100 hog farms containing 9.7 million pigs that produce about 10 billion pounds of waste a year. This waste is often transported, stored, and treated in lagoons near the hog houses. This large amount of waste in the lagoon produces an intense odor primarily caused by a chemical called Para Cresol (P-cresol). In this experiment, we will use a constant amount of commercial granular activated carbon to adsorb various amounts of P-cresol in varying temperatures. The activated carbon, with its porous large surface area and favorable chemistry, will adsorb the P-cresol via chemisorption and intra-particle diffusion. With the results from the lab experiments, I used Rstudio, QGIS, and data driven analysis to identify the optimal temperature, pH and amount of Para-Cresol that pairs best with the constant amount of activated carbon used. My findings showed that from six different concentrations of P-cresol (100, 150, 200, 250, 500, and 1000ppm) 1g of activated carbon will deplete P-cresol at a concertation of 500ppm at a faster rate than the other concentrations. I also concluded that from 15, 25, and 35˚C, the optimal temperature for effective carbon is 35˚C. While these optimal characteristics were found under controlled limits, data driven predictions that best fit the needs of consumers are underway.

45. **Design and Computational Modeling of a Chemically-Inducible Variant of the Protein Kinase, Akt1**
Correggio Peagler, Sophomore, Biology; *clpeagler@aggies.ncat.edu*
Dr. Robert H. Newman
Protein phosphorylation, mediated by protein kinases, is one of the most widespread regulatory mechanisms in eukaryotes. Inside the cell, protein kinases, phosphatases, and their respective substrates are organized into integrated phosphorylation networks that govern nearly all aspects of cellular physiology. Likewise, dysregulation of these pathways leads to a variety of pervasive diseases, including cancer and diabetes. Unfortunately, due to the complexity of cellular phosphorylation networks, it has been difficult to dissect the functional roles of individual kinases within a given cellular network. Here, we describe the design, computational modeling and initial construction of a chemically-inducible variant of the canonical serine/threonine protein kinase, AKT1. Successful construction of this new molecular tool will lead to a better understanding of the effect that AKT1 has on the cellular signaling system as a whole.

46. **Hypertension and Food Insecurity in Cottage Gardens Community**
Sheliah Harris, Senior, Biology; *syharris@aggies.ncat.edu*
Dr. Kelsie Bernot
There are often no obvious symptoms before hypertension does significant damage to one's arteries, eyes, kidneys, and heart, making it a dangerous chronic condition. Hypertension is defined as systolic blood pressure 140 mmHg, and/or diastolic blood pressure greater than 90 mmHg. This condition is highly prevalent in the United States, and it continues to increase over time; contributing factors may include lack of healthcare, stress and food insecurity. Food insecurity is the inaccessibility of nutritionally adequate foods owing to financial or other resource limitations. The relationship between hypertension and food insecurity in

the Cottage Gardens community was investigated through a needs assessment survey given at community events in spring 2019. Of the 36 respondents 59.5 % indicated that someone in their household was living with hypertension, and 51.4% indicated that in the past year they had run out of food before they got money to purchase more. Chi-square analysis demonstrated that there was no significant relationship between the two findings; however the high prevalence of both issues, hypertension and food insecurity in this community is a concern. To get ideas on how to address food insecurity in this community respondents were also asked in the survey close ended questions on what foods they want access to. Community members expressed interest in eating and having access to more healthy and nutritional foods. Eating healthy foods like fresh vegetables and fruit instead of processed high sodium content foods can lower one's risk for developing hypertension. Thus, this research demonstrates a potential intervention point. If we could provide better access to fruits and vegetables, perhaps we could reduce food insecurity in this community.

47. "Assessment of Cardiovascular Fitness [VO2max] Among Kinesioloy Students by Treadmill Maximal Aerobic Capacity Testing"
Courtney Baskerville, Junior, Pre-Physical Therapy; *cjbaskerville@aggies.ncat.edu*
Dr. Troy Purdom
Aerobic capacity (AC) is the gold standard for fitness and health assessment. Monitoring aerobic capacity is warranted to stratify health. VO2max is the preferred method to assess aerobic capacity. Purpose: assess aerobic capacity and demographics of Kinesiology students. Methods: Fourteen Kinesiology students (mean ± SD: Age: 20.9 ± 1.8yrs; height: 168.6 ± 9.0cm; weight: 73.8 ± 22kg; FFM: 54.7 ± 15.0kg; 26.0 ± 8.3%; VO2max: 46.9 ± 13.5ml/kg/min) participated in a standardized VO2max protocol to assess AC. All subjects completed a cardiovascular risk evaluation sheet prior to measuring height and weight via electronic scale and standiometer. The subject's body composition was then measured using multi-frequency bioelectrical impedance. Subjects completed a standardized dynamic warm-up and a five minute self-selected treadmill warm-up prior to starting the VO2max test. Each maximal test protocol was customized to begin with a built-in warm-up and end with volitional fatigue within 8-12minutes. Rate of perceived exertion, heart rate, and VO2 were recorded at minute intervals. Data are presented as mean ± SD. Results: Sex based VO2max values of male and female subjects was 51.8 ± 13.1 mL· kg-1min-1 and 42.8 ± 11.3 mL· kg-1min-1 respectively. When converted to METs, men's and women's peak MET value was 14.8 and 12.2 respectively Conclusion: Results of the VO2max and METs values produced indicate that both male and female Kinesiology students AC was higher than the minimum standard recommendation of 7.9 METs. The lower AC limit (7.9 METs) suggests increased mortality and cardiovascular disease risk, when compared with Kinesiology students.

48. "Chronic high fat diet exposure alters balance and motor coordination in C57BL/6J mice"
Destiny Belton,Senior, Psychology; *dmbelton@aggies.ncat.edu*
Dr. Antoinette Maldonado-Devincci
Behavioral impairments of sensorimotor integration are directly associated with diet exposure. Currently little is known regarding chronic high fat diet exposure on aspects of sensorimotor integration in youth. This study aimed to identify critical stages in which sensorimotor integration are impaired based on diet exposure beginning during juvenile development. One-month old C57BL/6J male and female mice were given either high fat (45% calories from lard) or control diet (10% calories from lard). Balance/motor coordination serving as markers for sensorimotor integration were measured using the beam traversal test. Each mouse is challenged to cross a beam that breaks at its midpoint and becomes narrower. Mice are trained over three trials to traverse the beam, separated by at least 10 minutes for each training trial. Mice are tested on the final trial for total time to traverse and number of slips for the wide and narrow portions of the beam. The test trial was video recorded and scored offline. Mice were tested after both 4 and 5 months of diet exposure. The data suggest that balance/motor coordination was diminished in the animals exposed to the high fat diet compared to controls. Mice exposed to high fat diet slipped more on the narrow side at both time points. Mice, independant on sex, exposed to the high fat diet took a significantly longer amount of time (in seconds) to cross the entirety of the beam. Together, these data indicate that high fat diet exposure induces balance/motor dysfunction.

49. "Mapping Food Insecurity vs. Agency Supply"
Adonis Rucker, Junior, Civil Engineering; *acrucker@aggies.ncat.edu*
Dr. Lauren Davis
As poverty and unemployment rates increase, the number of food insecure households in North Carolina has

the potential to increase. In order to counteract the effects of food insecurity within the state, the Food Bank of Central & Eastern North Carolina operates as a distributor of donated food. The biggest challenge with this donation driven environment is uncertainties associated with the supply and demand of the 800 plus food bank partners. Qualified partner agencies include food pantries, shelters, soup kitchens, group homes, and even food drives. Factors such as unemployment rate, and income can influence the number of households in need within the locality of agencies. This research provides a decision support tool that can assist the food bank in determining where and when to recruit new agencies to meet the needs of the food insecure population. Our decision support tool incorporates spatial and temporal factors that characterize food supply, access, and need. We develop a predictive score that identifies areas of unmet need throughout the service area. We then develop a visualization of the score and show how it changes over time as a function of increasing population demand and food supply. Our resulting model can be useful to decision makers in the recruitment of new food agencies, which can improve the effectiveness and efficiency of the distribution of food within the entire service region.

50. "Impact of high fat diet on sensorimotor integration in C57/BL6 mice"
Adenike Irby-Shabazz, Senior, Biology; *airbysha@aggies.ncat.edu*
Dr. Jessica Han
The exposure to a high fat diet in youth and its impact on brain development and sensorimotor skills are currently unknown. The purpose of this study is to determine the critical stages of when sensorimotor integration begin to decrease. One-month old male and female C57BL/6 J mice were given either a control diet (10% calorie from fat) or a high fat diet (45% calorie from fat). The dietary consumption and body weight were monitored weekly and blood glucose level was measured monthly. After two months, we observed that the high fat male mice had a significant decrease in diet consumption compared to control ($p<0.05$). Males gained more weight than females when given the high fat diet ($p<0.05$). We measure the sensorimotor integration with both stride length and adhesive removal behavioral tests. Using a two-ANOVA data analysis, the data shows that there was no significant effect of diet and time on sensorimotor behaviors at the end of two months with dietary treatment. The study is currently ongoing, with the expectation that difference in sensorimotor integration between the control and high fat diet mice will continue to grow.

51. Human Astrovirus (HAstV) Replication Systems
Sydney Townsend, Junior, Biology; *setownsend@aggies.ncat.edu*
Dr. Christiane Wobus
Human astroviruses (HAstV) are understudied positive-sense RNA viruses that cause viral gastroenteritis in immunocompromised people. HAstV are classified into three clades: VA/HMO, classical human AstV (HAstV) and MLB. In the Wobus laboratory, we recently established human intestinal enteroids (HIE) as an in vitro replication system for all the three astrovirus clades. Here, we used HIE to study the effects of triptolide (RNA polymerase inhibitor), ruxolitinib (JAK inhibitor) and 2'-C-methylcytidinine (2'CMC - nucleoside analogue) on HAstV replication. HIE monolayers were pretreated with these drugs overnight and infected with VA1 for 3 days. Virus titer was then determined by reverse transcription quantitative polymerase chain reaction (RT-qPCR). Furthermore, we started the establishment of the reverse genetics system for MLB1 and HAstV1 in our lab. This is a process of obtaining virus stock by transfecting permissive cells with RNA encoding the viral genome. To do this, plasmids encoding MLB1 and HAstV1 viral genome were amplified in bacteria, purified with QIAGEN kit and transcribed into RNA in vitro. The RNA was later used to transfect Caco-2 and HEK293T cells followed by a 48 hour incubation. Virus was harvested from cell lysates after 3 freeze-thaw cycles. Finally, to establish a small animal model for HAstV, we infected polymeric immunoglobulin receptor knockout mice with VA1 and HAstV5 per orally and intraperitoneally. Virus titer was determined at 24 and 48 hours post infection from homogenized mice tissues. Results are currently being analyzed. Our data will provide information on HAstV replication and enhance the study of AstV biology.

52. "The effect of perfluorooctanioc acid on bacteria associated with the human microflora"
Lauryn Chadwick, Junior, Biology-Premedical; *lachadwick@aggies.ncat.edu*
Dr. Pameeka Smith-Pearson
Perfluorooctanoic acid (PFOA) and is a man-made chemical used in household products (an example being non-stick cookware) and industrial products (an example being fire-fighting foams). PFOA has been detected to be in drinking water due to product runoff and contamination. High levels of PFOA consumption can lead to health problems such as low birth weight and some cancers such as kidney, liver, and testicular cancer. The hypothesis was if people consume PFOA contaminated water, then they are at a higher risk for

having health problems than residents with purer drinking water. The sub-problem that was investigated was whether high concentrations of PFOA would limit the rate of resident microflora bacteria growth. A controlled experiment was performed by measuring the growth of Escherichia coli with increasing concentrations of PFOA in the nutrient broth. E. coli was chosen because it is resident bacteria in the human microflora. The data showed that as PFOA concentration increased, E. coli growth decreased. These results infer that the ingestion of PFOA alters bacteria metabolism and population in the human microflora. When the bacteria in the human microflora is disturbed, it can cause several chronic diseases such as inflammatory bowel syndrome and autism. This could be a result of the ingestion of PFOA contaminated drinking water, but further research will need to be conducted to confirm this theory.

53. "Nutrition and Millennial's Poor Eating Habits"
Khiliel Bullock, Junior, Information Technology; *kbullock2@aggies.ncat.edu*
Dr. Grace Byfield
Nutrition and Millennial's poor eating habits are becoming more and more prevalent in college students as seen with the high consumptions of unhealthy foods resulting in an increase in chronic diseases. College students typically develop unhealthy food habits due to key factors that come into play, such as, a chance to get out, cost, taste, and convenience. Studies have shown that most weight gain occurs in college due to the lack of physical activity. This study proposed "The Healthy Eating Initiative" website as an intervention for students who may have unhealthy diets that put them at risk later in life. It is designed to prove to students that they can eat healthily on a reasonable budget whether they reside on or off campus. Weekly food logs from current students were used to compare daily consumption and eating habits of typical students (control) and of a student who is eating healthily on a budget. The data show that control students typically consumed more calories and made less healthy choices. We used this data to support our argument that while college students can afford to eat healthy they often do not. We expect that the website will provide food selection ideas and nutrition options for students to utilize in making informed decisions about their eating.

54. "A Double-Blind, Placebo-Controlled Crossover Study of Low Dose Creatine on Cognitive Function Before and After High Intensity Exercise"
Tyler Schuster, Junior, Pre-Physical Therapy; *ttschuster@aggies.ncat.edu*
Dr. Troy Purdom
Purpose: observe low-dose creatine supplementation and high-intensity exercise effect on cognitive function. Methods: Thirteen recreationally trained males (mean ± SD: 20.9±1.3yrs, 79.4±9.9kg, 175.2±6.6cm, 16.4±6.2%BF) completed Stroop Tests (ST) with one minute to correctly select color-word combinations. Demographic information was measured prior to control (CONT) where ST occurred PRE/POST a standardized HIIT training bout. Participants completed two 7dy identical blinded supplement protocols in randomized fashion separated by a 7dy washout period: 1st double-blind (1DB); washout; second (2DB). The DB supplement protocol included prepackaged 4g placebo (PLA) or creatine monohydrate (CRE) morning and night for 7dys. After each DB, participants repeated the exercise and ST separated by a 7dy washout. Separate ANOVAs analyzed cognition per condition: CONT, PLA, and CRE before exercise (PRE), post-exercise (POST), and PRE/POST exercise per condition. LSD post hoc tests evaluated pairwise comparisons when significance was observed ($p < 0.05$). Results: Cognition was affected PRE ($F_{1,2} = 16.0$, $p < 0.002$, $2 = 0.58$) and POST ($F_{1,2} = 17.0$, $p = 0.001$, $2 = 0.59$). PRE/POST comparisons revealed both PLA and CRE had an effect (PLA: $F_{1,2} = 100.6$, $p < 0.001$; $2 = 0.89$) (CRE: $F_{1,2} = 112.4$, $p < 0.001$; $2 = 0.90$). PLA and CRE both significantly increased cognition PRE/POST exercise (PLA: PRE 24.2±13.2, POST: 29.3±9.4; $p = 0.004$) (CRE: PRE 29.4±10.4, POST 34.2±11.6; $p = 0.002$). Conclusions: Increased ST POST exercise suggest both PLA and CRE increase cognition. Lack of CRE/PLA differences within timepoints (PRE: +16.0% and POST: +12.6%) are likely due to large within group variations.

55. "Needs Assessment Survey Analyzes Food Insecurity in Relation to Mental Health"
Ryan Bills, Senior, Biology (pre-med); *rjbills@aggies.ncat.edu*
Dr. Kelsie Bernot
According to the World Health Organization, one and four people will be impacted by a mental health disorder which is roughly 450 million people worldwide. The lack of food in homes has been proven to be one of the possible triggers on one's mental health. The World Summit of 1996 defined food security as "all people at all times having access to sufficient, safe, nutritious food to maintain a healthy and active life." Students from North Carolina A&T State University and Guilford College went into local low-income

communities/food insecure areas to assess health disparities and needs of the community via convenience sampling at community events. The survey consisted of multiple-questions to measure food insecurity and a checklist of mental health disorders to observe if anyone in the participants' households suffered from it. Out of 68 participants, 43% reported that someone in their household suffered from anxiety and/or depression. Food insecurity was also assessed, and 55% of participants stated that they had run out of money to purchase food in the past year. Interestingly, of the people who had mental health issues in their household, 50% also had food insecurity; whereas only 3.7% of households with mental health issues had no food insecurity issues. Using SPSS, chi-square test demonstrated that this was a statistically significant relationship ($p<0.001$). Now that there is an awareness of this issue, implementing ways families can get access to good nutritious foods can reduce food insecurity. We don't know if there is a causal relationship with mental health; however increasing access to mental health resources may also help.

56. "Social Networking Sites and Political Influence"
Marlon Petty, Senior, Sociology; *mlpetty@aggies.ncat.edu*
Dr. Tobin Walton
We are in the midst of a digital age. Social media use and virtual connection are growing as the global standard for social and political discourse. Considering the magnitude of this shift in dialectical venue, it is becoming increasingly important to consider the potentialities these proliferating interactions pose for a nation's social and political future. Studies in this area have identified the impact of Social Networking Sites (SNS) manipulation of big data sets on recent political campaigns and decision-making. Although it is known that user data is collected by SNS to improve the online experience, little is known regarding the depth of this garnered information and the use of its employment. This realization poses three major questions that will be addressed within this article: 1.What ways have SNS influenced political discourse? 2. How aware are users of these influences? 3. How can we mitigate the potential harm the use of big data poses to the shaping of our realities? These questions will be answered by drawing on the findings of prior research, random-sample survey distribution, and social media environment analysis. Study findings illuminate a growing need for legislation regarding the protection of digital civil liberties and greater transparency in the use of big data sets in the influence of the average user's daily life.

57. "Assessing the Correlation between Diabetes in relation to Diet and Convenience in Greensboro Food Desert"
Kammikia Barnes, Senior, Biology/Pre-Med; *kmbarnes1@aggies.ncat.edu*
Dr. Kelsie Bernot
Food deserts are defined as being low-income areas where at least 33 percent of the population lives more than one mile away from a grocery store. Greensboro has 17 food deserts, but this study covers the food desert on the east side of Greensboro by N.C. A&T State University. Food deserts have a higher incidence of chronic illnesses like diabetes which has been associated with low-income populations. This research was done to investigate how food preferences relate to diabetes prevalence. Data was collected using a survey and convenience sampling at community events within Cottage Gardens, yielding a sample size of 37 households for the research. Results from the surveys indicate the presence of diabetes in 32.4% of households. We also analyzed how participants make food choices. We found that 16.2% make food choices based on taste; whereas 24.3% chose whatever was easiest or most convenient. We did not find a relationship between food choice preferences and the prevalence of diabetes based on chi-square analysis. However, food found in food deserts are known to be high in sodium, sugar, and fat because of the type of food present in convenience stores. It is possible that increasing access to cheap fruits and vegetables could increase healthy eating habits in this community and potentially impact the incidence of chronic disease.

58. "The Effects of Faces and the Preference for Different Object Types on the Generation of the N170 Event-Related Brain Potential"
Kristoni Barnes, Senior, Psychology; *ktbarnes@aggies.ncat.edu*
Dr. George S. Robinson Jr.
Facial recognition is both essential and fundamental. In the brain the parietal-occipital stream controls object recognition. A person's preference may modify their response towards another person or object. Faces are identified faster than other objects. The N170 event-related brain potential is a measure of object recognition. The amplitude within the N170 is associated with recognizing objects. We propose the amplitude of the N170 will be greater for Black female faces than other objects and scalp locations will have

different amplitudes. Participants were students attending NCAT. Participants signed a consent form. Seven electrodes were applied to the scalp. Participants focused on one object at a time on the screen for one second per object. Participants were required to participate in three conditions involving 100 random objects (cars, dogs, flowers). Participants responded to, either a Black female face, or one of the other objects. A repeated samples t- test revealed a trend of faster reaction times towards faces versus objects, but it was not significant. Black female faces ranked significantly higher than other ethnicities. Participants responded faster to cars than dogs or flowers. The results confirm that faces are generally identified quicker relative to other objects. The data also suggest that preferences for within group faces is a mediator of facial recognition. The N170 amplitude for faces and objects showed no significant differences, except for dog faces versus Black female faces. Increase occurred in the N170 amplitude from parietal-occipital streams. Dogs and flowers showed significance in scalp differences in the N170 amplitude.

59. **"Preparation and Characterization of Polycaprolactone based Nanofiber Mesh for Biomedical Application"**
Alessia Stewart, Senior, Biomedical Engineering; ***acstewa2@aggies.ncat.edu***
Dr. Narayan Bhattarai
Nanofiber technology is an increasing interest in the biomedical field of tissue regeneration and drug delivery. Nanofibers have diverse applications due to their high surface area, enabling an increased amount of cells, proteins, and drugs to bind to these structures. Additionally, nanofibrous mesh allows researchers to mimic the physical structure and function of tissue extracellular matrix (ECM), and thus have the potential for tissue engineering applications. Electrospinning process creates the nanofibers in a wide range of lengths and diameters through the application of electrostatic force. Natural or synthetic polymers can be employed in the electrospinning process to make nanofiber mesh. Natural polymers are generally biocompatible, whereas synthetic polymers biocompatibility ranges based on chemical, physical, and structural properties. The polymer of interest for this study is polycaprolactone (PCL), a semi-crystalline polyester that is biocompatible and biodegradable. PCL based nanofiber meshes were fabricated by electrospinning its solutions in trifluoroethanol. To support the potential use of the nanofibrous meshes for biomedical applications their physicochemical properties such as morphology, mechanical strength, and integrity in an aqueous medium, will be studied.

60. **"Implementing WebIDs + Biometrics with Enrollment"**
Taylor Martin, Senior, Computer Science; ***tsmarti1@aggies.ncat.edu***
Dr. Albert Esterline
We are in the process of establishing a seamless way to accommodate WebIDs and biometrics into the cyber environment. This involves constructing a method of user verification that allows for simple, easy, and safe access. It is known that WebIDs are equipped to provide these such things when compared to the traditional username and password user authentication. However, with the use of WebIDs, important information can be stolen if an attacker is either to gain direct access to the user's computer or they somehow obtain the user's unique certificate. This possibility can be interrupted with the inclusion of biometrics to the authentication process since biometric data (eg, fingerprints, iris scan, etc.) is unique and not easily duplicated. We first created an enrollment protocol that verifies if a user has a WebID while attempting to access a server. If they do, we permit the use to have access to the server, and if they do not, we register the user by accessing their own server. Implementing these features in the WebID protocol would significantly improve the security of user authentication and reduce replay attacks in conducting biometric assessment.

61. **Examining Dietary Patterns to Reduce Cognitive Decline**
Lauryn Bethea, Sophomore, Biology; ***lmbethea@aggies.ncat.edu***
Dr. Grace Byfield
Many cases of Alzheimer's disease (AD) are caused by modifiable risk factors such as diabetes, hypertension, and obesity. Previous research studies indicate that the Mediterranean diet, DASH diet (Dietary Approach to Stop Hypertension), and MIND diet (Mediterranean-DASH Diet Intervention for Neurodegenerative Delay) help slow cognitive impairment. This study examined the Mediterranean, DASH, and MIND diet; to determine which diet is most effective in reducing cognitive decline. We performed a systematic review and identified 9 papers using the following terms: cognitive decline, dietary pattern, DASH diet, Mediterranean diet, MIND diet, and dietary pattern. In each literature review there were 800-900 participants that had to be dementia free before beginning the study. The Covariates used in the literature reviews were: 1) age, 2) the number of years of education, 3) the presence of Apolipoprotein E genotypes, 4) caloric intake, 5) physical activities, and 6) cognitive activities. The Mediterranean diet score ranged from 0-9, the MIND diet score ranged from 0-1, and the DASH diet score ranged from 0-10. Graphs were created to compare the dietary and cognitive scores of each diet.

While the Mediterranean, DASH, and MIND diet, were all effective in reducing cognitive impairment, the MIND diet was the most effective.

62. **"Setting the standard: juggling mental well-being, healthy eating and physical activity"**
Katia Jackson, Senior, Psychology; *ksjacks1@aggies.ncat.edu*
Dr. Jeannette Wade
African Americans are more likely to have higher rates of obesity which means higher risks of chronic diseases (Ogden, Carroll, Kit, & Flegal, 2014). Specifically, African American women tend to have higher rates of obesity, are less likely to engage in physical activity and less likely to lose weight compared to white women (Fitzgibbon et al., 2015). Cultural factors may play a role in these health trends and how African American women respond. The expectation of being a "Strong Black Woman" can influence African American women's mental and physical health and play a role in those health issues. The study seeks to understand how the role of the "Strong Black Women" impact on mental health is related to nutritional health and eating habits. This study consisted of African American women aged 18-25 who were recruited from North Carolina A&T State University. Data was collected through qualitative methods which consisted of small focus groups. Participants answered questions related to obesity, mental and physical health, and perceptions of what it is like to be a strong woman. Two significant themes emerged from the data collected: 1) mental health was seen as one of the top barriers that put black women's health at risk and 2) food security seems to be an indicator of healthy versus unhealthy eating habits. Future directions for this study include exploring how mental health status may be an important factor in determining nutritional and physical health.

63. **Assessment of Diabetes Risk Factors in HBCU College Students**
Hadassah Holder, Senior, Public Health; *hholder@ncat.edu*
Dr. Raymond Samuel
In North Carolina, African American adults have 1.5-2.77 greater risk of having diabetes compared to other races. This disparity can be minimized by reducing risk factors during key developmental stages such as young adulthood. Young adults make up the majority of the population in college communities. Our study aimed to assess the prevalence of risk factors for diabetes among young adults at N.C. A&T State University. A secondary objective was to determine whether educational level is a protective factor for diabetes risk factors among African American college students at a large public HBCU. In fall 2016, a written health assessment survey was completed by a convenience sample of 537 students at N.C. A&T State University. The survey was a compilation of 48 questions from several databases and results were analyzed using Chi-square tests. Study results indicated the NC A&T students may be at greater risk for diabetes due to lack of health education, lack of physical activity and lack of interest or engagement in their own health. The strength of the study was limited due to response rate of study participants. Future assessments of N.C. A&T students should further evaluate health habits and behaviors, utilizing research strategies that reduce response rate and increase the quality of data collected. A proper assessment of N.C. A&T students health and behaviors is necessary to development and implement health promotion initiatives that decrease the prevalence of risk factors for diabetes in this vulnerable population.

64. **"Police Fatality Shootings: Examining the Circumstances of Race"**
Samantha Gast, Senior, Criminal Justice and Forensic Science; *SIgast@aggies.ncat.edu*
Dr. Tobin Walton
While America has a long history of police brutality, there has been an increase of police shootings that result in fatalities in recent years. Media representations suggest that police only target unarmed African American men. This representation has resulted in tension, riots, and calls for policy change, however it is unclear if this is a true representation of police killings. The aim of this research is to answer the question "does race, circumstance and region affect the rate in which a person is fatality shot by police?" In order to answer this, the Washington Post Police Fatality Shooting Database's collection of individual cases will be analyzed in order to break down the data into categories of Black and armed, Black and unarmed, White and armed, White and unarmed, along with the region of the United States the incident occurred in. Within each region there will be an examination of a small set of nominal level variables through the use of a nonparametric, two by two chi square procedure. The chi square procedure will be use to inference if a relationship occurs within the data. By computing the two-way chi-square, the data will show if the X2obt is larger than the X2crit. This will determine if the variables are independent or dependent of each other along with the level of significance in order to see if the media representation is true in regards to who is fatality shot by law enforcement.

65. **"Tissue Transglutaminase-2 Modifies Fibrin(ogen) Stimulated Macrophage Cytokine Expression"**
Jazmin Johnson, Junior, Biology Department; *jtjohnson1@aggies.ncat.edu*
Dr. James Luyendyk
The blood clotting protein fibrin(ogen) acts as a bridge between the hemostatic system and the inflammatory response. Specifically, conversion of fibrinogen to its clotted form (i.e., fibrin) enables fibrin(ogen) engagement of leukocyte β2 integrins. Interestingly, we found that cross-linking of fibrin(ogen) by tissue transglutaminase-2 (TG2), a process distinct from blood clotting, inhibited lipopolysaccharide (LPS)-mediated induction of the anti-inflammatory cytokine IL-10 in cultured macrophages. Thus, we hypothesized that TG2 cross-linking enhances fibrin(ogen)-directed macrophage pro-inflammatory activity. Methods: Bone marrow-derived macrophages from wild-type mice were cultured on uncoated tissue culture plates or plates coated with fibrinogen or TG2-cross-linked fibrin(ogen) (10 µg/ml) for 4 hours. The cells were then stimulated with LPS (1 ng/mL) for 4 additional hours and levels of mRNAs encoding the pro-inflammatory cytokines TNF□ and IL-6 were measured using a qRT-PCR. Results: LPS stimulation significantly increased TNF□ and IL-6 mRNA levels compared to unstimulated cells. Unmodified surface-adhered fibrin(ogen) had minimal effect on basal and LPS-stimulated expression of TNF□ and IL-6 mRNA. In contrast, TG2-crossilinked fibrin(ogen) caused a reproducible enhancement of LPS-stimulated TNF□ and IL-6 mRNA induction. Conclusion: The results indicate that LPS activation of macrophages in culture is enhanced by exposure to TG2 cross-linked fibrin(ogen). This suggests that the pro-inflammatory activity of fibrin(ogen) in vivo may be influenced by changes in fibrin(ogen) structure mediated by processes independent of blood coagulation. Funding: Student support was provided by NIH grant R25 HL103156.

66. **Visualizing Optimal Fuel Strategies under Uncertainty**
Sheldon Smith, Senior, Industrial and Systems Engineering; *swsmith1@aggies.ncat.edu*
Dr. Lauren Davis
Natural disasters create unexpected uncertainty. For example, in Florida during a hurricane there is a high peak in demand for fuel. Homeland security is challenged with constantly and consistently meeting the high demand for fuel during a hurricane. In a natural disaster, fuel ports can become inoperable due to the extreme weather conditions (high wind speeds). The objective is to visualize the data of a model that optimizes decision making for Homeland Security during a hurricane. Our visualizations examine schedule optimization, port unmet demand and port ending inventory in the event of a natural disaster.

67. **Understanding the mechanism of silver resistance in Escherichia coli by evaluating mutations in CusS**
Aaron Phillips, Senior, Biology; *atphilli@aggies.ncat.edu*
Dr. Misty Thomas
As resistance to antimicrobial agents continues to become more widespread in nature understanding the mechanisms bacteria use to combat them is important to prevent antimicrobial agents from becoming ineffective in treating microbial infections. Bacteria utilize the Cus system to obtain silver resistance. CusS is an important protein in this system and is used to sense silver in the presence of the cell. Only the crystal structure of the sensor domain of CusS has been determined. Researchers still are aiming to determine the crystal structure of the periplasmic domain because knowing the crystal structure of a protein helps to understand its function. Recombinant cloning was used for the expression of CusS in component cells. In the procedure that was followed, the CusS protein was not successfully expressed by the competent cells used. The goal is to successfully determine the crystal structure of the periplasmic domain of CusS to better understand the protein and its contribution to bacterial silver resistance. This will aid in the greater effort to prevent the oncoming of the antimicrobial resistance crisis by understanding how bacteria become resistant to silver.

68. **"Income and Food Consumption Patterns"**
Nicolas Arduh, Senior, Economics; *narduh@aggies.ncat.edu*
Dr. Lyubov Kurkalova
Income and Food Consumption Patterns Literature on demand systems of food consumption shows that on average an increase in income results in an increase of food consumed but a decrease in the percentage of income spent on food. This research focuses on the impact of income on food consumption patterns. The specific objectives for this research are as follows: 1) Summarize the consumption patterns for different income class brackets; 2) Analyze the effect of socio-cultural backgrounds of individuals on their food demand patterns; and Develop a linear regression model for explaining observed food consumption patterns as a function of the income class of individual and other variables .We use the quarterly, 2015-2018

Consumer Expenditure Surveys Public-Use Microdata provided by the Bureau of Labor Statistics, and focus on 3 main aspects of food consumption: food at home, food away from home, and total food consumption. The regression results show that higher income individuals are more likely to spend approximately $50 more on food per week, when compared to the lowest income class. We do find a limited effect of race on total food expenditures, which opens the door for future research in that area. Higher education did not show a statistically significant impact on any of the three models (food away from home, food at home, food total).

69. **"Food Security: Fast Growing Crops For Economical Sustainability In North Carolina "**
Morgan Thacker, Senior, Civil Engineering; *mathacke@aggies.ncat.edu*
Dr. Lyubov A Kurkalova
Because North Carolina is known for its farming industry, this research explores its possible agricultural expansion in hollow areas for economic development. Utilizing ArcGIS, a map of all the hollow areas in North Carolina was created and accessed with recent crop data to find adequate land to allow fast growing crops to be planted. These fast growing crops will help lower production costs and have better yields in comparison to conventional crops, thus providing monetary development and sustainability in these areas of North Carolina. The results from the data found that over 10% of the hollow areas in North Carolina are agriculturally suitable for fast growing crops.

70. **Modeling Tropical Cyclogenesis Frequency and Variation in the North Atlantic Basin**
Ian Livengood, Sophomore, Mathematics; *lmlivengood@aggies.ncat.edu*
Dr. Liping Liu
Tropical cyclones (TCs) are dangerous because they produce destructive winds, heavy rainfall with flooding, and damaging storm surges. It is valuable to understand tropical cyclogenesis: a meteorological word used to describe TC formation, and its strengthening due to the atmosphere. This study focuses on tropical cyclogenesis frequency and variation and the prediction of the number of tropical cyclones that form in the North Atlantic Basin. Previous studies from physics analysis identified four factors that affect tropical cyclogenesis: potential intensity, vertical shear, relative humidity, and absolute vorticity. In this study, we include other factors in addition to the above four variables. We obtain data for various variables from the European Centre for Medium-Range Weather Forecast (ECMWF) ERA-Interim reanalysis dataset. Some variables (e.g. potential intensity) are computed from the ECMWF data. From the National Hurricane Center's track maps, we compile the data on the number of TCs that formed each month from 1979 to 2011 in the North Atlantic Basin. The first part of this study investigates a genesis potential index (GPI) as a function of the four factors. Numerous plots are generated to compare the GPI with the cyclogenesis frequency. The second part of this study employs machine learning methods on the variables that could be linked with cyclogenesis. The methods considered include support vector machine, random forest, naïve Bayes classifier, and nonlinear regression. It is discovered and verified that the GPI matches well with the cyclogenesis frequency for most months. The effectiveness of the machine learning methods is provided.

71. **"Exploiting Affordances in Monitoring a Smart Home"**
Alfred Acquaye, Junior, Computer Science; *akacquaye@aggies.ncat.edu*
Dr. Albert Esterline
The Internet of Things (IoT), where internet connections are extended to every-day objects, enables collaboration, monitoring, and remote control. An IoT can make a home smart at least in the sense that those in it can be monitored. The question arises of how much and what kind of data are needed to monitor a person as they move about a smart home. This paper focuses on affordances, manifest possibilities for action provided by the environment (e.g., the appearance of a doorknob). Our thesis is that, since the same things are affordances for the monitored and monitoring persons, a little data goes a long way in monitoring a subject's interaction with affordances. This paper describes a scaled-down model of a floor in a smart home equipped with only passive infrared (PIR) motion sensors where nevertheless the data allows high-level interpretation of the subject's activities on that floor.

72. **"The quality of birth experiences among middle-class Romanian women focusing on obstetric violence, potential tensions, and the perception of a good birth experience"**
Robin Jones, Senior, Biology; *rejones@aggies.ncat.edu*
Dr. Kelsie Bernot
Childbirth is a natural process that most women get to experience within their lifetime. There is very little

data on Romanian births, and more specifically, Romanian women's birth experiences. Since this data is very hard to find and report, this study was designed to get more insight about the birth experiences of Romanian women that included the frequency of cesarean sections, obstetric violence, tensions, and the overall perception of the experience. In this study, thirteen women from Cluj-Napoca, Romania were interviewed to gain more insight about their birth experiences. Only five interviews have been analyzed for this interview, while the remaining 8 are going through the analyzing process. Three out of five women delivered vaginally, the remainder underwent a cesarean section for parturition. In terms of obstetric violence, three of the women reported that they did not experience any violence. Contrastingly, two women reported their experience as negative and experienced some type of coercion or violence. In terms of tensions, three of the women reported that they experienced tension with their health care professionals in regards to birth plans and overall quality of care. In two of the women's interviews, they experienced little to no tension and stated that the nurses gave them the best quality of care. In terms of the perception of the experience, three women described the overall experience as a positive one. Contrastingly, two of the women perceived their experience as a negative one. For the women who reported their birth experience as positive, they had a good relationship with their health professionals, had a relatively safe birth, and felt well taken care of in their respective facilities. For the women who reported their birth experience in a negative light noted tainted relationships with their healthcare professionals, the presence of coercion, and lack of autonomy in choosing the birth plan. In conclusion, the study supports that to move in the direction toward a more supportive and positive birth experience for women, it is essential to have a sustainable balance between autonomy, support, education and advocacy within the doctor-patient relationship.

73. The Labor Exploitation of Prisoners
James Sifford, Senior, Sociology; ***jamessifford007@gmail.com***
Dr. Tobin Walton
Understanding the prison industrial complex concerning prison labor is crucial to stopping the exploitation of prisoners. This exploitation runs deeper than just prisoner exploitation; large corporations are using these prisoners to manufacture their products without having to pay for it. This study will look at what corporations are using prison labor, how they benefit from exploiting prisoners and what laws allow them to exploit prisons. I will be conducting descriptive research on the data related to the monetary contribution of prisons across the United States and how they contribute to corporations. This study will provide data on the history surrounding the legality of the exploitation of prisoners for their labor. This study will also detail the corporations across the United States that are using prison labor for the manufacturing of their products. From my research, I hope to find that many of the corporations that use prison labor are making hundreds of millions of dollars in profit from not having to pay prisoners for their labor. I hope to find that many big brand companies are using prison labor and that their actions are unjust. I also hope to discover the need to revise the laws surrounding the exploitation of prisoners due to the lack of payment for their labor and extreme profit made by corporations.

74. "Computational Framework for Identifying Suspects in Multiple Situations"
Hannah Foster, Senior, Criminal Justice/Computer Science; ***hnfoster@aggies.ncat.edu***
Dr. Albert Esterline
We present a framework for identity that addresses how information can be evidence for identity hypotheses and how such evidence can be discounted and combined. The framework (which is computational) is built on three pillars: the situation theory of Barwise and Perry (and Devlin), the Dempster-Shafer theory of evidence, and Semantic Web standards (OWL, RDF, and the use of URIs). According to situation theory, situations support information and some (particularly utterance situations) carry information about other situations. We see a legal case investigating the identity of an agent as a constellation of situations, which provide evidence for identity hypotheses. We have developed OWL ontologies to provide concepts for encoding cases in RDF. The structure captured in these encodings allow us to apply Dempster-Shafer theory in novel ways to discount and combine levels of evidence for various hypotheses. The majority of this poster is an in-depth analysis of our new scenarios that have multiple situations.

75. Isolation and Discrimination in High School: Impact on Perceptions of STEM Courses
Imani Bass, Senior, Psychology; ***ijbass@aggies.ncat.edu***
Dr. Anna Lee
Due to the hierarchy of race in America, Black people often find themselves in environments where they struggle to fit in and be accepted by their white counterparts and by authority. One of the places this

happens most often is in schools. Black children find it hard to feel accepted by their white classmates and by their teachers. Researchers have been able to find examples of black students recognizing and being able to articulate the discriminatory nature of the way they are treated in schools. This leaves students feeling singled-out and isolated in these environments. The purpose of this study is to examine the ways in which Black students experience isolation and discrimination in high school math and science courses. This research is based on the following research question: How does the feeling of isolation and discrimination affect perceptions of STEM courses in high school? It is hypothesized that there will be a negative associations between perceived discrimination and isolation and perceptions of STEM. The method included focus group interviews and individual interviews of high school seniors and college freshman. The students were asked specific questions regarding their high school experience which would highlight perceived discrimination and isolation and the impact it had on each individual. It is expected that students' will have negative perceptions of STEM courses if they have experienced isolation and discrimination in school.

76. "Social Determinants of Health and Mental Wellness of College Students"

Stacey Lawson, Senior, Psychology; *slawson1@aggies.ncat.edu*
Dr. Anna Lee

Social determinants of health (SDOH) are conditions in the places where people live, learn, work, and play affect a wide range of health risks and outcomes (CDC, 2018). The five key areas of SDOH include economic stability, education, social and community context, health and health care, and neighborhood and built environment. The purpose of this study is to explore how SDOH impact the mental wellness (including depression, anxiety and stress) of undergraduate college students. It is hypothesized that social determinants of health will have a negative impact on undergraduate college students' mental wellness. A survey will be administered to undergraduate students to measure both their individual levels of SDOH as well as their mental wellness, specifically their depression, anxiety and stress. The Statistical Package for Social Sciences (SPSS) that will be used to analyze the data. The proposed data analysis will include descriptive statistics, correlations and t-tests. This study aims to find associations between social determinants of health and the impact it has on undergraduate college students' mental wellness. It is expected that findings will suggest a negative relationship between the students' levels of social determinants of health and their mental wellness.

77. Optimizing Choices Through Interactive Data Visualization

Matthew Mullens, Senior, Industrial Systems Engineering ; *mwmullen@aggies.ncat.edu*

The undergraduate team from North Carolina A&T is one group of students across several other universities developing solutions for the North Carolina Food Bank and their Flexible, Equitable, Efficient and Effective Food Distribution (FEEED) Project. The FEEED project is a platform that was developed using technological frameworks such as Process Genius, Python, Plotly, Microsoft SQL Database, and web servers. The group's objective is to develop a user-friendly platform that allows North Carolina Food Bank employees and volunteers to access and visualize data that will help them make more efficient decisions concerning food distribution across North Carolina. Due to the large volume of data the Food Bank utilizes, visualization of the of the distribution numbers were crucial. The research team hypothesized that Tableau may be the best tool for displaying interactive visualizations of the Food Banks data. Upon trying to integrate Tableau with the machine learning platform, Process Genius, we found that Tableau had limitations in being a stand-alone integration within our framework since the company will not allow the code produced to be open source. The team explored the open source data analytics platform Plotly, which allowed for better integration between the SQL Database, Process Genius and Python. The utilization of Plotly and python for large data may prove to be more advantageous in the future of interactive data visualization.

78. "Aggie Access Revised"

Travon Bland, Carson Calcutt, Tonya McClendon, Computer Systems Technology
Dr. Zhaohui Wang

The current course-scheduling system at North Carolina Agricultural and Technical State University, known as Aggie Access, uses an outdated, unorganized design, which causes end-users to waste time maneuvering around the website. The purpose of this project is to create an improved course scheduling system for the university that organizes content logically and allows users to retrieve the information they need efficiently. As opposed to the current scheduling system, which has content placed sporadically throughout the website, our improved system organizes content into different areas for each of the university's functions, including areas for transcripts, course searches, student registration, and financial aid. This redesigned website is also fully functional on mobile devices, including both iOS and Android smartphones and tablets, which makes

the system even friendlier for end-users. The new website incorporates Hypertext Markup Language (HTML) for its structural foundation, Cascading Style Sheets (CSS) for its design stylings, JavaScript for client-side event handling, MySQL as its relational database management system, Hypertext Preprocessor (PHP) for server-side database implementation, and the Bootstrap framework for its mobile formatting. To complete the project, the team has been using GitHub for version control throughout the entire development process, which allows us to deploy the website's code to the project's contributors for collaboration. Overall, the deliverables for this project include the system's web interface, along with an accompanying relational database that makes the web interface functional, and the outcome of the project is to have these deliverables deployed online for students and staff members to utilize.

POSTER PRESENTERS

List of Students

Poster #	Last Name	First Name	Emails
1	Acquaye	Alfred	*akacquaye@aggies.ncat.edu*
2	Alston	Kayla	*kaalston2@aggies.ncat.edu*
3	Ambush	Amani	*Asabush@aggies.ncat.edu*
4	Anderson	Imani	*imanderson@aggies.ncat.edu*
5	Arduh	Nicolas	*narduh@aggies.ncat.edu*
6	Asya	Macon	*apamacon@aggies.ncat.edu*
7	Barnes	Kammikia	*kmbarnesl@aggies.ncat.edu*
8	Barnes	Kristoni	*ktbarnes@aggies.ncat.edu*
9	Baskerville	Courtney	*cjbaskerville@aggies.ncat.edu*
10	Bass	Imani	*ijbass@aggies.ncat.edu*
11	Belton	Destiny	*dmbelton@aggies.ncat.edu*
12	Bernot	Kelsie	
13	Bethea	Lauryn	*lmbethea@aggies.ncat.edu*
14	Bills	Ryan	*rjbills@aggies.ncat.edu*
15	Bradley	Amina	*aabradley@aggies.ncat.edu*
16	Braxton	Langston-Chapman	*helpvolumes@braxtonlangstonchapman.com*
17	Brianna	Williams	*bgwillil@aggies.ncat.edu*
18	Bryant	DeAndria	*dmbryanl@aggies.ncat.edu*
19	Bullock	Khiliel	*kbullock2@aggies.ncat.edu*
20	Chadwick	Lauryn	*lachadwick@aggies.ncat.edu*
21	Fennell	Jaylin	*jlfennell@aggies.ncat.edu*
22	Flowers	Jasmine	*jrflowe3@aggies.ncat.edu*
23	Ford	Sade	*scford@aggies.ncat.edu*
24	Ford	Maria	*mlford@aggies.ncat.edu*
25	Foster	Hannah	*hnfoster@aggies.ncat.edu*
26	Gast	Samantha	*Slgast@aggies.ncat.edu*
27	Gibbs	Synphane	*slgibbs@aggies.ncat.edu*
28	Gibbs	Jasmine	*jsgibbs@aggies.ncat.edu*
29	Gibson	Jasmine	*jgibson@aggies.ncat.edu*
30	Grant	Selah	*svgrant@aggies.ncat.edu*
31	Harris	Sheliah	*syharris@aggies.ncat.edu*
32	Hayley	Respress	*harespress@aggies.ncat.edu*
33	Holder	Hadassah	*hholder@ncat.edu*
34	Hudson	Qubanae	*qchudson@aggies.ncat.edu*
35	Hulitt	Kyra	*knhulitt2@gmail.com*
36	Irby-Shabazz	Adenike	*airbysha@aggies.ncat.edu*
37	Jackson	Katia	*ksjacksl@aggies.ncat.edu*
38	Johnson	Amethyst	*arjohns3@aggies.ncat.edu*
39	Johnson	Akosua	*asjohns3@aggies.ncat.edu*
40	Johnson	Jazmin	*jtjohnsonl@aggies.ncat.edu*
41	Jones	Brooke	*bnjones5@aggies.ncat.edu*
42	Jones	Myracle	*mcjones3@aggies.ncat.edu*
43	Jones	Brooke	*bnjones5@aggies.ncat.edu*
44	Jones	Robin	*rejones@aggies.ncat.edu*
45	Khader	Balqees	*bkhader@aggies.ncat.edu*

46	Kumari	Anjali	*akumari@aggies.ncat.edu*
47	Lawson	Stacey	*slawsonl@aggies.ncat.edu*
48	Le'Hendria	Phillips	*lrphillips@aggies.ncat.edu*
49	Lewis	Tylar	*ttlewis@aggies.ncat.edu*
50	Livengood	Ian	*Imlivengood@aggies.ncat.edu*
51	Martin	Taylor	*tsmartil@aggies.ncat.edu*
52	Massey	Bria	*bpmassey@aggies.ncat.edu*
53	McCain	Dextiny	*dtmccain@aggies.ncat.edu*
54	McCarter	Quinton	*qmmccart@aggies.ncat.edu*
55	McCray	Aliyah	*akmccray@aggies.ncat.edu*
56	McElroy	Asha	*aimcelroy@aggies.ncat.edu*
57	Mikell	Zandra	*zdmikell@aggies.ncat.edu*
58	Mitchell	Malek	*msmitchell@aggies.ncat.edu*
59	Moore	Nadia	*njmoore@aggies.ncat.edu*
60	Moore	Tyneesha	*tpmoore2@aggies.ncat.edu*
61	Mullens	Matthew	*mwmullen@aggies.ncat.edu*
62	Mullens	Matthew	*mwmullen@aggies.ncat.edu*
63	Parham	Justice	*jiparham@aggies.ncat.edu*
64	Parsons	Paris	*pkparsons@aggies.ncat.edu*
65	Peagler	Correggio	*clpeagler@aggies.ncat.edu*
66	Peebles	Corvonn	*ckpeeble@aggies.ncat.edu*
67	Petty	Marlon	*mlpetty@aggies.ncat.edu*
68	Phillips	Aaron	*atphilli@aggies.ncat.edu*
69	Redd	Kaylan	*karedd2@aggies.ncat.edu*
70	Richards	Rachel	*rmrichards@aggies.ncat.edu*
71	Robinson	Victoria	*vrobinson@aggies.ncat.edu*
72	Rucker	Adonis	*acrucker@aggie.ncat.edu*
73	Ruiz	Renata Gabriela	*rgruizrabadan@aggies.ncat.edu*
74	Schuster	Tyler	*ttschuster@aggies.ncat.edu*
75	Sifford	James	*jamessifford007@gmail.com*
76	Smith	Jessica	*jysmith@aggies.ncat.edu*
77	Smith	Sheldon	*swsmithl@aggies.ncat.edu*
78	Stewart	Alessia	*acstewa2@aggies.ncat.edu*
79	Streeter	Gayle	*gestreeter@aggies.ncat.edu*
80	Thacker	Morgan	*mathacke@aggies.ncat.edu*
81	Thomas	Daria	*dthomas@aggies.ncat.edu*
82	Thomas	Daria	*dthomas@aggies.ncat.edu*
83	Thompson	Chelia	*cthomps2@aggies.ncat.edu*
84	Townsend	Sydney	*setownsend@aggies.ncat.edu*
85	Umelo	Michael	*Umelomnumelo@aggies.ncat.edu*
86	Vanderpool	Jacob	*jrvander@aggies.ncat.edu*
89	Williams	Victoria	*vwillial@aggies.ncat.edu*

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