



**7th Annual
Undergraduate Research Symposium
(URS)**

March 6, 2018
Hughes Gymnasium | Bell Conference Center
The University of West Alabama
Livingston, AL

**Poster Sessions & Graduate School Expo
8:00 a.m. – 4:30 p.m.**

Venue: Hughes Gym

- ❖ Registration 8:00 a.m.–9: 00 a.m.
- ❖ Poster setup 8:00 a.m.–9: 00 a.m.
- ❖ Poster viewing session I, Judging round 1 & Graduate
School/Career Exhibition 9:00 a.m.–11:30 a.m.
- ❖ URS Group Photo 11:30 a.m.
- ❖ Lunch (UWA Cafeteria) 11:45 a.m.–1:00 p.m.
- ❖ Poster viewing session II, Judging round 2 & Graduate
School/Career Exhibition 2:45–4:30 p.m.

**Keynote Address and Awards Banquet
6:00 p.m.–8:00 p.m.**

Venue: Bell Conference Center

Welcome
Dinner
Keynote Address
Awards Ceremony
Group Photo

Dr. Mustafa Morsy, Chair

Dr. Jing Chen

Mrs. Hoda Hassan

Dr. John McCall

Dr. Ketia Shumaker

Dr. King Tiong



The Tombigbee RC&D mission is to carry out activities that accelerate the development, conservation and wise use of human, financial and natural resources in order to improve the standard of living within the area.

RC&D is a local nonprofit organization led by local community leaders. To help you understand how RC&D works, the following information explains the RC&D program, the RC&D Area, the Council, and the relationships and responsibilities of each.

RC&D was initially started back in the 1960's to address rural poverty and help rural communities generate sustainable natural resource-based economies. Although today many RC&D Areas are not rural and are not poor, the need for the RC&D concept is just as strong as ever. RC&D is not the same-old, same-old – RC&D is collaborative, multi-leveled, action-oriented, and inclusive. And, sometimes, "RC&D" is difficult to explain and difficult to quantify. However, the effect of the RC&D approach to solving community problems involving local people in voluntary, empowering ways can be felt by almost every RC&D project that happens across the country.

Sponsors

- Tombigbee RC&D
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Judges

- Dr. Ratnakar Deole, Northeastern State University
- Mr. Jason Cassity, US Army Corps of Engineers
- Dr. Kenya Goodson, Stillman College
- Dr. Lingyan Kon, University of Alabama
- Mr. Carey Moore, University of West Alabama
- Dr. Libo Tan, University of Alabama
- Dr. JJ Wedgworth, The University Charter School

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KEYNOTE SPEAKER

The keynote speaker is Dr. Radha Ganesan, Curriculum Designer at the Alan Alda Center for Communicating Science. Dr. Ganesan has been working in the areas of Education and Training for the past 13 years. She comes with extensive experience in designing and delivering professional development learning experiences for a wide range of sectors. She has been worked in international development sector in the South Asia and African region seven years, focusing on technology integration, instructional design, curriculum design and training (formal and informal programs). She has worked with universities in the United States, the International Board of Standards for Training, Performance and Instruction, National Technical Institute for the Deaf (NTID), World Bank and the USAID. She has a doctorate degree in instructional design, development and evaluation as well as a M.S. degree in educational program evaluation from the school of education, Syracuse University and an M.Ed. in special education from the teacher's college, University of Cincinnati.



Graduate Schools Participants

- ❖ Alabama College of Osteopathic Medicine
- ❖ Division of Economic Development & Outreach
- ❖ East Tennessee State University
- ❖ Jacksonville State University
- ❖ Lincoln Memorial University-DeBusk College of Osteopathic Medicine
- ❖ Marian University
- ❖ Palmer College of Chiropractic
- ❖ Personnel Board of Jefferson County
- ❖ Samford University - McWhorter School of Pharmacy
- ❖ The University of Alabama - College of Continuing Studies
- ❖ The University of Alabama at Birmingham
- ❖ UAB - School Of Optometry
- ❖ University of Alabama
- ❖ University of Alabama Huntsville - College of Nursing
- ❖ University of Alabama in Huntsville
- ❖ UWA Master in Conservation Biology
- ❖ UWA Online
- ❖ UWA OSPR Seed Grants
- ❖ William Carey University College of Osteopathic Medicine

60. Long-term Effects of Paraquat on Movement Behavior and

Reproductive Performances in *Drosophila melanogaster*

Marshall Williams, Mary Jane Krotzer and Anathbandhu Chaudhuri

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Paraquat (PQ) is an environmental pollutant and neurotoxic pesticide widely used in agricultural fields. PQ exposure affects the dopamine (DA) neurons by causing a gradual apoptotic death and develops Parkinson's disease in human. Acute exposure to PQ may also cause kidney failure, heart disease and respiratory disorders. In order to determine the long-term effects of PQ on movement behavior, stress tolerance and reproductive performances, we used *Drosophila melanogaster* as a model system. The flies were exposed with 1 and 10mM PQ during the juvenile stages (second and third instar larva for 24 to 72 hours). We observe that PQ negatively affects larval negative geotaxis and reproductive performances. Both the doses of PQ cause significant reduction in producing functional adults when the herbicide treated during juvenile stages. Next, we treated the flies in their adult stage with 1mM of PQ and observe that reproductive performances are affected in terms to produce the functional adult. When we fed PQ (only to male or female and/both male and female) to the fly and allow to mate with their respective counterparts, it reveals that the reproductive performance drastically affected due to PQ exposure and produce very little or no functional adults.

We hypothesized that PQ significantly affect the reproductive performances in fly model causing oxidative stress either directly to the reproductive organ or via dopamine synthesis pathway. However the molecular mechanism yet to explore.

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59. Histopathology of Colon Cancer and Metastasis in Athymic Nude

Mice

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Colorectal cancer commonly known as colon cancer develops in the tissues of the lower portion of the gastrointestinal system. Colon cancer normally starts as an adenoma and is diagnosed if it is found in the first four feet of the large intestine. The purpose of this research is to identify the stages of cancer and track the metastasis of colon cancer using athymic nude mice. Human colon cancer cells (HCT116) tagged with GFP (green Fluorescence Protein) were transferred to the colon of the mice model. A histopathological staining using Hematoxylin and Eosin was made to identify the cancer tumor and the state of metastasis. We observed that transplantation of human colon cancer cells successfully form a solid tumor in colon and metastasized in to liver and lung in athymic nude mouse model.

58. The Effects of Ginger Derivatives on the Growth of Tramp-C

Cancer Cells using the Trypan Blue Viability Assay

Quintana White, Jawaher Almuqbil and Jeffery Merida

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Prostate cancer is the most common cancer among men 40 to 69. Cancer starts when a cell in the body starts to growing out of control. The prostate gland is located below the urinary bladder and functions in the production of semen. There are components in plants that play a significant role in reducing prostate cancer. Men are encouraged to intake these products which may be beneficial in the prevention of prostate cancer. One such plant is ginger. We have used murine Tramp-C prostate cancer cells to perform experiments. These cells are generally used for research on prostate cancer. Studies have shown that men who supplement their diet with ginger can significantly reduce their levels of prostate-specific antigen (PSA). There are several components that, previous studies have shown, reduce metastasis in prostate cancer cells. The purpose of this research is to determine if a ginger extract and gingerol derivatives have a direct effect on the growth of these cells. These cells were assessed for their growth using inverted light microscopy and the trypan blue assay for cell viability. We will present data showing the difference in the growth of cells treated and not treated with these ginger components.

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57. Effects on cell division in *Schizosaccharomyces pombe* cells lacking the critical membrane trafficking components AP3 or *sec72*

Melaina Z. Hissam, Joseph Whitaker, Rebecca V. Bryant, and Melanie Styers

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Membrane trafficking is an important cellular process required for transport of key enzymes and signaling proteins throughout the cell. In *Schizosaccharomyces pombe*, secretory membrane trafficking has been shown to regulate septation, where fission yeast undergoes cytokinesis to form two daughter cells. At the Golgi apparatus, activation of small GTPases called ADP Ribosylation Factors (Arfs) by Guanine Nucleotide Exchange Factors (GEFs) controls the formation of transport vesicles. These Arfs recruit specific coat proteins which recruit cargo molecules to be trafficked to the membrane. Our goal was to identify components of the late secretory pathway that regulate cytokinesis. We hypothesized that the fission yeast coat protein AP3 and the fission yeast GEF *sec72p* act in this pathway to regulate enzyme secretion required for cytokinesis. This was studied by comparing the effects of loss of *sec72p* and AP3 function in fission yeast. Compared to wild type cells, AP3 Δ cells were found to have significantly increased cell size, and a greater amount of DNA per cell. *Sec72* Δ cells were also larger, but to a lesser extent than AP3 Δ cells, suggesting some compensation by other GEFs. Similarly, AP3 Δ and *sec72* Δ strains both showed septation defects, though the phenotypes were stronger in AP3 Δ cells. These observations may be due to delayed trafficking of the *eng1p* cargo molecule, a protein involved in septum breakdown. Our results show that loss of AP3 or *Sec72* function results in similar changes in cell division, suggesting that AP3 and *sec72p* may be involved in a membrane trafficking pathway that regulates septation.

56. Isolation of Avian Carried *Cryptococcus* Species from Alabama

Soils

Haley Turner and Tracy Keener

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Cryptococcus is a yeast species carried by avian species and is harbored in the soil. Most *Cryptococcus* species are contained to tropical and subtropical locations. Recently, *Cryptococcus* related illnesses have become more prevalent in the United States.

Cryptococcus neoformans and *Cryptococcus gatti* have been identified as causative agents of human acquired infections in Alabama, with there being one reported case in the Black belt region of Alabama.

The goals of this experiment are to: 1) extract and identify *Cryptococcus neoformans* and *Cryptococcus gatti* in excreta contaminated soil samples and avian excreta from areas in the Black belt region of Alabama and areas outside of the Black belt, and 2) attempt to identify the avian species responsible for transmission of infection from avian species to soil. Our hypothesis states that both *Cryptococcus neoformans* and *Cryptococcus gatti* can be found in the soils of Alabama due to the high populations of pigeons as well as the humid, tropically parallel weather patterns that this region experiences. We will collect samples of avian excreta and excreta contaminated soil from the Black belt region and other regions of Alabama taking note of the collection location, and we will confirm the presence of *Cryptococcus* yeasts using Caffeic Acid Agar (CAA). Brown colonies will be picked and streaked onto an Sabouraud Dextrose Agar (SDA) plate for identification. This research will provide the first insights into the prevalence of *Cryptococcus neoformans* and *Cryptococcus gatti* in the Alabama Black belt region as well as other regions of Alabama.

ABSTRACTS

1. Evolution of Physics Identity Throughout an Undergraduate's Career.

Nicole Aledo and Scott Franklin

¹University of West Alabama

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A strong physics identity (PI) is essential for the physics majors to remain in physics. We look at PI by analyzing student responses about their perception of themselves as a “physics person” and how they feel they are perceived by others. Surveys were given annually to all physics majors within a single department. Freshman were given the survey at both the beginning and end of their first year; subsequently sophomores, juniors and seniors take the survey at the end of each academic year. Survey questions probe both self-perceptions and students' beliefs about how their professors, parents, and peers perceive them. We look for a relationship between physics identity and retention in the physics program, in particular retention between the 1st, 2nd and 3rd years.

2. Bioinformatic Research into Phage Host Specificity

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Bacteriophages are viruses that infect bacteria and are the most numerous biological entities on the planet, vastly outnumbering every form of life on earth. As pathogens of bacteria, bacteriophages are a driving force behind bacterial evolution, thus they are an extremely important part of our planet's ecosystem. In recent years, research into host-phage interaction has shed light on the mechanisms involved within phage infection and the phage lifecycle as a whole. However, there is still much that remains a mystery, such as the mechanisms responsible for host specificity among phages. I conducted an exploratory comparative genomics analysis of Actinobacteriophages to identify factors related to host specificity. Using *Gordonia* phages as a point of focus, a bioinformatic approach into host range specificity has uncovered a possible link between the Lysin A protein and host range. The Lysin A protein of *Gordonia* phages appear to be related through a known protein domain, the LGFP super family. This domain is known to alter interaction with mycolic acids, which are crucial for survival among members of *Gordonia* and closely related members of *Corynebacteriales*.

Preliminary research points to the LGFP domain of Lysin A as a crucial piece in the puzzle responsible for host range specificity among bacteriophages.

55. Finding the Good in Bacteria

Kyla Tucker, Erica Johnson, and Mustafa Morsy

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In the US, 23,000 people are killed annually from antibiotic resistant bacteria. It is projected that the number of deaths will increase to 10 million worldwide if there are no rejuvenated cures, novel antibiotic. With tuberculosis alone, there are about 480,000 people worldwide with drug-resistant strains from the disease. In 2014, it was estimated that 3.3% of all new tuberculosis cases were resistant to multiple drugs; in recurring cases, 20% were resistant. The cost of taking care of a patient infected with ARB ranges from \$18,000 to around \$30,000. Human overuse of antibiotics, prescription, and consumption of meat treated with antibiotics contributed to the development of antibiotic resistant bacteria (superbug). A "superbug" is bacteria that is resistant to antibiotic drugs. Our goal is to find ways to treat these superbugs by discovery of novel antibiotics from bacteria found in soil. Being that 75% of all known antibiotics come from soil, we collected and tested soil samples from Alabama. We have identified a number of antibiotic producing bacteria and we are in the process of identifying these bacteria and the nature of the antibiotics produced. We found over 1000 bacterial colonies with ranging phenotypes from yellow star shaped to red oblong circles. Ninety-five of the 1000 were tested against *Staphylococcus epidermis* and *Staphylococcus cohnii*. After this process, five true antibiotic producing bacteria were chosen. We tested these true antibiotic-producing against nine commonly known pathogens. This experiment has allowed us to learn about the biological processes that will benefit us in the future and helped us see how we are contributing to our community by finding antibiotic producing bacteria.

54. Correlating Changes in Holocene Floral Composition to Climate

Change and Disturbance in Alabama's Black Belt using Palynology and Leaf Analysis

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The Black Belt of Alabama contains a unique and diverse plant community that has been influenced by both climactic and anthropogenic factors. To date, there are no records of the flora that occurred in the Black Belt before European settlement. Determining prehistoric species composition will help us quantify the changes that have occurred in plant community organization since that time. In this study, we investigate prehistoric pollen and organic plant remains trapped in sediments of river ox-bow lakes within the Black Belt. A complete soil profile of ox-bow lake sediments was sampled using a 4in-diameter core. Once the chalk bedrock was reached, the core was removed, the contents frozen, sectioned, and is currently being examined for remnant plant material, which will be preserved and identified. In addition, two independent bulk carbon samples have been submitted for Accelerator Mass Spectrometry and pollen analysis. The age of the sediments will be determined at the basal portion of each 10cm interval in the core. Upon return, they will provide baseline data for the age of the organic material. In essence, the collected core will represent a chrono-sequence in which shifts in plant community structure will be measured over long periods of time. Upon completion, this data will allow us to correlate the observed shifts in plant community structure to climatic and/or disturbance events. This will clarify and improve our understanding of successional dynamics within the Black Belt region of Alabama.

3. Wound Repair: The Underlying Effects of Aging

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Wound healing is a critical biological process and a deeper understanding of the mechanisms involved could prove to be of great value. Since it involves varying cellular populations interacting in overlapping phases, it must follow through at the appropriate time and place, with subtle alterations having drastic implications. There are several factors that can affect the efficiency of wound repair, particularly age. With an increasing elderly population due to improved medical care and scientific advancements, investigating how age directly affects wound healing could lead to more effective treatment options. I specifically questioned if age decreases the efficiency of the degree of epithelialization, vascularization, and fibroblast infiltration that occurs in cutaneous wound repair. My approach involved using a mouse model to examine young and aged mouse wound beds which would be analyzed using immunofluorescence microscopy. I then quantified the detected populations and observed a significant decrease in efficiency of each process. After a baseline study, I was able to pinpoint a specific cellular population for further evaluation. Since fibroblasts are such a predominant cell type in the proliferative phase, the complexity of this population comes into question. Therefore, my subsequent investigation included how age interferes with fibroblast functional heterogeneity in wound repair, including any subsets that are more effected. I targeted the adipocyte precursor subset and found that it had the most substantial decrease among fibroblast populations. These results show how extensively regeneration can be influenced by age, and further research could lead to potentially counteracting developments.

4. A Tale of Two Tears: A Study of Lysozyme Activity

Krystal Aultman, Riley King, and Tracy Keener

Department of Biological and Environmental Sciences, University of West Alabama, Livingston, AL 35470

The human immune system has many mechanisms of defense including tears. The mucosa of the eye may appear to have minimal protection from outside elements such as airborne irritants, microorganisms, light, and even harsh environmental factors. However, tears provide a powerful system of defense and are essential to maintaining the health of the eye. They flush out and neutralize foreign substances like dust, air pollutants, and bacteria. Tears are secretions of the lacrimal gland in the eye and have a complex chemical composition including an enzyme called lysozyme. This enzyme contributes to the eye's defense by breaking down the cell walls of susceptible bacteria that infiltrate the eye, therefore preventing the spread of an infection. Humans have three distinct types of tears: basal tears, reflex tears, and emotional tears. Basal tears provide lubrication, nourishment, and protection. Reflex tears form to protect the eyes from irritants. Emotional tears are unique to humans and are triggered by feelings such as joy or sadness. We investigated if there was a notable difference in the lysozyme activity and effectiveness in tears secreted in response to emotion versus tears in response to an irritant. Participant tears were collected after exposure to an irritant and after a contrived emotional cry. We measured our samples for lysozyme activity at different time frames using spectrophotometry and compared our results to a control. Using two-way ANOVA, a significant difference was seen between the lysozyme activity of emotion versus irritant derived tears.

53. Dose and Time Dependent Changes to Rotation Behavior and Immunoreactivity of Tyrosine Hydroxylase Staining in 6-OHDA Lesion Mice

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Parkinson's disease (PD) is a neurodegenerative condition in which dopaminergic neurons in the substantia nigra of the basal ganglia die, eventually leading to loss of motivation, motor control, and motor learning. There's no cure for PD. The most common treatment is levodopa. Long-term treatment decreases the therapeutic effects, and most patients develop levodopa-induced dyskinesia. Therefore, it's important to find more effective treatments, and that effort depends upon testing in animal models of the disease. The goal of this study is to validate a mouse PD model involving striatal injection of the neurotoxin 6-OHDA, which kills dopamine neurons. We examined 6-OHDA-induced changes in behavior and dopaminergic cell loss. Subjects were C57/Bl6 mice. Saline/control, low, and high dose 6-OHDA injections were given. Behavioral effect of the lesion was assessed using rotation tests. Immunocytochemistry on slices of each mouse's striatum was performed to assess the level of staining for the dopamine neuron marker, tyrosine hydroxylase (TH). The fluorescence intensity in the striatum was determined for each hemisphere and a ratio was calculated. Comparison of TH immunostaining results with the behavioral data revealed an inverse correlation of the difference between rotation directions to the ratio of TH staining comparing hemispheres. Overall, our data shows that more dopaminergic cell death and intense behavioral affects of the neurotoxin 1-2 weeks post-injection and at a dose of 4ug/ul. The results of this experiment contribute to a larger study aimed at manipulation of synaptic plasticity in striatal medium spiny neurons to relieve the symptoms of dopamine cell loss.

52. The Influence of Elevation on the Diversity of a Salt Marsh Plant

Community

Harris Steven and Lee E. Stanton

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Understanding the processes that determine plant community structure is a longstanding goal of ecology. Given that salt marshes are dominated by relatively few species and have steep environmental gradients, they make excellent laboratories to study questions relating to plant zonation and diversity. As such, we investigated the relationship between plant species abundance and surface elevation in Point aux Pins salt marsh, AL. To address our question, three transects were established in the low marsh, and extended into the high marsh. Elevation and species assemblage was surveyed along each transect every five meters and at plant zone boundaries. There were strong positive correlations between elevation and species diversity for all transects (T1: 0.800; T2: 0.923; T3: 0.937). After averaging elevation data, plant species boundaries were nearly identical in each transect. The lower marsh consisted almost exclusively of *Juncus roemerianus*, and ranged from 72.73cm to 73.74cm above sea level (ASL). The middle marsh was dominated by *Sporobolus alterniflorus* and extended to the salt panne edge, and ranged from 74.65cm to 75.97cm ASL. The high marsh began at the upper boundary of the salt panne and quickly transitioned to a diverse coastal pine community at 94cm ASL. Lastly, a scatterplot analysis examination of all transect data revealed a positive correlation between elevation and species abundance. As hypothesized, there was a gradual increase in species diversity as elevation increased. These data will be useful in understanding the zonation of plant communities and respective stressors that are present in coastal marshes.

5. Trypanosomes and Other Parasites of Birds in Mississippi

Brady Badon, Hannah McCracken, Kayla Fast, and Tracy Keener

Department of Biological and Environmental Sciences, University of West Alabama, Livingston, AL 35470

Birds are commonly infected by parasites, but not all birds are infected with the same parasites. Blood parasites known to infect birds include *Plasmodium*, *Parahaemoproteus*, *Trypanosoma*, and *Leucocytozoon*. We screened the Tufted Titmouse (*Baeolophus bicolor*) and the Northern Cardinal (*Cardinalis cardinalis*) from the same localities for common parasites. We predicted that behavioral differences between the two birds would cause imbalances in parasite infections. The two birds nest and forage in different locations within the trees. This is an important factor because the vectors are also located at different heights within the trees and spread different blood parasites through their bite. We addressed whether or not titmice and cardinals in Mississippi harbor the same parasites. Our data show that 85.6% of titmice and 82.0% of cardinals are infected with at least one genus of blood parasite. Of infected titmice, single parasite and mixed infections are as follows: *Plasmodium* (71.4%), *Parahaemoproteus* (4.8%), *Trypanosoma* (71.4%), *Plasmodium* with *Trypanosoma* (50.0%), *Parahaemoproteus* with *Trypanosoma* (2.4%), and mixed *Plasmodium* or *Parahaemoproteus* (4.76%). All cardinal infections of *Parahaemoproteus* or *Plasmodium* appear to be mixed. Titmice and cardinals are infected with many of the same genetic lineages of parasites. Titmouse infections are more likely to occur in the spring and male cardinals are infected with *Plasmodium* and *Parahaemoproteus* significantly more often than females. We will continue to screen birds for *Trypanosoma* and *Leucocytozoon*. More data will allow us to address the role of vectors in the distribution of parasite infections.

6. Finding Gold in Dirt

Dillon Baker, Jakaira Crim, and Mustafa Morsy

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The Small World Initiative is a group of faculty and students who focus on researching for novel antibiotics. Novel antibiotics are key to fighting against antibiotic resistant bacteria, which kill 23,000 people annually in the United States. Here at West Alabama, we are taking soil samples from a variety of locations, such as the nature trails and in front of various buildings, so that we can find bacteria that are producing antibiotics. We spread various Petri dishes to discover colonies that were producing antibiotics. After we identified these colonies, we isolated them by transferring samples of them into a 96 well plate. A total of 95 samples was taken for the 96 well, with each well containing a unique colony of bacteria. Among the first samples chosen were the colonies that were clearly producing antibiotics. We obtained 20 colonies that were clearly producing antibiotics out of my samples. After the 96 wells grew for an ample amount of time, we used a 96 well screening tool in order to test our isolated colonies against various common pathogens such as *E. Coli* and *staphylococcus epidermis*. We then examined our plates from our 96 well tests and chose our 5 best candidates for antibiotic producing colonies. We then spread these 5 colonies onto Petri dishes and tested 9 different pathogens against it in order to see how effective the antibiotics they are producing really are. The 9 different pathogens were *Staphylococcus epidermis*, *Staphylococcus cohnii*, *E. coli*, *enterobacteria bayly*, *bacillus subtilis*, *Salmonella newport*, *Erwinia carotovura*, and *pseudomonas putida*.

51. Precision and Accuracy of Autonomous Vehicles Through PID and Statics Control Variables

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Accuracy and Precision are two major goals that needs to be attained while working with autonomous vehicles or robots. Accuracy goals can be achieved in two ways i.e. using mechanical and or programming techniques. For e.g. (i) the mechanical techniques would be based on the strength of materials being used and the static variable estimations (ii) the programming techniques would be by manipulating the electrical switching of the controls and as well the power controls of the output speeds using proportional, Integral and Derivative PID controls.

In the present study, we will be discussing our recent findings by using the above two techniques in achieving up to an accuracy of 90% cross validation accuracy for autonomous movements. We built an autonomous robot by considering the above target goals of precision and accuracy and used it in the 2017 IEEE hardware competitions for performing the desired tasks. The sensors being used for reading the input data are optical shaft encoders that work by converting angular position of the motor into a digital output value. By feeding these values from the encoder input through the estimated PI control formula, the precision is greatly increased. In addition, the accuracy will also be maximized with Gyro sensor. The Gyro sensor will help the robot in completing tasks such as following a straight line and turning an exact number of degrees. With the use of Gyro, we will always know the direction the robot that is facing. This helps in controlling the desired turn angle and direction.

50. Object Identification and Tracking for Autonomous Vehicles using Computer Vision

Jonathan B. Steele¹, Balakrishna Gokaraju¹, Kyle B. McLellan¹
Anish C. Turlapaty³, Raymond Tesiero¹, and Rajeev Agrawal²

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Computer vision is the process of automatically gathering information from images and then analyzing it for better decision capability. This information can be used in object detection, movement analysis and 3D reconstruction. Computer vision has a wide variety of applications: everyday phone cameras focusing on faces, Xbox Kinect picking up dance moves as an input to a dance video game, and 3D models reconstruction from Magnetic Resonance Images (MRI). The objective of computer vision is to give computers the ability to identify and respond to its environment. This can be in an industrial setting where computer vision is used to inspect and identify defective bolts going through an assembly line, or in the application of self-driving cars to identify pedestrians, traffic signals, road signs and other vehicles.

Computer Vision would complement the autonomous robotics goals of accuracy and precision by adding “eyes” to the performance of the robot. We will be researching on computer vision techniques and experimenting their benefits with autonomous robotics. We investigated both Arduino Mega™ Controller Board and Raspberry Pi for analyzing the flexibility of chipset for computer vision using the 4-wire dual data bus Pixi Camera (CMU’s 5th version). Both C/C++ and Python libraries were implemented to test the vision camera using I2C and USB communication. Pixi camera scans at a rate of 50 frames per second. We investigated the object recognition, object classification and object tracking capabilities using various algorithms.

7. Finding Antibiotic Producing Bacteria on The University of West Alabama Campus

Kaylen Bendolph and Garrett Myers, and Mustafa Morsy

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In the United States, an alarming 23,000 people die each year because of antibiotic resistance. This, unfortunately, has a major impact on human health. Many of the widely used antibiotics have come out of soil. Healthy soil is a rich source of bacteria such as dark soil, gardens, marshlands, and construction sites. The areas we tested were a construction site near Hoover Residence Hall and Lake LU's Nature Trails. The goal of this study is to find unknown bacteria that may help against antibiotic resistant infections. To do this, the soil bacteria was isolated using saline solution onto a petri plate and then into a 96-well plate. We chose two plates from our total number of plates as my representative plates. We had a total of 118 bacterial colonies and 7 phenotypes. After this, we began to screen for antibiotic production using *Staphylococcus cohnii* and *Enterobacteria bayly* that were spread onto a TB media plate and applying the bacteria from the 96-well plate onto the dish. This resulted in 36 antibiotic producing bacteria. Presently, we have picked the 5 best colonies from our set of plates and used them on all 9 pathogens. Reviewing these plates, we have found that our unknown bacteria produces the most antibiotics against *Escherichia coli*, *Salmonella Newport*, *Bacillus Subtilis*, and *Staphylococcus Epidermidis*.

8. Differences in Frequency and Intensity of Canopy Disturbances

Across the Range of Eastern Hemlock

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Eastern hemlock (*Tsuga canadensis*) is a long-lived conifer tree in old-growth forests in eastern North America. This tree can be a valuable record of historical disturbance regimes. In this study, tree-ring chronologies from eight eastern hemlock stands were used to determine differences in canopy disturbances using the radial-growth averaging criteria. We hypothesized that across the range of eastern hemlock, canopy disturbance would be similar in intensity and frequency. We rejected our hypothesis because this study showed a diversity of disturbance patterns across stands. This heterogeneity is likely due to extreme weather events, logging, insects or pathogens. Eastern hemlock is a foundational species that provides habitat for wildlife, aquatic species, and later successional plants and our results imply old-growth forests are highly diverse which makes conservation efforts difficult.

49. AKH Mediated Stress Tolerance and Nicotine Addiction in

Drosophila melanogaster

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AKH (Adipokinetic Hormones) is a small neuropeptide that is secreted from the insects brain. AKH controls energy metabolism by mobilizing lipid and carbohydrates in insects. The AKH function is similar to the glucagon hormone in mammalian system. Since AKH controls stress tolerance in insects and perform similar functions like glucagon, we are interested to see whether AKH pathways interact with nicotine induced physiological stress.

In the first set of experiment, we tested the dose response of nicotine using wild type male flies (W1118). Next, the AKH mutant flies will be used to work out the effect of a selective dose of nicotine and its interaction with AKH pathway. Different doses of pure nicotine (10mM, 5mM, 2.5mM, 1.25mM, and 0.625mM) mixed with 5% sucrose solution were used for the treatment. A 5% sucrose used as negative control. The stress tolerance was recorded till day 7 under continuous exposure to nicotine. We observed that higher doses of nicotine are very toxic to male flies and kills within 24 hours. However, low doses also have the negative effect in stress tolerance.

Thus, we conclude that excessive consumption of nicotine is very toxic. To conform the AKH link to nicotine, we planned to expose the AKH mutant flies to a selective dose of nicotine to record the stress tolerance. The detail findings will be discussed during the conference.

48. AKH Mediated Stress Tolerance and Addiction in *Drosophila melanogaster*

Cayla Skinner¹, Natraj Krishnan² and Anathbandhu Chaudhuri¹

¹Department of Natural Science, Stillman College Tuscaloosa, AL 35401

²Department of Biochemistry, Molecular Biology, Entomology and Plant Pathology, Mississippi State University, MS 39762

This experiment focuses on AKH Mediated Stress Tolerance and Addiction in *Drosophila melanogaster*. AKH (Adipokinetic Hormones) is a small neuropeptide hormone that is secreted from the insects brain. AKH controls energy metabolism by mobilizing lipid and carbohydrates in insects. The AKH function is similar to the glucagon hormone in mammalian system. Since AKH controls stress tolerance in insects and perform similar functions like glucagon, we are interested to see whether AKH pathways interact with nicotine induced physiological stress. In the first set of experiment, we tested the dose response of nicotine using wild type male flies (W1118). Next, the AKH mutant flies will be used to workout the effect of a selective dose of nicotine and its interaction with AKH pathway. Different doses of pure nicotine were used (10mM, 5mM, 2.5mM, 1.25mM, and 0.625mM) and mixed with 5% sucrose solution for the treatment. A 5% sucrose used as control. The stress tolerance was recorded till day 7 during the nicotine exposure. We observed that higher dose of nicotine is very toxic to male flies and kills within 24 hours. However, low doses also have the negative effect in stress tolerance. Thus, we conclude that nicotine excessive consumption of nicotine is very toxic. To confirm the AKH link with nicotine, we designed to expose the AKH mutant flies to nicotine. The detail research will be present during the conference.

9. Fresh garlic cloves vs. granules: testing best suppressor of the pathogenic bacterium *Escherichia coli*

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The pathogenic bacterium *Escherichia coli* (*E. coli*) causes nearly 100,000 illnesses, 3,000 hospitalizations, and 90 deaths annually in the United States alone. *E. coli* is more prominent in the lower intestines of humans and animals and is generally a food borne illness. Antibiotics are used in the treatment of bacterial infections and used as a prevention method after surgeries that are at high risk of developing a bacterial infection. Garlic, a commonly used spice, has been reported to have antibacterial activity, a substance that suppresses bacterial growth or their ability to reproduce. Garlic is known to detox the body of heavy metals, like lead and reduce toxicity. Garlic is also proven to reduce risk of high blood pressure and infections, like the common cold. A chemical compound called allicin is present in garlic, which helps garlic kill off microorganisms. Many researchers have screened garlic against *E. coli* and found that garlic, in the form of slices, inhibit the growth of *E. coli*. We plan to examine the different forms of garlic, fresh garlic cloves and garlic granules, as it produces antibiotics to inhibit pathogenic growth to examine which garlic form produces the best inhibition zone, a clear area around the garlic that indicates where the bacteria have been suppressed. We expect the fresh garlic to have more active antimicrobial compounds, which will be the most effective at suppressing pathogenic growth, while the granulated garlic will have less growth suppressing effect due to industrial processing that is involved in spice production.

10. Radial Growth Response of Coniferous and Deciduous Trees to

Late Growing-Season Frosts in Michigan

Abigail S. Coley^{1,2}, Ketia L. Shumaker², and Carolyn A. Copenheaver¹

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Extreme climatic events, such as late frost, may have a greater impact on long-term tree growth than previously realized. We tested whether late frost reduced tree-ring growth in coniferous and deciduous trees. To observe differences in tree-ring width during frost and non-frost years, we used superposed epoch analysis and a t-test to analyze tree-ring data from three coniferous (eastern hemlock, white pine, and red pine) and three deciduous (red maple, red oak, and bigtooth aspen) trees. The frost years had significantly narrower ring widths than non-frost years ($t = -4.261$, $P = 0.004$). There was no evidence that deciduous trees had a greater reduction in tree-ring width than coniferous trees during frost years. Therefore, late frosts reduce growth in both coniferous and deciduous trees.

47. Antibiotic Producing Bacteria from the Black Belt Soil

Isabelle Ross, Mason Swain, and Mustafa Morsy

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A decrease of antibiotic discovery and development has been noticed around the world for many years leading to increase in number of antibiotic resistant bacteria. The cost of the antibiotic industry is approximately 83.6 billion dollars and about 50% of the antibiotics made are misused. People are harmed by antibiotic resistant infections, super bugs, infecting approximately 2 million in the United States (of those about 30,000 are killed) and 10 million worldwide. If no new antibiotics are developed, 10 million worldwide could die every year by 2050. Antibiotics are found in bacteria that could be anywhere. Our goal is to discover unknown antibiotics and useful bacteria in our soil samples to fight against resistant bacteria. We are determined to have a soil collection that is producing antibiotics, accepting the possibly hardships along the journey. We found over 1000 bacteria colonies from the plates we put our soil. After some repeated attempts we took each of the best inhibition zone colonies and put them in a 96 well plate. We later stamped the colonies in the 96 well plates on 4 different pathogens (*E.coli*, *staphylococcus epidermidis*, *Erwinia Carotovuru*, *Actino-Bacteria*) to test their resistance. We chose 5 true antibiotic producing bacteria of many phenotypes between each other. We had 2 phenotypes that appeared red, 2 that were dark yellow, and one with a star-shaped inhibition zone. With further research into the bacteria the soil within the premises of Livingston could have an impact due to the environmental factors in the black belt of Alabama.

46. Savior's In the Soil

R. J. Rodgers, Harlee McLean, and Mustafa Morsy

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Antibiotic resistance bacteria are killing people everyday. In the US only, more than 23,000 people die annually from antibiotic resistant bacteria like MRSA. The numbers of death increase significantly worldwide. To solve this problem, there is a dire need to discover novel antibiotics that can be used to treat such bacteria. Researchers are turning to finding bacteria that live in the soil that may be able to produce antibiotics to kill this resistance bacteria. In our experiment we found a place where we may think the best bacteria are. We collected from a swamp and here on campus. Once we collected the soil, we spun it down to get the bacteria solution. After this we spread a serial dilution it on four Petri dishes. After we grew our bacteria for 24 hours we were able to see whether we had flourishing bacteria or not. We collected 95 bacteria colonies and placed them in a 96-well plate to test their antimicrobial efficiency against a safe relative of pathogenic bacteria. We tested on *Staphylococcus e.* and *Salmonella*. We replicated and saw whether we had antibiotic producing bacteria or not. We identified 15 bacteria that may be antibiotic producing. Once we found our bacteria we took and made a 300ml solution and spread our 5 bacteria solution and tested it on 12 pathogens. We tested them and found that 3 of the 5 bacteria had died. Though we had an effect on killing *Salmonella* and *Staph*. Even though one of the pathogens did not have a decent colony size, we will replicate and test again. After this testing, will stock the bacteria for antibiotic producing to help the cause of killing resistant bacteria.

11. Isolation and Characterization of Mycobacteriophage Telulah

Nick Noland, Caleigh Cook, Kayla Fast, and Tracy Keener

Department of Biological and Environmental Sciences, University of West Alabama, Livingston, AL 35470

Bacteriophages are viruses that infect bacteria. The overall goal of this project was to discover a phage, particularly one with a high enough DNA concentration to be sequenced. We were able to accomplish this by collecting soil samples, from which we found three phages and donated two to other students. We extracted a phage which infected the bacteria *Mycobacterium smegmatis* mc²155 from the soil using a plaque assay, spot testing, making webbed plates, and setting up restriction enzyme digests for gel electrophoresis. We discovered a phage (Telulah) in dry soil near a designated smoking area and prepared it for DNA sequencing. The phage was imaged with a transmission electron microscope and we discovered it has a long tail.

12. A Histopathological Study of Human Breast Cancer in Athymic

Nude Mouse Model

Trinity Curry¹, Tyra Craig^{1*}, Kim Lackey², Anathbandhu Chaudhuri¹

¹Biology Department Stillman College, Tuscaloosa, AL

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Breast Cancer is an uncontrolled growth in the cells of the breast. This form of cancer is the more commonly diagnosed in women, but men are susceptible to the disease. Breast cancer is the second leading cause of death in African-American women in the United States. An estimated 12.4% of women will develop breast cancer. Breast cancer can metastasize to the lungs, bones, liver, or brain tissues. Present study aimed to observe whether human breast cancer cells form a primary tumor in mouse model to find out the metastatic ability in different tissues. GFP tagged human breast cancer cells transplanted to the Athymic nude mouse and conducted an eosin and hematoxylin staining to identify the cancer tumor and metastasis in tissues. We reveal that human cancer cells successfully form a tumor in the breast area and metastasized at least in lung tissues. Further experiment is under progress.

45. Age Dependent Stress Tolerance and Dopamine Interactions in

Drosophila melanogaster

Tabitha Robinson, Franklin Fairly, Roshinique Johnson, and Anathbandhu Chaudhuri

Biology Department, Stillman College, Tuscaloosa, AL

Stress is essentially a physiological response where body releases a number of different chemicals and hormones in order to maintain homeostasis. Stress causes several physiological disorder like, diabetes, obesity, mental defects blood pressure etc. Recent studies show that Africans Americans suffer more in stress related issues which increasing by forty-four percent compared to the last year. Dopamine is a neurotransmitters released by the brain have significant control in stress response. Present experiment aimed to find out the effects of dopamine in age related stress response in fly model. In the first set of experiment we used one week old male transgenic flies having mutations in different dopamine synthesis pathways to expose the starvation stress. High dopamine mutant flies (*catsup*¹) survive longer compared to low dopamine mutant (*Z²²*) and control flies. Thus, dopamine plays a significant role in stress tolerance. The experiment is under progress with various ages of flies to see the age dependent stress tolerance.

44. Impacts of Invasive *Xiphophorus helleri* in Florida Streams

Bayleigh Roberts, Mallory Warren, Chance Caylor, and John McCall

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Non-native species can prey on native species, compete with them for resources, and exhibit behavioral aggression. Furthermore, the movement of species within ecological systems, often as a result of anthropogenic forces, has increased dramatically in recent decades. As a result, the impact of invasive species is seen as one of the major ecological issues of the 21st Century. This project focuses on the green swordtail (*Xiphophorus helleri*), an invasive live-bearing fish in the Family Poeciliidae, and its impacts on fish assemblages in the Florida Panhandle. In particular, the impact of *Xiphophorus* on another poeciliid, *Gambusia holbrooki*, was examined. Invasive populations of *Xiphophorus* were identified at two locations in the Florida Panhandle, one on Hurlburt Field in Fort Walton (Okaloosa County) and another in Jacksonville in Duval County. Fish assemblages were sampled and quantified at five sites in Okaloosa County and a single site in Duval County. At most sites, *Xiphophorus* was found to have significantly impacted the native fish assemblage. In addition, *Xiphophorus* and *Gambusia* from all six sites were examined for fecundity, size distribution, and sex ratios to examine the impact of *Xiphophorus* invasion.

13. Prospecting for the Presence of *Staphylococcus aureus*

Bacteriophage in Breastmilk and Neonate Chyle

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Breast milk is composed of crucial bacteria that aid in the development of a newborn's immune system. These bacteria are the building blocks of their intestinal flora. Babies fed strictly breast milk are healthier than babies that are fed formula, but the mechanisms for this are unknown. We hypothesize that bacteriophages from the breast milk are altering the microbiome in the gut that is beneficial to the baby. To test this hypothesis, we designed PCR primers for bacteriophages that infect *Staphylococcus aureus*. The genus *Staphylococcus* is one of the main bacterial components of breast milk, but *S. aureus* is a known human pathogen and a likely target of symbiotic bacteriophages. Primer design required three steps; 1) we ran DNA sequences through Bioedit to find the conserved regions across five *S. aureus* genomes, 2) we used the Primer3 program to design primers using the conserved regions, and 3) we used BLAST to identify putative gene functions. We found four viable primer sets corresponding to partial sequences of the dUTPase gene (x2), a repressor gene and a hypothetical gene with unknown function. We are using a custom PCR assay of *S. aureus* phage in milk and chyle.

Bacteriophages recovered from this project could be used as a probiotic to prevent *S. aureus* infection in preterm neonates.

14. Specialists and Generalists: How Feeding Habits Relate to Moth

Proboscis Morphology

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Morphological traits of butterfly proboscises have been shown to be good indicators of what types of food sources butterflies visit, but the same has not been determined for moths. In general, moths that are nectar specialists are expected to have similar proboscis morphology, and moths that are fruit specialists are expected to have similar proboscis morphology. However, the two specialist groups have considerably different proboscis morphologies when compared; moths that are nectar specialists have proboscises without spines and minimal ornamentation, while moths that are fruit specialists have proboscises with spines and more ornamentation. Generalist moth proboscis morphology is not extensively documented, and generalists are only said to have an intermediate morphology between nectar specialists' and fruit specialists' proboscises. The purpose of this project is to identify morphological traits that have been attributed to specialist moth species' proboscises, and to identify specific morphological traits of generalist moth species' proboscises. Identification of generalist moth proboscis morphology will allow for determination of how generalist moth proboscis morphology is similar to, or different from, specialists' proboscis morphology. If moth proboscis morphology is related to the food source moths visit, then moths should have adaptations that match their food sources; specialists that visit open food sources should have wider, more ornamented proboscises that allow them to blot, specialists that visit flowers should have thinner, less ornamented proboscises that allow them to drink from the narrow tubes of corollas, and generalists that feed on both food sources should have intermediate proboscis morphology.

43. The Role of Social Support in Post-Traumatic Stress Disorder

Severity

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Social support has been found to have a negative relationship with post-traumatic stress disorder (PTSD) severity (Brewin, Andrews, & Valentine, 2000). For example, service members who received social support while deployed in a combat environment exhibited lower PTSD symptoms than those supported either before or after the deployment (Han et al., 2014). Although there is evidence that social support relates to PTSD severity, questions about the boundary conditions of that effect remain. This project aimed to determine for whom social support is most likely to lower PTSD severity in a military population. We hypothesized that individuals with high levels of depression would especially benefit from social support, whereas individuals with lower levels of depression might see a weaker relationship between social support and PTSD. 68 Military veterans completed surveys measuring secure base (social support), depression, and PTSD. Results indicate that having a secure base correlates with lower PTSD severity in individuals with moderate to high depression. One may infer that individuals with higher levels of depression may seek out more social support than those with lower levels of depression. However, one could also infer that social support is not as effective in those with lower levels of depression. Limitations such as sample size, variability of trauma, and period of service in the military should be considered. Future research should include longitudinal studies to examine shifts in social support throughout military service to assess its effects on depression and PTSD.

42. Oral Hygiene Habits and Knowledge among Marengo County

Teenagers

Daniel Ratcliff and Tracy Keener

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Dental issues are one of the most prevalent of all diseases. It is a major health problem in most industrialized countries, affecting 60-90% of school aged children along with the vast majority of adults. Dental care is considered the most prevalent unmet health need in U.S. children, with rural children having the greatest unmet dental needs. Dental visits or dental problems account for over a million hours of school time lost annually. The aims of this study were to determine the prevalence of oral hygiene practices and basic dental health knowledge among teenagers in Marengo County, Alabama. Our study involved 188 teenage students that attended school in Marengo County; one city school and one county school. Demographics consisted of 66% females and 34% males from Caucasian, African American, and Other. We found that most of our participants brush and floss but do not know basic dental health. We also discovered a huge disparity between our ethnic participant groups in regards to orthodontic treatment.

15. Caffeine affects the Reproductive Functions of *Drosophila*

melanogaster: A Model System to Study Human Diseases

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Caffeine is one of the most commonly used psychoactive chemicals in our food and beverages. Caffeine has several negative effects on human health. Dopamine (DA) pathway a reported target of caffeine which alters sleep pattern in humans. Recently it has been reported that caffeine consumption has been linked to abortion, preterm birth and fetal growth restriction in humans. However, the mechanism of caffeine actions on reproductive behavior is still lacking. We used fruit flies, *Drosophila melanogaster* to study the effect of caffeine on the reproductive function, a common model system that has close genetic analogy to humans.

Present research is to determine the impact of caffeine on the reproductive functions in *Drosophila melanogaster* and the possible link to DA pathway. We observed that high doses of caffeine alter the biological clock and completely changes the rhythmicity in fruit flies. Also, we discovered that caffeine has a significant link to the DA synthesis pathway to alter the movement behavior.

Adult male and female flies were fed with caffeine with 4% sucrose solution for 48-72 hours and observe the basic reproductive behavior of male and female flies together with the production of functional adults. The experiment is under progress and the details will be presented in the conference.

16. Community Based Participatory Research on Youth Sexual

Health Education: A Student's Perspective

Sherilyn Garner, Jamie Keith, Christina Clark, Brook Araya, Kortland Hudson, Alison Footman, Erin Boyd, Susan Davies, Tina Simpson, and Robin Lanzi

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The proposed presentation, will present a summary of my directed research on a community based participatory research (CBPR) study on youth sexual health education in Alabama. This CBPR study was designed to survey a representative sample of all Alabama school systems to assess the scope and content of sexual health education provided in Alabama's public schools. Based on CBPR principles, this partnership was formed between the Alabama Campaign to Prevent Teen Pregnancy (ACPTP) and the University of Alabama at Birmingham (UAB) Department of Health Behavior in the School of Public Health and Department of Pediatrics in the School of Medicine and approved by the UAB Institutional Review Board. All aspects of the study were developed, implemented, and analyzed together with the community and academic partners. My role was to work with the team to develop the school based phone interview script, role play the phone interview script, discuss adjustments that needed to be made to the phone interview script and process for conducting the phone interviews, conduct phone interviews, and enter the data. My presentation will share the CBPR process and how it was essential to the development, implementation, and analysis of the study. I will share lessons learned and recommendations for future studies on youth sexual health education.

41. Seismic Studies on the Cascadia Margin using Tomography

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The Cascadia margin, located on the west coast of the United States and Canada, is one of the most seismically active regions in the world. The last major earthquake on this margin occurred in January 1700. The time span between massive earthquakes is 300-700 years. This places us in a time where another major earthquake can happen any moment. Currently the plates are in a locked position building more stress. This region consists of a subduction zone, where one plate slides beneath another plate, stretching from southern British Columbia to northern California. As a result of the Juan de Fuca plate sliding beneath the North American plate, sediments were scraped off and formed an accretionary complex. Associated with these accretionary ridges are areas indicative of slope failure, some of which have the capability to generate tsunamis. There is also evidence for probable association between slope failure and the presence of gas hydrates in the accretionary sediments. Hydrates contain enormous amounts of methane gas, a potential future energy resource. When hydrate dissociates, it triggers slope failure as well as releases methane gas that goes in to the atmosphere and effects climate. In this study, we use seismic data collected previously on this margin to understand (1) natural hazards, and (2) natural resources. Subsurface images obtained using advanced geophysical imaging techniques show faults beneath the subsurface, fluid seeps, and underwater mountains, which provide clues about the subsurface dynamics along the Cascadia Subduction Zone.

40. Nicotine Modulates Stress Tolerance and Movement Behavior in

Drosophila melanogaster: Is Dopamine Pathway a Target for

Nicotine

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Nicotine, commonly found in tobacco products, causes nearly six million deaths each year. Smoking causes cancer, stroke, lung diseases, heart disease, and diabetes. It also increases the chance of getting certain eye diseases, tuberculosis, and problems with the immune system such as rheumatoid arthritis. Since exposure of nicotine negatively affect the human health, we hypothesized that dopamine (DA) pathway could be a possible target for nicotine. To test the hypothesis we used the flies having mutations in different dopamine synthesis pathways (*catsup*¹ produce high DA; *Pale*² produce low DA). Wild type flies (*w¹¹¹⁸*) was used as control. Only female flies were used for this experiment. Different doses of nicotine (10mM, 5mM, 2.5mM, 1.25mM, and 0.625mM) mixed with 5% sucrose solution were fed to the wild type flies to find out a dose response conducting stress tolerance experiment. The control group of flies always fed with only 5% of sucrose solution. The test results showed that the 10 and 5mM doses of nicotine are extremely toxic.

Thus, a selective dose of nicotine (2.5mM) was fed to the DA mutant flies to monitor the daily activity pattern using Trikinetics fly monitoring instrument. We have recorded a differential movement behavior in DA mutant flies. Since DA is one of the key regulator to control movement behavior and stress tolerance we conclude that nicotine have significant link to DA synthesis pathway.

17. Investigation of the Function of ETV1 in Zebrafish Intestinal

Motility

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The interstitial cells of Cajal (ICC), the pacemaker cells of the gut, play a pivotal role in mediating proper functioning of the gastrointestinal tract. Slow waves generated by these cells coupled with neural input from the enteric nervous system (ENS) stimulate contractions within the gut known as peristalsis. Previous work has implicated ICC in various gastrointestinal diseases with intestinal motility being compromised where ICC are sparse. Currently, there are no reliable early embryonic markers of ICC in zebrafish. This study investigates whether the gene ETS transcription factor ETV1 is a potential marker for ICC. We determined ETV1's embryonic expression pattern by in-situ hybridization. We then performed a gene knockdown using morpholino anti-sense oligonucleotides and examined intestinal motility and ENS development in ETV1 morphants. Morphant intestines isolated from transgenic zebrafish expressing GFP in their enteric neurons revealed no significant loss of enteric neurons. However, time-lapse movies of peristalsis in morphant and control intestines revealed that morphants exhibited uncoordinated peristalsis. Taken together, these results are consistent with our working hypothesis that ETV1 is essential for normal ICC development and gut motility in zebrafish. To further validate this hypothesis, we are using immunocytochemistry to determine the development of the ICC and ENS networks in control and ETV1 morphant zebrafish.

18. Herbaceous Vascular Plant Biodiversity in an Open Blackland

Prairie of Greene County, Alabama

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The Black Belt region of Alabama, named for its dark, rich topsoil, was historically typified by the floristically diverse and open Blackland Prairie ecosystem. Largely due to agricultural practices, less than 1% of intact prairie habitat remains. As a threatened ecosystem, Blackland Prairie ranks as the second most important terrestrial habitat in Alabama and supports greater than 20 species of imperiled organisms including approximately ten species of vascular plants. Although this ecosystem is lauded for its plant biodiversity, no recent studies have attempted to compile a complete plant inventory for this system over the course of an entire year. In this study, we aim to complete a year-long floristic survey of an intact Blackland prairie near Mt. Hebron, in Greene County, Alabama. Beginning in August 2016, during frequent visits, we have collected, preserved, and identified all fertile herbaceous vascular plants from the open prairie. Thus far, we have identified 98 species representing 25 different families. Of those 98 species, the sunflower family (ASTERACEAE) was most represented with 35 taxa while the legume family (FABACEAE) was representative by 10 taxa. Once our annual bioinventory survey is complete, the specifics of this flora project will be used as a baseline for prairie management and restoration. Additionally, we will use the data to publish a Blackland Prairie manager resource guide.

39. Effect of polyamine homeostasis on resistance to the anticancer ruthenium complex KP1019 in yeast

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Platinum-based chemotherapies are commonly used to treat cancer. However, due to limitations of platinum-based chemotherapies, including potentially harmful side effects and resistance to anticancer drugs, scientists are looking at other metals to use in new cancer drugs. One such example is KP1019, a ruthenium-based drug that causes oxidative stress and DNA damage in cancer cell lines as well as the model organism *S. cerevisiae*. Here we show that loss of the yeast polyamine transporter Tpo1 increases resistance to KP1019. Consistent with previous studies on oxidative stress, yeast lacking *TPO1* display altered timing of the KP1019-induced stress response. Specifically, following KP1019 treatment *tpo1Δ* yeast induce expression of the chaperone Ssa1-GFP more quickly than wild-type controls. Although the signaling pathways responsible for this altered timing and the resulting stress resistance are not well understood, it was previously proposed that elevated polyamine levels played a role. To test this hypothesis, we overexpressed Spe2, which catalyzes the rate-limiting step of polyamine synthesis. Results indicated that increasing expression of Spe2 did not have a significant influence on KP1019 resistance. Future studies will examine whether deletion of *SPE2* influences KP1019 resistance or timing of the KP1019-induced stress response in *S. cerevisiae*.

38. Synthesis and Characterization of the Zinc Complex of

5,10,15,20-tetra[3,4-dibenzyloxyphenol] Porphyrin

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Porphyrins exist abundantly in nature and perform life sustaining functions in many organisms. For example, the heme prosthetic group in hemoglobin. It is responsible for binding the oxygen that is carried throughout our body. Chlorophyll, yet another example, is responsible for light absorption in the photosynthesis of plants. The properties exhibited by porphyrins found in nature make them potentially useful in many applications. Zinc porphyrins have been found to be useful in light absorption for solar cell applications. The objective of this research is to synthesize porphyrins that show potential for these applications. This paper reports the first synthesis of the zinc complex of 5,10,15,20-tetra[3,4-dibenzyloxyphenyl]porphyrin. It was synthesized using conventional methods of porphyrin metalation and was purified using silica gel column chromatography with chloroform as the eluent. Its electronic absorption spectra exhibited a shift in the Soret band and disappearance of some of the Q bands as was expected upon metallation of the porphyrin. The zinc complex exhibited a Soret band at 426 nm and Q bands at 552 nm and 594 nm with corresponding molar absorptivities of $3.1 \times 10^5 \text{ cm}^{-1}\text{M}^{-1}$, $1.5 \times 10^4 \text{ cm}^{-1}\text{M}^{-1}$ and $5.5 \times 10^3 \text{ cm}^{-1}\text{M}^{-1}$. The zinc complex gave an emission at 606 nm upon excitation in the Soret band and the quantum yield for the zinc complex was determined to be 0.08 upon excitation at 515 nm. Additional characterizations of this compound are currently underway.

19. Curcumin Rescues Spectracide Induced Movement Disorders in

Drosophila Melanogaster

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Spectracide®, an atrazine-based herbicide that is widely used in the United States, while it has been banned in Europe because of its potential harmful impact on human's health. Atrazine, diquat dibromide, fluazifop-p-butyl and dicamba are the common toxic ingredients of Spectracide® that usually cause birth defects, central nervous system dysfunctions, prostate cancer, liver enlargement, kidney damage and other health impairments in humans. Previous reports from our laboratory confirms that this herbicides cause movement disorder in fly model and disrupt the biological clock function and significantly decrease the stress tolerance. Also, Spectracide cause oxidative damage in fly tissues. Since dopamine is one of the key regulators to control the movement behavior, we are interested to see whether dopamine neurons are being affected due to exposure of Spectracide®. In first set of experiment, we examine the effect of Curcumin on Spectracide® induced movement disorders in fruit fly model. The objective is to find out if curcumin would restore normal mobility in the fly and replenish what was lost due to Spectracide. Since dopamine defects cause movement disorders we hypothesized that curcumin have neuroprotective effects to restore the dopamine functions.

Male and female *w¹¹¹⁸* wild type flies were used to study the effects of Spectracide® and Curcumin on the movement and jumping behavior. A 10% Spectracide mixed with 5% sucrose and curcumin 1mg/ml + 10% Spectracide® were fed to the flies to test movement behavior. Only 5% sucrose used as negative control. We observed that fly mobility was restored in curcumin treated flies to certain extent. However, no changes were observed in jumping behavior when fed with curcumin in addition to Spectracide®.

We concluded that curcumin rescues from Spectracide® induced movement defects and possibly act as a neuroprotective agent. We planned to study the effect of curcumin on stress tolerance negatively affected by the Spectracide®.

20. Phylogenetic and Morphological Analyses of the Everglades

Pygmy Sunfish (*Elassoma evergladei*)

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Pygmy sunfishes are a group of morphologically distinctive, but poorly understood freshwater fishes of the southeastern United States. We investigated the taxonomic divisions within the species *Elassoma evergladei* using phylogenetic and morphological data. *E. evergladei*, known as the Everglades pygmy sunfish is commonly found in the Everglades and Atlantic coastal plain habitats. Environmental changes have recently led to concern within the fish's range because of fluctuations in population density and habitat loss. Recent changes could be leading to hybridization patterns with *Elassoma zonatum*, a closely related species within its range of the Atlantic coastal plain. Furthermore, geographical isolation north of the Everglades may be a mechanism driving diversity. We have collected representatives of the Everglades Pygmy Sunfish from all major watersheds and physiographic provinces within the species range. Morphological data include the number of dorsal spines, dorsal fin rays, caudal fin rays, pectoral fin rays, lateral series scales, and head scales. In conjunction, we have constructed a phylogenetic tree using mitochondrial data. This novel phylogeny revealed two well-supported and geographically restricted clades (North Carolina and Alabama). Morphometric analyses revealed wide variation in body shape, but no significant differences among the three groups. Head scale count distinguished populations from Alabama and extreme west Florida from all other populations. Morphological and molecular data provide evidence for a monophyletic clade within the range of *E. evergladei*. We propose a new species of Pygmy Sunfish, which is geographically restricted to the Mobile and Perdido River drainages of southern Alabama and western Florida.

37. The Synergistic Effects of Isothiocyanate and Apigenin on the Growth of Tramp-C Cancer Cells using the MTT Cell Viability Assay

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There are components in plants that play a significant role in reducing prostate cancer. Men are encouraged to intake these products which may be beneficial in the prevention of prostate cancer. Two such foods are cruciferous vegetables and chamomile. We have used murine Tramp-C prostate cancer cells to perform experiments. These cells are generally used for research on prostate cancer. Studies have shown that men who supplement their diet with either cruciferous vegetables or chamomile can significantly reduce their levels of prostate-specific antigen (PSA). There are several components that, previous studies have shown, reduce metastasis in prostate cancer cells. Phenyl isothiocyanate is found in cruciferous vegetables, and apigenin is found in chamomile. The purpose of this research is to determine if the combination of these components have a direct effect on the growth of these cells. We will present data showing the difference in the growth of cells treated and not treated with these components.

36. Regenerating Agricultural Soil of the Black Belt Region Using

Bio-fertilizer

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Sumter County, as well as other centrally located counties with numerous towns and cities in Southern Alabama are part of the Black Belt Region. Counties in this region are widely known for their agriculture products and farming. A common problem encountered by many farmers and blue-collar workers in this area is that of overuse of agricultural soil, leading to poor crop outcomes, and low incomes for that season, due to the inability of crops to grow. Restoration efforts have been made with bio-fertilizers such as actinomycetes, rhizobium, and mycorrhizae. Our focus is on bacteria, although, fungi have aided in soil fertility through the interactions of other microbes such as bacteria, viruses, and other fungi. The aim of this project is to regenerate the fertility of black soil, abundant in this area, to provide sustainability in a much-needed industry through the isolation and identification of bacteria that aid in generating soil fertility to promote healthy plant growth. Preliminary work comparing microbial diversity in black vs non-black soil samples on microbiological solid/agar media demonstrated differential colony morphology of bacteria, thus suggesting a variation of bacteria in black vs other soil types compared. Additionally, spore-forming/heat-resistant bacteria with varied colony morphologies were detected in all soil types following heat treatment at 80°C. Further experimental findings on 16S rRNA bacterial identification and inoculated validation tests could lead a soil fertility generating revolution not only in Sumter County and the Alabama Black Belt Region, but nationwide by the studying of soil content and microbial interactions.

21. An In-depth Examination of the Blackbelt Ticks and the

Pathogens They Harbor

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In the past few decades, tick-borne diseases have become more frequent across the United States; therefore, the need for further research into tick-transmitted pathogens and their vectors has dramatically increased. Understanding the cycle of these diseases, host-pathogen relationships, and the frequency/location of these diseases is critical to preventing their spread. There are currently sixteen known tick-borne diseases in the United States, with Lyme disease being the most prominent. The goal of our research is to survey ticks in the Blackbelt region of Alabama to determine the frequencies of these diseases and to better understand their cycle. We began collecting ticks in 2016 from various areas within the Blackbelt: farms, veterinary clinics, and deer processing sites. We recorded the location, date, species, and condition of all ticks collected. We then extracted the DNA from the ticks and obtained positive controls known to possess the pathogens we are examining. Our next step was PCR to amplify the DNA and view the results using gel electrophoresis. Thus far, we have completed PCR amplification and gel electrophoresis on all 75 of our samples and have found possibly 10 to be positive for Lyme. These samples are currently being sequenced to determine the accuracy of our results. Our ongoing research is focused on the identification of several other tick-borne pathogens in the Blackbelt region, such as Ehrlichia, Rickettsia, and Anaplasma. We will use the same extraction/analysis methods for our future samples and compile our data to gain more insight into tick-borne pathogens in the Blackbelt.

22. Glyphosate and Atrazine Toxicity on the Reproductive

Development in Fruit Fly, *Drosophila melanogaster*

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Pesticides includes insecticides, herbicides, and fungicides that are commonly used to control pest and weeds. There are five pesticides which are banned in European countries while still available in the United States which includes: Neonicotinoids, Paraquat, Dichloropropene, Glyphosphate and Spectracide. Our previous experiment confirms that Spectracide and Round-Up significantly alter the movement behavior and stress tolerance by altering the circadian clock in the fruit fly model. The present research was conducted to investigate the effects of the herbicides on reproduction. Atrazine the main active component in Spectracide cause endocrine disruption, affects reproduction, increases the risk of cancer and causes severe eye injuries. Glyphosate the active ingredient in Round-Up also causes various cancers. We aim to find out the effects of these herbicides on reproductive function and its subsequent effect on stress tolerance and the daily activity pattern of F1 generation produced by the drug fed parents. Interestingly, Round-Up increased the production of the F1 generation while Spectracide significantly decreased the amount of the production of functional adults. The Trikinetics daily activity monitor was used to record the individual movement of adult flies from the F1 generation to explore the consequential effects on the offspring. The offspring from the drug fed generation indeed showed the disruption in the biological clock and behaved arrhythmic as the parents.

Thus, we conclude that the active ingredients in Round-Up and Spectracide could possibly perturb the dopamine function as revealed from movement disorder in *Drosophila*.

35. Service-Learning As a Means to Foster Values of Civic

Engagement and Sustainable Practices in a Large Enrollment Non-Majors Biology Class

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National calls on reforming undergraduate education have highlighted the need to relate abstract concepts in biology to real-world examples on a regular basis. This is especially important for non-majors who may not otherwise realize the value of scientific processes in their day to day life. One among the suggested interventions to help bridge this gap includes service-learning. Involving undergraduates in service-learning projects has been regarded as one of the effective ways to make biology seem relevant to their lives. We therefore, decided to explore the impact of service-learning on civic engagement and sustainable practices by introducing a new learning module on global climate change in a large enrollment non-majors biology class. To assess student learning gains, we used pre and post assessments around the service-learning module as well as focus group interviews to evaluate student outcomes. We received affirming student feedback and observed 30% increase in student's willingness to change their daily habits as a result of completing the service learning module. These findings therefore suggest that educators can easily utilize interventions like service-learning to better engage non-majors and also help foster values related to civic engagement and sustainable practices.

34. Does Curcumin Rescue from Paraquat (PQ) Induced

Reproductive Dysfunction in *Drosophila melanogaster*?

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Paraquat (PQ) is a toxic chemical widely used as an herbicide in the United States, but is banned in most foreign countries. Paraquat use in commercial farms is to kill or stop the growth of weeds and grass. PQ is also known to be a very strong neurotoxic agent and has had strong negative effects on human health. Exposure to PQ is cited as a high risk factor for Parkinson's disease, and can also lead to heart failure, kidney failure, liver dysfunction etc. Curcumin is a chemical produced by turmeric plants. Curcumin has been proven to fight multiple sclerosis, rheumatoid arthritis, psoriasis, multiple types of cancer and promotes liver and kidney health amongst other health benefits. This study was conducted to examine the paraquat induced reproductive dysfunction, mobility and life span to determine the rescuing property of curcumin. Wild type *w¹¹¹⁸* flies were used to study the effects of PQ and curcumin on the reproduction in fly model. In this experiment we fed the drugs to the flies in 3 different groups: control (5% sucrose), paraquat (1.0mM), and paraquat (1.0mM) +curcumin (1mg/ml) in 5% sucrose solution. Both the male and females were fed four days to study the mobility, life expectancy and reproductive performances.

We observed that PQ significantly reduce the mobility and reproductive deformity. Curcumin rescues the fly from PQ induced negative effect of life expectancy. However we did not find any positive effect of curcumin on movement behavior and reproductive function.

We conclude since dopamine is a key neurotransmitter to control movement behavior and reproductive function, we predict that PQ perturbs dopamine function and eventually negatively affects the reproductive development. We planned to alter the timing and dose of curcumin to get the better results on reproductive function.

23. An Active Learning Module to Enhance Understanding of Osmosis and Diffusion

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Osmosis and diffusion are regarded to be fundamental concepts in Biology. However, these two concepts are perceived to be rather difficult by the undergraduate students. We were therefore interested in introducing an active learning module to enhance the understanding of osmosis and diffusion. To determine the comprehension of these two concepts, we utilized Osmosis and Diffusion Conceptual Assessment (ODCA) and Osmosis and Diffusion Confidence Inventory (ODCI) and osmosis and Diffusion familiarity assessment (ODFA). These assessments were given us pre-test and again after the completion of the module as post-test. Our initial findings indicate statistically significant improvement in students' content knowledge following participation in the module ($p = 0.014$), as well as a statistically significant increase in their perceived understanding of tonicity and transporters (both question sets have items with a $p < 0.008$ after Bonferroni correction). Collectively, 79% of students found the lecture beneficial, 81% found the graphic organizer activity beneficial, and 62% found the kinesthetic activity beneficial.

24. Symbiosis: Improved Crop Production via Plant-Fungal

Interaction

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Agricultural industries are having to develop new methods of crop production to sufficiently produce enough food for a growing population, which is expected to increase by over 2 billion people by the year 2050, with 800 million currently considered undernourished. This task is overshadowed with global climate change resulting in overall yearly higher temperatures. Agricultural industries will need to increase crop production by 80% by the year 2050, to meet the growing population demands. Many different efforts are being employed to aid the agricultural industries in their efforts, such as the use of agrochemicals, genetic modification, and classical breeding, but more effective natural ways are needed. One such method that is currently being studied is the symbiotic relationship between plants and fungal endophytes, which are microscopic fungi that live within host plant tissues and aid plants in surviving harsh environments. We hypothesize that tomato and corn plants, that have been colonized with endophytes, named H and J, will show increase in crop production, compared to a non-symbiotic control, in a field trial setting. Field trials were conducted during the 2017 growing season, 2 for tomato and 1 for corn. It was observed that both H and J showed an increase in tomato fruit weight production (111.5% and 39.9% respectively), while J showed an increase in corn weight production (over 100%). Utilizing the plant-fungal symbiotic growing method could potentially aid the agriculture industries in their efforts to produce sufficient food for the growing population.

33. Introduction of a Native Fish Assemblage into the UWA Duck

Pond

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For over forty years, the duck pond on the University of West Alabama (UWA) campus has been populated by an assemblage of fish species commonly found in farm ponds across the Southeast. In 2009 the pond was drained during repairs to the dam, with small populations of largemouth bass (*Micropterus salmoides*), bluegill sunfish (*Lepomis macrochirus*), and Eastern mosquitofish (*Gambusia holbrooki*) remaining in small pockets of water. The current fish assemblage derives from that root stock, along with 100 triploid grass carp (*Ctenopharyngodon idella*) that were introduced to assist in control of aquatic vegetation. In the spring of 2018, the College of Natural Sciences and Mathematics at UWA began a project to establish a assemblage of native species in the Duck Pond. The project began with collection of baseline information regarding the composition of the fish assemblage, followed by the introduction of native species collected from streams and lakes in the watershed. Baseline sampling indicated that the fish assemblage was in fact, dominated by the aforementioned three species. Grass carp were not sampled with the methodology employed but were visually verified. Initial introductions included eight species of centrarchids, along with five other species representing four families. Assemblage will be monitored throughout the spring, and in subsequent years by UWA's Field Zoology class.

32. Pharmacies in the Dirt

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The Small World Initiative (SWI) has the goal to inform students on the dangers of antibiotic resistant drugs. Antibiotic drugs are a growing problem in the United States, and the only way to solve this problem is to discover new antibiotics. This is what the goal of our class is. We got soil samples ranging from the University of West Alabama to a pasture in Mississippi. The first step of us finding antibiotics was to separate our unknown bacteria from our soil samples. We then put the unknown samples on a LB agar media and grew it at 34° for 16 hours. Our soil was rich in CFU with the lowest being 35 CFU and the highest being 350 CFU, with 5 different phenotypes in all. We then tested 96 different colonies on 4 different diseases, I tested my colonies on Staphylococcus epidermis and Salmonella Newport, while my partner tested her colonies on *Actinobacteria* and *E. Coli*. Out of the 4 different diseases we had 15 Antibiotic bacteria. We then tested 5 of our good antibiotic producing on ESKAPE pathogens. Although we had a minor setback of overgrowth one of our antibiotics was able to kill 3 of the ESKAPE pathogens. Annually the United States spends a high 20 Billion dollars on healthcare, we have the potential to save America money on finding antibiotics and save lives while we are at it.

25. Examining the Role of Dermal Adipocyte Lipolysis during

Wound Healing

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It has been determined that white adipose tissue functions as an endocrine organ. One of its functions as an endocrine organ is to maintain an anti-inflammatory state which contributes to overall homeostasis. In the lean state, resident macrophages are polarized to the M2 phenotype which work to maintain regulation of lipid breakdown which contribute to the anti-inflammatory state. However, in the obese state, the tissue environment and resident macrophages shift to an inflammatory state; this change in the cellular environment interferes with and affects the relationship between the resident cells and immune cells which then contributes to improper wound healing. White adipose tissue cells, or adipocytes, are found at various locations in the body; however, this study focused on understanding the contribution of dermal adipocytes to skin repair. Using cre-recombinase technology, two mouse lines were developed that altered dermal adipocytes. The altered cells contributed to a decrease in the number of wound bed macrophages present during the inflammation stage and a decrease in revascularization and reepithelization at Day 5 of the repair phase. The goals of this study were 1) to determine if or when the decrease in revascularization and reepithelization in wound beds would resolve and 2) to determine if any other phenotypes would occur later in the wound healing process. Immunofluorescent staining and microscopy was used to examine 7-day wound beds.

Data from samples was quantified, and it was determined that all defects at day 5 were resolved by day 7, and no alternate phenotypes had emerged.

26. Characterization of an Unannotated Transcript in *C. elegans*

Somatic Gonadal Development

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The reproductive system in the roundworm, *Caenorhabditis elegans*, originates as four cells. These four cells are composed of two somatic cells, which will form the somatic gonad, that surround two germ cells, which will produce all the sperm and eggs. The somatic gonadal cells play a critical role in the development, organization, and function of the *C. elegans* reproductive system. To gain insight about how gonadal development is regulated, the mRNAs present in the developing somatic gonad were identified by Next Generation Sequencing, and, several hundred gonad-enriched mRNA transcripts were identified. Among the highly enriched gonadal-transcripts was a transcript that was previously unannotated. We are interested in what type of gene the unannotated transcript is and how it's expressed in *C. elegans*. Previous experiments showed that an extrachromosomal array expressing the promoter of the unannotated transcript fused to green fluorescent protein promoted expression exclusively throughout the gonad. Subsequently a CRISPR Cas edit was made by replacing the three predicted exons of the unannotated transcript with GFP to observe any effects in development due to the loss of the unannotated transcript. Initial animals may have had decreased brood sizes, but after a few generations animals produced similar numbers of progeny as wild type. Future research will consist of repeating the deletion of the unannotated transcript to see phenotypic defects, fusing GFP to C-terminus to confirm that the gene is translated into a protein, and mutating regions within the promoter to determine motifs important for the gene's expression.

31. Resourceful Sampling of Roadkill in West Alabama

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Animals crossing highways often results in mortality. Approximately, 1 million vertebrates die daily on American roadways. The scent of an apple core, piece of gum, or beverage poured out is tempting for many creatures and may cause it to get hit by a car or worse cause a vehicle wreck resulting in human injury or death. We wanted to determine the amount of carnage specifically along Highway 28 from Livingston, Alabama to the intersection of Highway 80. We predicted that roadkill would be common due the location surrounded by a mosaic of pastures, regenerated woods, and residences coupled with high traffic volume leading to a proportionate litter level. We documented 75 roadkill specimens from 1 Jun 2017 through 30 Jan 2018. Carnage of raccoons and possums resulted in 34% and 21% respectively; followed by 12% squirrels, 11% skunks, 8% deer and 9% other. This study only represents 19% of the total collection data, therefore, it may serve as a foundation for another researcher to thoroughly collect the necessary data to lead to a firm conclusion. This project may help to model predictable roadkill related to local ecology without deliberate sacrifice of any animals.

30. Exploration into the World of Phages: The Discovery of Cane17

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Bacteriophages are some of the oldest and most dynamic viruses in the biosphere. The phage population remains vastly unexplored as only about 2×10^3 genomes have been discovered and sequenced. Phages have a very promising role in the future of scientific research as they play a central role in our knowledge of molecular biology. Phages have the potential to advance the biotechnology field and medical field due to their quick propagation and simple structure. The objective of this research was to discover more about the bacteriophage population and learn about a unique assortment of viruses. To accomplish this objective, a mapped out lab procedure, which included isolation, purification, amplification, extraction, and characterization, was created and followed to ensure a positive outcome in the research. The end result was a phage that we named Cane17 which was selected by the class for gene sequencing. Cane 17 came from a soil sample and was hosted by *Mycobacterium smegmatis mc2155*. Before the discovery of Cane17, a totally of six other soil samples were tested for phages, only three were demonstrated positive results. Two of the other positive phages were donated to other groups in the class, while the third resulted in Cane 17. The plaques for Cane17 were clear, in a circular shape, with distinct margins. The average diameter of the plaques were approximately 2mm. The phage was imaged with a transmission electron microscope. The image showed that Cane17 was a small phage with a short tail.

27. Dirty Cures: Finding Golden Cures in Soil Extractions

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A growing medical problem in the United States is antibiotic resistant bacteria. Antibiotic resistance, is defined as the ability for a microorganism to resist the effects of antibiotics. These antibiotic resistant bacteria cause over 23,000 deaths annually in the U.S. Being a slightly profitable cause, the development of novel antibiotics has been scarce; while the growth and evolution of antibiotic resistance has increased steadily. Most of the current antibiotics were discovered in the “golden age of antibiotic discovery”, 1950s and 1960s, since then not many new novel antibiotics have been discovered. My partner and I share one common goal in doing this project, and that goal is to develop a cure for the broad spectrum of antibiotic resistant bacteria. To do this we extracted soil from Livingston and York Alabama; because a large amount of antibiotics come from soil. We scanned 192 individual colonies and put them to the test against two known infections. Those two now infections were *Escherichia coli* and *Salmonella Newport*. The test yields a total of 18 antibiotic producing bacteria.

Using the lab and techniques taught by Dr. Morsy we plan on identifying antibiotic producing bacteria. Using equipment in the lab, we plan on identifying the chemical structure of each antibiotic producing bacteria. This project has allowed us to build team working skills, learn more about the world of antibiotics, and it gave us the chance to make an impact on the world of medicine.

28. Mediated Mutagenesis of Adipokinetic Hormone in *Drosophila* and its Locomotory Activity Response to Nicotine Exposure

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Adipokinetic hormones (AKH) are one of the best-defined groups of neurohormones belonging to the arthropod AKH/RPCH (adipokinetic hormone/red pigment concentrating hormone) family. AKH secreted by the neurons in the fly brain. AKH regulates energy metabolism in insects. Glycogen in human functions like AKH in insects and regulates sugar metabolism. Nicotine is a psychiatric drug that can turn into addiction. The present experiment ask the question whether AKH hormone is a target for nicotine addiction. In the first step of the experiment, *w¹¹¹⁸* wild type flies were used as control to study the effects of nicotine and compare with AKH mutant flies. The male flies (5-7 days old) were fed with different doses of nicotine and the daily locomotor activity was recorded. Locomotor activity of 5-7 day old males were recorded for 3-5 days in (LD 12:12 photoperiod) using the Trikinetics locomotor activity monitor. We recorded the higher the concentration of the Nicotine the more abnormal movement behavior occurs. Interestingly, nicotine makes most of the fly arrhythmic and eventually kill the flies after long exposure of the drug. In conclusion, nicotine effects the male fly in a dose dependent manner and the higher doses kills the fly within 1 – 2 days. All the doses of nicotine drastically affected the biological clock and fly rhythmicity.

We plan to treat a selected dose of nicotine to treat AKH mutant flies to explore the link with drug addiction. The experiment is under progress.

29. Isolation of Bacteriophage Apple from the Host *Mycobacterium smegmatis* mc2155

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Our main goal for this semester was to isolate and characterize a bacteriophage. A bacteriophage is a virus that infects a host bacterium, using it to replicate. For our research, we used host bacterium, *smegmatis mc 2155*. We examined roughly 10 soil samples without discovering a phage, until we were finally donated a phage that was found on a local farm. The isolation and characterization of our bacteriophage was done through a process that is divided into six sections: Isolation, Purification, Amplification, Extraction, Characterization, and Microscopy. Our phage, that we dubbed Apple, is lytic, meaning that it destroyed the infected host cell, producing clear, opaque plaques These plaques were roughly (I don't have this info) wide. Apple was sent to UAB to be imaged with a transmission electron microscope, and the pictures show that the phage has a standard capsid with a short tail. Apple has a relatively high DNA count of 119.4 ng/ml and our lysate titer was 3.03×10^{10} . Apple has currently been submitted for whole genome sequencing, and we are awaiting the results.