6th Annual
Undergraduate Research Symposium (URS)

March 7, 2017

Hughes Gymnasium || Bell Conference Center

The University of West Alabama

Livingston, AL

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Poster Sessions & Graduate School Expo
Hughes Gym
8:00 a.m. – 5:00 p.m.

- Poster setup 8:00 a.m.–9:00 a.m.
- Poster viewing session, Judging 1 9:30 a.m.–11:30 a.m.
- Graduate School Expo 9:00 a.m.– 5:00 p.m.
- URS Group Photo 11:30 a.m.
- Lunch (Cafeteria) 11:45 a.m.–1:00 p.m.
- Poster viewing session, Judging 2 2:45 p.m.–5:00 p.m.

Keynote Address and Awards Banquet
Bell Conference Center
6:00 p.m.–8:00 p.m.

- Welcome
- Keynote Address
- Dinner
- Awards Ceremony
- Group Photo

Organizing Committee

Dr. Mustafa Morsy, Chair

Dr. Brian Burnes

Dr. Jing Chen

Mrs. Hoda Hassan

Dr. John McCall

Dr. Ketia Shumaker

Message from the Dean

The College of Natural Sciences and Mathematics places great emphasis on involving our students in actual research. We strongly believe that science is more than a collection of facts; it is a process - a way of doing things. The best way to learn science, is to DO science. When students engage in independent research under the guidance of talented faculty mentors, they gain an insight into the process that can be gained in no other way. The resulting immersion into the techniques of academic research provides undergraduate students with a deeper understanding of their academic fields and prepares them for further success in their academic pursuits and future careers. The faculty of the College of Natural Sciences and Mathematics pays special attention to a student's individual interests and identity, and takes pride in helping research participants concentrate in his/her field of focus and refine the skills of scientific research. The College sponsors the Undergraduate Research Symposium (URS), which is held on Assessment Day each Spring Semester. On this day, we celebrate the year's research efforts and students present the results of their research to a panel of judges and to the broader UWA community. Undergraduates from a wide range of disciplines present current and recent research projects, showcasing a wide range of topics, approaches, and interests. The URS also serves as a resource for other undergraduates not yet engaged in research pursuits. Such students can learn how their fellow students developed their intellectual interests, how they initiated and developed their research projects, and how they developed and nurtured connections with their faculty mentors. Finally, the URS is an occasion for students, faculty, staff, prospective students, and alumni to witness how student projects enhance learning, support faculty members' own work, and serve the greater community.

Dean John McCall

Message from the Chair

On the behalf of the organizing committee, I welcome you to the Sixth Annual Undergraduate Research Symposium (URS) at the College of Natural Sciences and Mathematics. In the past four years, the URS has been quite successful. The URS provided an accessible forum for UWA undergraduate students to display and promote some of their exemplary research. In addition, the URS provided UWA students with opportunities to network with graduate schools and industry representatives. We are very pleased that fifth annual URS provides the same opportunities for students from seven regional institutions. The expansion of URS regionally will promote faculty and student collaborations among participating institutions.

We are delighted that the keynote speaker is Dr. Erin Dolan, Professor of Biochemistry & Molecular Biology at the University of Georgia Dr. Dolan is a prolific researcher and a world leader in undergraduate education.

We are thrilled to report that the 6th URS event features 52 poster presentations, a 30% increase from previous year, and 20 graduate schools present for the graduate school expo. We look forward to further growth for the URS in 2017, and more participation from UWA and other institutions.

Mustafa Morsy

Keynote Speaker

The keynote speaker is Dr. Erin Dolan, Professor of Biochemistry & Molecular Biology and Georgia Athletic Association Professor of Innovative Science Education at the University of Georgia.

As a graduate student in Neuroscience at University of California San Francisco, Dr. Dolan volunteered extensively in K-12 schools, which prompted her to pursue a career in biology education. She teaches introductory biology and biochemistry, and her research group studies scalable ways of engaging students in science research and mentoring of undergraduate researchers in the life sciences.

In 2014-2016, Dr. Dolan served as founding Executive Director of the Texas Institute for Discovery Education in Sciences (TIDES), the teaching innovation initiative in the College of Natural Sciences at University of Texas Austin. She has designed and led a wide range of professional development on active learning and mentoring, including intensive sessions for faculty to develop course-based undergraduate research experiences. She is principal investigator or co-investigator on more than $10 million in grants, including one for CUREnet (http://curenet.cns.utexas.edu/), a network of people and programs integrating research experiences into undergraduate courses. She is also Editor-in-Chief of the leading biology education journal, *CBE – Life Sciences Education* (http://www.lifescied.org/).

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Abstracts

1. Antibiotic Resistant Bacteria: The Search for a Panacea

Anthony Abner and Mustafa Morsy
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As time progresses, the road taken by antibiotic resistant bacteria will continue to pave their way into problems as bacteria progress forward in their ability to resist current antibiotics. Over prescription and use of commercial antibiotics in recent years has enhanced the ability of some bacteria to survive these antibiotics. The overuse of these antibiotics coupled with the decline in discovery of new antibiotics is a deadly way that causes more than 25,000 deaths in the United States alone. This significant problem is the driving force behind our research and the Small World Initiative. Virtually 75% of known antibiotics were found in soil bacteria and fungi. Our target is to test various soil samples from Alabama to find novel antibiotics.

Bacteria were isolated from the soil and plated on LB agar media, and grown at 34^{o}C for 19 hours. More than 400 bacterial colonies were obtained. We tested 285 bacterial colonies against *Salmonella* and *Erwinia* to check of any inhibition zone, an indication of antibiotic production. Eight unknown bacteria were effective in inhibiting the growth of the tested pathogens. We further tested these eight unknown against four other pathogens. The unknown antibiotics were effective on some pathogens, but not on all. These results indicate a specificity of the antibiotics produced. Our research findings could potentially help save numerous lives lost to antibiotic resistant bacteria. Additionally, novel antibiotics can save about $25 billion that is expected to cost the economy due to care of patients infected with antibiotic resistant bacteria.

2. Preparing for Battle: The Search Novel Antibiotics

Rakim Ali, Kaitlynn Markham, and Mustafa Morsy
Department of Biological and Environmental Sciences, University of West Alabama, Livingston, AL 35470

Discovery of new antibiotics has become stagnant over the years. With only one new class of antibiotics being found in three decades. This is an issue because bacteria are evolving, quickly becoming resistant to the antibiotics currently available. Initiatives worldwide have been started to combat the rise of super bugs, reinvigorating the effort to discover new and effective antibiotics. Aiding in the search, UWA has teamed with the Small World Initiative, searching Alabama's soil for bacteria producing novel antibiotics. Soil samples were collected from three distinct sources around campus, a parking lot median, the banks of Lake LU, and the inside of a dead tree stump. To isolate bacteria from the soil, one gram of soil was suspended in sterile water. Soil extracts were then plated on Petri dishes, where bacteria would grow and then be isolated into single bacterial colonies. Distinct bacterial colonies varied by sample, ranging from 1 to 100 colonies per plate, along with 1 to 3 different phenotypes. Screening of two 96-well plates containing unknown bacteria for formation of inhibition zones yielded 27 antibiotic producing bacteria. We are performing Polymerase Chain Reaction (PCR) followed by DNA sequencing of the r-RNA gene to identify the unknown producers. We aim to identify all antibiotic producing bacteria at a molecular level by the end of the class. If just one of our bacteria is discovered to be producing a novel antibiotic, it could potentially make a huge impact in the fight against antibiotic resistant bacteria.

3. The Effects of Garlic Extract on the Growth of Tramp-C Cancer Cells using the MTT Assay

Laila Alonazi, Matthew Tackett, and Jeffery Merida
Department of Biological and Environmental Sciences, University of West Alabama, Livingston, AL 35470

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 fruits and vegetables that play a significant role in reducing prostate cancer. Men are encouraged to intake these vegetables which may be beneficial in the prevention of prostate cancer. One such vegetable is garlic 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 garlic 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 garlic extract has a direct effect on the growth of these cells. In this research the murine cells were grown under normal conditions of 37 deg-C and 5% CO_2. These cells were assessed for their growth using inverted light microscopy and the MTT colorimetric assay for cell viability. We will present data showing the difference in the growth of cells treated and not treated with garlic extract.

4. The Impact of Fungal Endophytes on Tomato Plants under Greenhouse Conditions

Mohammed Alqarni and Mustafa Morsy
Department of Biological and Environmental Sciences, University of West Alabama, Livingston, AL 35470

Climate change, such as increasing drought waves and soil salt concentrations, are negatively impacting agricultural growers from producing enough food to feed the human population, which is increasing each year. Researchers have developed methods over the years, such as chemical fertilizers, breeding practices, and genetic modifications to aid agriculture in defending against the effects of climate change, but more practices are needed to create a sufficient food supply for the growing human population. Microbial symbionts, such as fungal endophytes, live virtually in all plants. The use of such organisms in crop plants have shown a positive symbiotic relationship that aid crops in producing more biomass, with or without stressful conditions.

Method: Our lab has collected large number of fungal endophyte isolates from plants growing in stressful environments. The isolates were then identified via phenotypic and genotypic characteristics using the rRNA 5.8 ITS sequences, which were searched on the NCBI BLAST database.

Results: We tested the role of ten different fungal endophytes on tomato growth. Tomato plants colonized with each fungal endophyte was compared to non-symbiotic plants (heights, biomass, and production). After, eight weeks of growth, it was found that endophyte 1-A, 3-B2, and 1-D were able to grow taller than the NS control group. This data suggests that more testing of these endophytes needs to be done to conclude the overall effectiveness for their effects on tomato crops.

Conclusion: On going and future studies will include stress testing, such as drought and salt, to determine if the proposed endophytes are able to convey abiotic stress tolerance to their host plants. The use of fungal endophytes in crop production could potentially aid agricultural companies in meeting the growing food demand in the presence of climate change.

5. Developing an Activation Tagging System for Wheat Mutagenesis

Amanda Askins and C. Nathan Hancock
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Transposable elements are sequences of DNA that can jump from one location to another in the genome. A transposable element named *mPing*, first discovered in rice, requires two proteins, ORF1 and Transposase (TPase), to move in the genome. This element can be used for mutagenesis, changing an organism's genome, which is useful for gene discovery. An activation tagging version of *mPing*, called *mmPing20F*, was created by inserting an enhancer sequence from the promoter region of the figwort mosaic virus into a hyperactive version of *mPing*. An activation tag can show gene function by causing overexpression of nearby coding regions in the genome. Wheat is a good organism for applying activation tagging because it is a polyploid and one of the most widely grown crops in the world. Plant transformation was used to get *mmPing20F*:GUS and an ORF1/TPase expression construct into the wheat genome. Cross- pollination between plants with *mmPing20F* and plants with ORF1 and Transposase were performed. The F1 generation is being analyzed by PCR to determine if *mmPing20F* shows evidence of transposition. The expectation is that *mmPing20F* will be able to transpose if both ORF1 and TPase proteins are expressed. We are also using GUS staining to determine if *mmPing20F* has been removed from its original position in the *GUS* reporter.

6. Preliminary Study of the Frequency of Tick-borne Pathogens in the Black Belt Region of Alabama

Krystal Aultman, Fhallon Ware-Gilmore, and Tracy Keener
Department of Biological and Environmental Sciences, University of West Alabama, Livingston, AL 35470

Tick-borne diseases have become increasingly prevalent in the United States, showing up predominantly in the midwest and northeast regions. As a result, interest in tick-transmitted pathogens has greatly increased in the past few decades (Jamason, 2016). The vectors of numerous tick-borne pathogens are in a group commonly referred to as "hard ticks" which are members of the family Ixodidae (Arachnida: Acari: Parasitiformes), and are widely distributed in the North America including the southeast. Our working hypothesis is given that the southeast has the same hard tick species as other areas, where tick-borne diseases are common, there is great potential for these vectors to also carry the same disease causing bacteria. This study is being investigated on a broad spectrum and aims to determine the frequencies of tick-borne pathogens in the Black Belt region of Alabama, including the causal agents of following diseases: Erhlichiosis, Anaplasmosis, Babesiosis, Rocky Mountain Spotted Fever, and Lyme disease. In order to obtain ticks, our field collection methods included dragging, flagging, sweep-netting, visiting animal clinics, and farm inspections. After collection, DNA was extracted from the samples. We will use specific pathogen targeting primers in PCR reactions to ultimately determine if any of the ticks collected contain the same bacteria. The results of this study potentially could yield strong epidemiological and economic implications in the region.

7. Female STEM Major Selection and Persistence

Erica Blackstock, Candice Gonzalez, and Jessica S. Mitchell
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While female college students have outnumbered men in admissions for years, male college students remain over-represented in most STEM subjects, most notably in engineering where there are 20,000 more men than women, and computing science, where there are 17,000 more (Adams, 2015). According to Heaverlo, Cooper, and Iannan (2013), the lack of women pursuing and persisting in STEM fields is an intricate issue that warrants further exploration of the experiences that they have encountered over the course of their academic careers. The purpose of this ethnographic case study was to explore the perceptions of female college students in regards to their own selection and persistence within their selected STEM discipline. The methodology included a mixed-methods design utilizing a 50-question survey instrument and 8 focal participant interview sessions in each of the four STEM categories. Preliminary analysis from this study has revealed a correlation between female college students' social experiences and their decision to become a STEM major. Utilizing Bronfenbrenner's Ecological Framework, the researchers of this study relate the prevalent spheres of influence to issues of persistence and retention of female STEM majors. Ultimately, this study answered the call for more contextualized studies utilizing an ecological framework to explore the perceptions of female STEM majors (Heaverlo, Cooper, & Iannan, 2013).

8. Potential Antibiotic Discovery in Livingston, Alabama

Christian Braswell, Mackenzie Shaw, and Mustafa Morsy
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The Small World Initiative (SWI) was founded at Yale University in 2012 by group of educators, including the senior author of this abstract. Since then the program has expanded to more than 180 schools around the world, including Puerto Rico and 12 other countries. All universities involved with this program are coming together to help discover potential new antibiotic producing bacteria. Thousands of people die annually due to antibiotic resistant bacteria; the number of deaths could be reduced for every new antibiotic producing species that is found. In many occasions, doctors prescribe antibiotics for common illnesses, which builds up immunity of bacteria. The SWI program will be helping the world save lives as new bacteria are discovered and recorded. The University of West Alabama has contributed to the SWI efforts by testing soil samples collected from the UWA campus and the surrounding areas. Soil bacteria were isolated on LB media, and then each student screened a 96 well plate containing 95 colonies for antibiotic production against common pathogens such as *Staphylococcus colinii* and *Bacillus subtillus*. We obtained 15 bacterial colonies that inhibited the pathogen growth. Several other pathogens were also tested against the bacteria producing antibiotics. The bacteria producing antibiotics were highly effective at killing the pathogens that they affected, but different pathogens such as *Salmonella typhi* were largely unaffected by those same antibiotics. This experiment has provided us with experience, research, and hands-on learning in the lab, while also providing us with the opportunity to benefit our community.

9. Biotin Rescues Herbicide Induced Hyperactive Movement Behavior in Drosophila Melanogaster

Chasley Brown[1], Mary Jane Krotzer[1], Janis O'Donnell[2], and Anathbandhu Chaudhuri[1]

[1] Biology Department, Stillman College Tuscaloosa, AL 35401

[2] Department of Biology, University of Alabama Tuscaloosa, AL 35401

Biotin is a coenzyme and a vitamin B usually present in many foods help in breakdown of glucose to produce energy. Biotin deficiency could lead to hair loss, dry skin, and mental depression. Recently it was reported that biotin could reduce diabetes induced oxidative stress in mice. Our laboratory revealed that the glyphosate based herbicide Roundup® increase oxidative stress and decrease stress tolerance in fruit fly, Drosophila melanogaster. In this experiment we have tested the rescue effect of biotin on movement behavior and stress tolerance after exposing the fly to the glyphosate based herbicide. In the first set of experiment, we fed 50% Roundup mixed with 5% sucrose to test the toxic effect of herbicide on movement behavior and stress tolerance in fly model. In an another set the flies were fed with 10 mg/ml of biotin +50% Roundup +5% sucrose to find out whether biotin could rescue the toxic effect of herbicide. The control flies were fed with 5% sucrose solution. Preliminary data shows that biotin significantly alters the movement behavior and fly become hyperactive in general. However, we record a rescue effect of biotin on herbicide induced stress tolerance when the young adult flies were subjected to starvation stress after feeding of biotin and Roundup for 4 days. Biotin also rescue the glyphosate induced movement disorder in flies. We conclude that biotin possibly works through dopamine synthesis pathway since dopamine is a key molecule to regulate movement behavior and stress response in higher organisms.

10. Evidence of Climate Change: Reductions in Sugar Maple Growth

Brittany Butcher, Ketia L. Shumaker, and Carolyn Copenheaver
Department of Biological and Environmental Sciences, University of West Alabama, Livingston, AL 35470

The current range of sugar maple is largely determined by climate. Models predicts sugar maple's range will shift northward and eastward in response to climate change. In this study, we examined dendroclimatology data to verify theses model predictions. We correlated tree-ring width data with temperature, precipitation and Palmer Drought Severity Index from study sites in southern, western, and central parts of sugar maple's range. Sugar maple growth at the southern site was limited by drought. Sugar maple growth at the western site was limited by precipitation and in the central region sugar maple growth was not correlated to climate. The southern and western sites provided evidence of a recent (post-1950) increased sensitivity to drought. These dendroclimatic results confirm predictions of a northward and eastward shift in the range of sugar maple within the next century.

11. Three-Way Symbiosis: Unlocking the Potential of a Plant, Fungus, and Virus Relationship

Blake Cleckler, Chengke Liu, and Mustafa Morsy
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In the geothermal soils of Yellowstone National Park, panic grass (*Dichanthelium lanuginosum*) was able to grow in soil temperatures > 50 °C because of a symbiotic association with *Curvularia protuberata* fungus harboring a double-stranded RNA virus, CThTV; neither partner of this symbiosis could survive temperatures above 38°C in isolation. The mechanism of interaction among the plant-fungus-virus that is responsible for thermotolerance controlled by the three-way symbiosis is not known. However, our lab has identified that fungal trehalose has a crucial role in adaptation to heat stress mediated by the three-way symbiosis, and that fungal melanin also plays a key role in stress tolerance. In addition, the interaction of a fungal translationally controlled tumor protein (TCTP) and catalase/peroxidase (KatG) with CThTV may alter the fungal cell cycle and cellular redox. Knock down of the trehalose, melanin, TCTP, and KatG genes in thermotolerant *C. protuberata* carrying CThTV; abolished the thermotolerance in tomato plants. In addition, overexpressing the same genes in non-thermotolerant *C. protuberata* without CThTV provided the plants infected with transgenic fungi with improved thermotolerance, but not comparable to the thermotoelrance of the original fungal isolate carrying the virus. W**e** propose a model in which *C. protuberata* carrying the CThTV confers thermotolerance in plants via production of large quantities of trehalose that function as a stress-signaling molecule or an osmoprotectant. Trehalose signaling would then regulate processes such as carbon utilization and cell division during stress. Melanin likely alters fungal cell walls to control trehalose movement into plant tissues during heat stress.

12. Investigation of Lysozyme to Facilitate Structure Verification of Organometallic Compounds

Darnell Cole, Katelyn Young, and Heather McDonald
Department of Physical Sciences, University of West Alabama, Livingston, AL 35470

Collaborators have attempted to synthesize 12 organometallic compounds, whose structures are similar to known anticancer compounds. Organometallic compounds are metal complexes containing a metal bound to organic ligands. According to *Cancer Facts & Figures 2016*, there was an estimated 1,685,210 new cancer cases diagnosed and 595,690 cancer related deaths in the U.S. alone in 2016. Organometallic compounds have recently been found to be promising anticancer drug candidates. Our work attempts to verify the 3-dimensional structure of these organometallic compounds using X-ray crystallographic analysis. Previous attempts to crystallize some of these new compounds have failed. We hypothesize that the organometallic compounds can be co-crystallized with lysozyme and the structure of the lysozyme-organometallic complex using X-ray crystallography. Our research will explore the use of hen egg white lysozymes as a potential tool for determining the structure of these organometallic compounds. Lysozyme is a model for protein crystal growth due to its ability to readily form large single crystals under various solution conditions. It has been proven that lysozyme crystallises best in sodium chloride solutions ranging from 1 to 7%. A 24 well crystallization plate was set up with 4 to 6% sodium chloride solution with the lysozyme-organometallic compound, Co tyrosine acac, and was set to crystallize over 3 to 5 days with several trials.

13. The Effects of Hydrogen Peroxide and Echinacoside on Movement Behavior and Reproduction in the Fly Model

Markale Cullins[1], Mary Jane Krotzer[1], Janis O'Donnell[2], and Anathbandhu Chaudhuri[1]
[1]Biology Department, Stillman College, Tuscaloosa, AL 35401
[2]Department of Biological Sciences, University of Alabama, Tuscaloosa, AL 35487

Oxidative stress is an imbalance between free radicals and antioxidants in the body. When our bodies cannot produce enough antioxidants to balance out the reactive oxygen species, stress is created. Excessive production of free radicals in the body causes several physiological imbalances. Aging is associated with oxidative stress in the body's cells. Stress response and movement behavior are significantly linked to the dopamine pathway, and any disruption in the function of such pathway due to oxidative stress could reduce the stress tolerance and affect the movement behavior in higher organisms. Present studies deal with the induction of oxidative stress using hydrogen peroxide (H_2O_2) in the fly model, and the use of echinacoside (antioxidant phenolic compound of plant extracts) to rescue H_2O_2 induced stress response. We observed that the application of H_2O_2 significantly altered the movement behavior and decreased stress tolerance in the fruit fly. Supplementation of echinacoside, however, rescued the flies from oxidative stress. Interestingly, echinacoside also decreased the reproduction performance in the fruit flies. Since dopamine regulates stress tolerance and movement behavior, we conclude that echinacoside could modify the dopamine function.

14. Bio-assessment of Alamuchee Creek Using Benthic Macroinvertebrates

Lindsay Daw and Kevin Morse
Department of Biological and Environmental Sciences, University of West Alabama, Livingston, AL 35470

The Alamuchee is a mostly sandy creek that runs through Sumter, Alabama and Lauderdale, Mississippi. Between the two counties, about 146km^2 of land is drained. The water quality of this creek was last biologically assessed in 2010, but it has not been assessed using ADEM standards until recently. In the biological assessment macroinvertebrates were used as indicators. Sample sites were chosen from four sections of Alamuchee Creek located between Kewanee, Mississippi and Livingston, Alabama. The results have determined that the creek's water quality is in good condition.

15. Intensive Aquatic Protein Production Using Duckweed as a Model Platform

Alex Dawson and Shahid Mukhtar
University of Alabama at Birmingham, Birmingham, AL 35294

Due to increasing global population, it is estimated that global food production must double by 2050 to meet population demands. University of Alabama-Birmingham (UAB) and Southern Research (SR) have established a program to focus on developing a deep scientific and engineering understanding of highly controlled duckweed growth as a platform for intensive protein production. This work will develop a new understanding of how to control the phenological cycle of duckweed. Preliminary results using wild type *Spirodela polyrhiza* grown in nitrogen and phosphorous-rich wastewaters show excellent growth rates, comparable to those seen with synthetic nutrition packages. We collected sewage and pond water from Star Lake (native site of culture collection), as a control. We recultivated the sterilized *S. polyrhiza* in pond and sewage water tanks using approximately 5% duckweed as starting material. We measured the growth of duckweed over time for 14 days and observed that percent growth of *S. polyrhiza* in sewage water reached 94% on day 7, while the duckweed in pond water obtained similar mass on day 11. We started to observe the onset of senescence in *S. polyrhiza* grown in pond water on the day 20, while we did not observe any senescence symptoms on duckweed grown in sewage water. We concluded that the growth rate of *S. polyrhiza* growth is significantly faster in sewage, and sewage water grown duckweed displayed delayed onset of senescence. The team anticipates that this work will inform scale-up of duckweed-based aquaculture systems for intensive protein production at a globally.

16. Antibiotic Discovery Across Saline Gradient of the Stimpson Wild Life Sanctuary

Riley King, Mara Deluca, and Mustafa Morsy
Department of Biological and Environmental Sciences, University of West Alabama, Livingston, AL 35470

Salt works and the Stimpson Wildlife Sanctuary in Clarke County, Alabama were an indispensable salt mine to the Confederacy during the Civil War. The area is characterized by the presence of a gradient of salt, ranging from fresh water to water with up to 500mM Total Dissolved Salts (TDS). The varying concentrations of salt across the land provides an opportunity to explore the bacterial diversity and the presence of antibiotics producing bacteria in response to salt stress. The goals of this study are: **1)** to compare the effect of different salt concentrations on the diversity of antibiotic producing bacteria found in the soil of Stimpson Wildlife Sanctuary and **2)** to examine the diversity of bacteria found within the varying salt concentrations. We have collected soil samples from the saline gradient of the Stimpson Wild Life Sanctuary, ranging from 0-500mM TDS. Soil bacteria was isolated by plating serial dilutions of soil extracts onto various bacterial media and grown at two different temperatures, to ensure recovery of the most bacteria possible. Nearly 3,000 bacterial colonies have been isolated and arrayed in 96 well plates. Currently, we have identified inhibition zones, and results show that in the presence of higher concentrations of salt more antibiotic producing bacteria are present. Various species of *Enterococcus, Serratia*, and *Citrobacter* bacteria have been identified using DNA sequences extracted from unknown bacteria by PCR amplification, DNA extraction, and DNA sequencing.

17. Fungal Endophytes Benefit Crop Production and Stress Tolerance

Mantricia Densmore, Austin Tubbs, and Mustafa Morsy
Department of Biological and Environmental Sciences, University of West Alabama, Livingston, AL 35470

Climate change is a serious problem that affect not only the environment, but also human's food security. Drought, heat waves and increased soil salinity associated with climate change is having an impact on the United States crop production. For example, the last three years were recorded as the driest weather ever in California, where a significant agriculture products are made. Another example, the rise of sea levels along the coast of Florida has increased soil salinity, where a 10% increase in salinity resulted in rapid and dramatic changes in the microbial activity in plants. Fungal endophytes are present in almost every plant growing on Earth. Those fungal endophytes obtain carbon from plants and in return they provide plants with some metabolites that can improve plants' environmental stress tolerance. We hypothesized that endophytes associated with wild plants growing in high stressed areas can improve crop production and stress tolerance. To test our hypothesis, growth rate and yield of tomato plants colonized with twelve fungal endophytes isolated from wild plants growing in saline soils were compared to non-symbiotic plants. The use of fungal endophyte is very promising and can help other crops flourish under harsh conditions like drought and salinity. While stressing the tomato plants under drought and salinity conditions, we have found that potentially five of our fungal endophytes are promising. *Fuscarium oxysporum*, *Purpureocillium lilacinum*, and *Ophiocordyceps heteropoda* were able to provide tomato plants with both salt and drought stress.

18. Examining The Effects of Platelet Derived Growth Factor (PDGF) on Growth of Murine Tramp-C2 Prostate Epithelial Cancer Cells

Kaitlyn Edmondson, Chicko Jones, Jeffery Merida, and Janis Beaird
Department of Biological and Environmental Sciences, University of West Alabama, Livingston, AL 35470

Prostate cancer is the second most common cancer found in American men. About 1 in 7 men will be diagnosed during his lifetime. The University of West Alabama is examining the effects of Platelet Derived Growth Factor (PDGF) on marine tramp-C2 prostate cancer cells. PDGF is a protein that regulates cell growth and division. The overexpression or mutation of this protein promotes cancer cell growth. We are using different concentrations of the PDGF to examine cell growth in order to set a baseline for further research. In the future, we will be using a variety of extracts to see if they suppress cell growth. Approximately 27,000 men die annually from prostate cancer and each new study is one-step closer to a successful treatment.

19. The Effect of Increased Glutathione (GSH) Synthesis on the Cytotoxicity of the Anticancer Ruthenium Complex KP1019 in Yeast

Dala Eloubeidi, Sydney Middleton, and Pamela Hanson
Birmingham-Southern College, Birmingham, AL 35254

The ruthenium-based anticancer complex *trans*-[tetrachlorobis(1H-indazole)ruthenate(III)], otherwise known as KP1019, has proven effective in inhibiting proliferation in both mammalian cancer and yeast cells. Despite these promising results, KP1019's mechanism of action is not completely understood; however, it appears that activation of the drug by chemical reduction is a necessary step that enables DNA binding, leading to damage. One intracellular molecule that could accomplish the reduction of KP1019, and therefore enhance its potency, is the antioxidant glutathione, or GSH. Previously, we and others have seen that GSH slowly reduces KP1019 *in vitro*. Here we use the budding yeast *Saccharomyces cerevisiae* as a model to study the impact of GSH on KP1019 toxicity *in vivo*. Based on our results, cells overexpressing the gamma glutamylcysteine synthase Gsh1, which catalyzes the rate-limiting step of GSH synthesis, displayed significantly higher IC_{50} values than control cells with normal Gsh1 expression. The results, therefore, suggest that GSH is in fact hindering KP1019's cytotoxic effects within cells where Gsh1 is overexpressed. Although our study suggests that excessively high levels of GSH diminish KP1019 toxicity, future studies could focus on determining which concentration(s) of intracellular GSH, if any, potentiate the drug's function.

20. Caffeine Affects Stress Tolerance and Locomotor Behavior of *Drosophila melanogaster*: Dopamine Synthesis Pathway A Possible Target for Caffeine

Franklin Fairley[1], Roishinique Johnson[1], Andrea Bednářová[2], Kuntol Rakshit[3], Mary Jane Krotzer[1], Natraj Krishnan[2], and Anathbandhu Chaudhuri[1]

[1]Biology Department, Stillman College, Tuscaloosa, AL 35401
[2]Department of Biochemistry, Molecular Biology, Entomology and Plant Pathology, Mississippi State University, MS 39762
[3]Department of Physiology and Biomedical Engineering, Mayo Clinic School of Medicine, Mayo Clinic, Rochester, MN

Caffeine is one of most commonly used chemicals and has several negatives effects on human health. It can shorten lifespan, increase blood pressure, induce symptoms of insomnia, etc. Dopamine is one of the reported neurotransmitters affected by caffeine. We analyze the negative effects of caffeine using the fruit fly as a model.
Initially, a 4% crude coffee extract mixed with 5% sucrose was pre-fed to the young adult male and female flies for 72 hours and then exposed to starvation stress until all the flies died. Kaplan-Meier survival curves revealed that male flies are susceptible to caffeine and died faster upon starvation stress compared to sucrose fed controls. Interestingly, females did not show any significant changes in stress tolerance. However, flies became hyperactive within 24 hours during the course of feeding of caffeine. Daily behavioral activity patterns revealed a drastic change in both the sexes during continuous feeding of caffeice as well as in-stress situation. Circadian rhythms were altered upon exposure to caffeine as evident by a ~50% reduction in the no. of rhythmic flies. Strength of the rhythm as indicated by Fast Fourier Transform (FFT) values also declined substantially upon exposure to caffeine in both male and female flies. Thus, we conclude that prolonged exposure to caffeine negatively affects stress tolerance and movement behavior. Since mobility is regulated by DA, we hypothesize that its synthesis pathway could be a possible target for caffeine. Presently, we are using flies having certain mutations in different DA pathway to confirm the hypothesis.

21. *Vibrio vulnificus* on the Alabama-Florida State Line

Sierra Fisher and Brian Burnes
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Vibrio vulnificus are flesh eating bacteria found in salt water. The flesh eating bacteria were initially discovered in Florence, Italy in 1854. The physician Filippo Pacini discovered the first species of *Vibrio* when a cholera outbreak occurred. He however did not discover *vulnificus*; instead, he discovered *cholera*. *Vibrio's* shape is slightly bent similar to a comma. *V. vulnificus* is found when people consume raw oysters that can lead up to a 56.4% fatality rate. Most causes were believed to happen in the warm summer months. Florida's incidence rate is double the national rate for vibrios. Individuals with wound infection related symptoms were approximately 50.7% of the 276 cases of *V. vulnificus* from 1998 to 2007. The *V. vulnificus* were found in the Gulf Coast area in Florida and Alabama. In this study samples were collected at to 2 different sample sites, Pensacola beach area of Florida and Perdido Key. The 37 total isolated vibrios were tested for the resistance to antibiotics. The purpose of this study is to test natural antibiotic resistance in *Vibrio vulnificus*.

22. Involvement of Dopamine in Aging and Stress Tolerance: Role of Myo-Inositol in Conferring Stress Tolerance in *Drosophila melanogaster*

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DA performs a crucial role in signaling and movement behavior and any alterations in DA homeostasis could lead to neurological disorders. We used *Drosophila melanogaster* with mutations in two key regulatory genes in dopamine synthesis pathway: *Catecholamines up* (*Catsup*) resulting in dominant hyper activation of both tyrosine hydroxylase (TH) and GTP Cyclohydrolase (GTPCH) causing an elevation in DA, and $pale^{2}$ and pu^{Z22} which decrease TH and GTPCH (GTP Cyclohydrolase I) activity resulting in low DA titers were used. In addition, we used flies having mutations in vesicular monoamine transporter (VMAT) to understand the role of this transporter in stress tolerance and drug response. W^{1118} used as control for this experiment. Myo-inositol was also used to determine its effectiveness in stress tolerance in this study.

Lifespan studies revealed that mean life span (MLS) of *Catsup* mutants was significantly higher than W^{1118} and *Punch* mutants in both the male and female. *Punch* mutants have shorter lifespan compared to control. In general, females survive longer than males and are more stress tolerant. We found that lifespan and stress tolerance both are related to the DA titer in the organisms and feeding of myo-inositol significantly improves the stress tolerance in Drosophila irrespective of sex and mutations in DA synthesis pathways. Given this data, we hypothesize that DA could play a significant role in aging and stress tolerance, while myo-inositol seems to prevent oxidative stress and increase stress tolerance capacity. Future research will focus on determining whether myo-inositol works via the dopaminergic pathway.

23. The role of Faith and Spirituality in Coping Among Mothers Living with HIV

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This study shares qualitative findings from the MOMS (Making Our Mothers Stronger) Study, a randomized, controlled trial for mothers living with HIV that compared a theoretically grounded parenting intervention ("Parenting Skills for MOMS") to a health focused intervention ("Healthy MOMS") on various parenting and health outcomes. Methods: We conducted post-intervention focus groups (N=4) to elicit participants' (N=16) perceived responses to MOMS participation. Two focus groups were conducted with participants from each intervention condition. Constant comparison analyses of transcripts by three independent coders led to the development of a codebook outlining primary and supporting themes. Results: Participants from both groups frequently discussed their faith in numerous contexts, indicating its central role in their thoughts and actions. Many expressed their faith and relied on their spirituality to help themselves and fellow group members cope with general and HIV-specific challenges. Responses also indicated that faith leaders and fellow congregants were unaware of their status and therefore unable to be a resource for them at this critical time in their lives. All participant responses related to faith and disclosure questioned whether they would be welcome in their faith community if their HIV status were revealed. Conclusions: Participants in both conditions brought their faith and spiritual beliefs into group discussions and experiences. Findings suggest that faith leaders and fellow congregants could play a key role in the health and coping of many mothers living with HIV. Future efforts should be focused on building bridges between persons living with HIV and their faith communities.

24. The Effects of *Ganoderma Lucidum* Mushroom Extract on the Growth of Murine Tramp-C Prostate Epithelial Cancer Cells using the MTT Assay

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In the recent years, prostate cancer becomes one of the most common types of cancer that afflicts men who are over 40 years of age. Prostate cancer can be treated if it is detected at an early stage. However, if the detection is too late, it may be fatal. One of the most popular ways to research and study prostate cancer is using the murine Tramp-C prostate cultured cell line. In our research, we are using various dietary supplements to determine if they have an effect on the growth of prostate cancer cells. *Ganoderma lucidum* is a type of mushroom found in Asian countries, such as China. Men in China are encouraged to eat this mushroom to help prevent prostate cancer. The main purpose of this research is to determine if *Ganoderma lucidum* may have a direct effect on the growth of murine Tramp-C cells. These cells were grown under normal conditions of 37 °C and 5% CO_2. Also, these cells were cultured in Dulbecco's Modified Eagle Medium (DMEM) essential nutrients medium which is commonly used in cell and tissue culture. Moreover, we stimulated the growth of the cell by adding bovine insulin to the medium. The murine Tramp-C prostate cultured cells were assessed for their growth using Methylthiazol Tetrazolium Assay (MTT Cell Proliferation Assay). We will present findings that will show the difference in the growth of cell treated and not treated with a *Ganoderma lucidum* extract.

25. Unearthing Antibiotics from Soil Bacteria

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We've all heard of the dreaded Superbug. Officially a superbug is defined as a strain of bacteria that has become resistant to antibiotic treatment. The number of antibiotic resistant bacteria is increasing and the search for novel antibiotics stagnated due to the financial burden of research and development for novel antibiotics. This means that globally we are facing an epidemic if effective novel antibiotics are not discovered in the near future. It is predicted that by the year 2050, ten million people will die as a direct effect of antibiotic resistant bacteria. Since most antibiotics used today were discovered in soil bacteria, we tested soil samples from Livingston, AL for antibiotic production properties. We screened approximately 350 bacterial colonies and obtained 36 colonies that appear to be producing antibiotics against *Escherichia coli*, *Staphylococcus Cohnii*, and Staphylococcus Epidermis. We are currently testing these bacteria against other safe relatives of ESKAPE pathogens, a particular group of bacteria that are aggressively pathogenic, and actively evolving drug-resistance.

We plan to identify antibiotic producing bacteria using molecular and physiological techniques. Then we plan to identify the chemical structure of the antibiotic produced by each bacteria using Gas-chromatography techniques. Performing an authentic research project enabled us to learn more about biological procedures and methods and allowed us to attempt to make an impact on antibiotic discovery.

26. Identification of Acetylated Proteins that Modulate DA Neuron Vulnerability in a *C. elegans* Model of Parkinson 's Disease

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Idiopathic Parkinson's disease (PD) is an oxidative stress-related disorder that result in abnormal dopamine (DA) signaling in cell death. Although the origin of the pathogenesis in PD remains unclear, corollary evidence suggests both genetic and environmental contributions. In this study, we asked what genes might be involved in DA neuron vulnerability to PD-associated toxicants. We utilized reverse genetics, immunofluorescence, transgenic C. *elegans*, mass spectrometry (MS), and neuronal morphology analysis to characterize expression, localization and the role that IDN-1 and acetylation may play in toxicant induced DA neuronal death. In this study, we demonstrate that IDN-1 deacetylase mutants render DA neurons up to over 15 fold more resistant to the neurotoxins relative to WT. We show that IDN-1 is expressed in dopamine neurons. Our preliminary MS studies indicate that toxicant exposure decreases protein acetylation and the acetylation levels are dependent on IDN-1. We also show that IDN-1 mutants have greater acetylation in molecular pathways involved in motility, mitochondria function and oxidative stress. This study identifies novel genes and molecular pathways that may be involved in DA neuron vulnerability in PD, and shows that common epigenetic mechanism modulates DA neuron vulnerability to PD-associated neurotoxins.

27. Improving Crop Productivity Using Symbiotic Fungi

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There are many factors that negatively affect crop productivity including heat, drought, and increased soil salinity. These factors are on the rise because of the global climatic changes. Current crop growing practices have been successful in the past, but with the vast increase in human population, there is a great need for sustainable methods to increase crop production. Fungal symbiotic endophytes are one of the natural and sustainable methods that have shown promising results. Our research is focused on introducing fungal endophytes isolated from wild plants growing healthy in a high stress area, and introduce them into crop plants and identifying what affect they have on the production and stress tolerance of the crops. Two novel fungal endophytes were discovered to be beneficial and led to increased tomato productivity and drought and salt stress tolerance. Under greenhouse and field conditions, tomato plants were colonized with these two fungal endophytes (names H and J for IP protection) and tested under controlled conditions. The tomato plants that were colonized with the endophytes were able to allow the plants to produce more tomatoes (H: 20% and J: 25%) and they were also able to cause a higher taste rating among consumers than that of the non-symbiotic control treatment. Further research is needed to be able to uncover more about these potentially helpful endophytes and how they could be used in aiding the agricultural industry in its search for a method that would allow them to produce a food supply that would allow them to feed the ever growing human population across the world.

28. Digging Up Bacteria… and Possibly Antibiotics, too!

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Antibiotic resistant bacteria is a crisis that is responsible for more than 23,000 deaths annually in the United States. The drug industry is no longer actively working to discover new antibiotics because of the low financial return. The overuse of antibiotics led to the development of superbug (Antibiotic resistant bacteria). The goal of our research is to discover novel antibiotics and help end this crisis. We collected soil samples from relatively undisturbed locations, and our hypothesis is that since the soil has been undisturbed by humans, it will have a relatively high number of antibiotic producing bacteria. We isolated 1,500 bacterial colonies with more than 25 distinctive phenotypes by plating soil extract on LB media. We tested 380 colonies for antibiotic production against *E. Coli* and *Salmonella Newport*. We further tested the antibiotic producing bacteria against two other safe pathogens--*Bacillus Subtilus* and *Staphylococcus Cohnii*. We obtained 35 antibiotic producing bacteria, (2.3% of the total screened colonies). Antibiotics produced were selectively effective based on the pathogen. For example, some antibiotics were specific to *Salmonella Newport* but had no effect on *Bacillus Subtilus* and vice versa, and others had a broad-spectrum (effective on more than one pathogen). Our ongoing research is focused on identification of antibiotic producing bacteria using rRNA sequencing and other physiological characterization. This research-based class expanded our knowledge of scientific inquiry and the current antibiotic resistant crisis. Additionally, this course unites undergraduates from around the world under one common goal of discovering novel antibiotics, which will allow UWA students to develop future collaboration with biologists worldwide.

29. The Harmful Effects of Herbicides on *Drosophila melanogaster*

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Spectracide® is a commonly used herbicide that produces results within hours of use. This weed repellent contains 4.00% of the active ingredient atrazine, 0.08% related compounds, and 95.92% other ingredients. Atrazine, the most used herbicide in the U.S has been found in 94% of the country's drinking water. Aquatic environments where traces of the herbicide have been discovered have been most affected. Atrazine has had monumental effects on the growth, behavior, sexual development, and immune functions of amphibian and fish. When exposed to larger amounts of atrazine, humans develop problems with the reproductive system and limb defects. In maternal cases, women develop complications such as premature births, low fetal weight and higher infant mortality rates. Our lab recently revealed that atrazine induced oxidative stress in tissues and cause movement disorders in fruit model. We are interested to find out the effects of atrazine on development male and female reproductive organs. An initial study reveals that 50% atrazine fed female flies produce less offspring compared to control. To study the reproductive development we fed 25% Spectracide for 48hrs and fixed the tissues for histological studies to understand the effect of the chemicals on reproductive tissue structures in male and female flies.

30. Antipsychotic Drug Reserpine Alters Dopamine Function in Fruit Fly, *Drosophila melanogaster*

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Reserpine is a common drug used to treat symptoms of hypertension as well as mental disorders in patients with schizophrenia. It is a crystalline alkaloid found in the roots of *Rauwolfia serpentine* and *R. vomitoria*. This drug has side effects ranging from mild dizziness and headaches to adverse chest pains, fainting, and depression and it can even lead to suicide. Reserpine is known to be an inhibitor and acts by blocking the receptors of the vesicular monoamine transporter (VMAT) in dopamine (DA) synthesis pathway. Thus, when VMAT is preoccupied by reserpine, the cell stops the uptake of monoamines into storage vesicles which results in the depletion of catecholamine and serotonin from central and peripheral axonal terminals.

Our laboratory previously reports that reserpine causes significant movement disorders and induced oxidative stress in the fruit fly model. Present experiments reports the effect of reserpine on daily activity pattern on flies having mutations in different DA synthesis pathways using Trikinetics instruments. We used *catsup1* flies (contain high DA), VMAT flies (defects in DA transporter), and w1118 white wild type flies (no mutations in DA pathway) as the control. One week old female flies are treated with 15mM reserpine, supplemented with 5% sucrose and transferred to the Trikinetics instruments. The experiment is under progress and we are recording the data every 15 minutes continuously for 5 days. We will report all of the data in details.

31. Toxic Effects of Atrazine Based Herbicide on Stress Tolerance and Locomotor Behavior of *Drosophila Melanogaster*: A Model System to Study Herbicide Induced Toxicity

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Spectracide®, an atrazine based herbicide that is used in the United States, while banned in Europe. Atrazine, diquat dibromide, fluazifop-p-butyl and dicamba are toxic ingredients that usually cause health impairments in humans. The research was conducted to test the effects of Spectracide® on stress tolerance, movement behavior and oxidative stress at the cellular level using *Drosophila melanogaster*. A dose response (5%, 25%, 50% ,100%) study of Spectracide® was conducted using flies to record the survival when supplemented with 5% sucrose. Kaplan-Meier survival curves revealed that all the doses of Spectracide® are highly toxic and kills the flies in a dose dependent manner. The daily activity pattern of the flies was also drastically changed upon exposure to Spectracide®.

To confirm the drug induced oxidative stress in fly, we assayed the protein carbonyl content in the entire fly body, and observed that Spectracide® fed flies accumulate more protein carbonyls compared to the control. The down regulation of sniffer mRNA expression and carbonyl reductase activity in tissues substantiates the negative effect of Spectracide® in the fly. Theoretical modeling suggests that the active components of Spectracide® have significant binding affinity to carbonyl reductase protein. Molecular docking studies have revealed that the atrazine component of Spectracide® is tightly packed in the binding site of carbonyl reductase with hydrogen bonding, Van der Waals and electrostatic interactions. We have concluded that the active ingredients in Spectracide® have a significant role in inducing cellular oxidative stress and alter the movement behavior and stress tolerance in D. *Melanogaster*.

32. The Effect of Cabbage extract on Cancer Cell Viability Using the MTT Assay

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Prostate cancer is the most type common of cancer in American men especially African American men. The prostate gland is one part of the male reproductive system. It secretes prostate fluid which is one component of semen. Murine Tramp-C prostate cultured cells are used to perform experiments at conditions in which cells grow. These cells are generally used for research on prostate cancer. Once at a certain age, men are encouraged to be mindful of their health and aware of their dietary habits. Studies have shown that men who supplement their diet with cabbage can significantly reduce their levels of prostate- specific antigen (PSA). There are several components that, previous studies have shown, reduce metastasis in prostate cancer. The purpose of this research is to determine if cabbage extract has a direct effect on the growth of these cells. Cabbage contains antioxidant like vitamin A, C and phytonutrients such as lutein. Also, it contains isothiocyanate especially allyl isothiocyanate. In this research, the murine cells were grown under normal conditions of 37deg-C and 5% CO_2. These cells were assessed for their growth using the MTT colorimetric Assay for cell viability. We will present data showing the difference in the growth of cells treated and not treated with cabbage extract.

33. Characterization of the Neurodegenerative Phenotypes in *Drosophila* Resulting from the Loss of Function Allele of a U1 snRNP Associated Protein, *snf*

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Many cellular mechanisms leading to the rise of Alzheimer's Disease (AD) are still unknown. The AD insoluble proteome is associated with high levels of amyloid-beta plaques and Tau aggregates. Recent studies indicate that U1 snRNP (spliceosome subunit) components, such as U1A, are also enriched in the AD insoluble proteome compared to other neurodegenerative diseases. Our lab demonstrated that a loss of function *SmB*, a U1 snRNP splicing factor, allele showed a neurodegenerative phenotype in *Drosophila* models. Our goal is to see if the loss of function allele in *snf*, the drosophila equivalent of the human U1A gene, expresses a neurodegenerative phenotype. Transgenic flies were generated using EMS mutagenesis. We conducted climbing assays and histology experiments on newborn and aged *snf* hemizygous, as well as control flies to identify neurodegenerative phenotypes of impaired locomotion, and neuronal loss, respectively. Newborn and aged *snf* flies took a longer time to display negative geotaxis than the respective control flies in the climbing assay. Moreover, our histology experiments indicated that neurons surrounding the calyx of aged *snf* flies are significantly detached, thus further verifying the presence of neurodegeneration. Our experimental results confirm that spliceosome-associated mutations contribute to neurodegeneration in AD. With a projected three-fold increase in AD cases by 2050, it is crucial to understand underlying mechanisms of neurodegeneration in order to better develop preventive and diagnosing strategies for AD.

34. Glyphosate Based Herbicide Affects Stress Tolerance and Locomotor Behavior of Fruit Fly, *Drosophila Melanogaster*

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The widely used herbicide Roundup® is banned in some countries but sold in the United States. Glyphosate (*N*-(phosphonomethyl) glycine) is the main ingredient in the herbicide. Glyphosate has implicated several health hazards. This study tested the effect of Roundup® on stress tolerance and movement behavior using a flies. A dose-mortality response of Roundup® to *Drosophila melanogaster* was conducted. The flies were pre-fed for 24 hours at the doses of 100, 50, 25 and 5% mixed in 5% sucrose and then exposed to starvation stress. Kaplan-Meier survival curves confirmed that exposure to glyphosate followed by starvation causes mortality in a dose-dependent manner compared to sucrose fed controls. Flies continuously fed with 100% Roundup® in 5% sucrose died within 68 and 94 hours in flies. Records of daily fly activity using Trikinetics instruments revealed a change in behavior pattern in herbicide treated flies irrespective of sex. Glyphosate induced the formation of protein carbonyl in fly tissues and down regulated sniffer mRNA expression together with a significant reduction in carbonyl reductase enzyme activity in fly tissues which leads to herbicide induced oxidative stress in fly body. Theoretical modeling suggests that the glyphosate in Round-up® has significant binding affinity to carbonyl reductase protein. The interaction of glyphosate to carbonyl reductase was investigated. The interacting residues present at the binding site of carbonyl reductase was computationally mutated to alanine to evaluate residue contributions towards glyposate interaction. Our results demonstrate that glyphosate causes cellular oxidative stress that causes movement disorder and decrease stress tolerance when exposed.

35. The Study of *E. coli* in Lake Martin

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Escherichia coli, also known as *E. coli*, can be hazardous to humans. *E. coli* is also a determinant of water quality. I conducted a study by collecting over 100 water samples in Lake Martian, located east of Montgomery, AL. The samples collected showed that the *E. coli* counts averaged zero. The few *E. coli* that were collected were analyzed for their source of origin.

36. Extraction and Purification of Essential Oils from Zanthoxylum clava-herculis by Polarity

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Zanthoxylum clava-herculis is a traditional remedy historically known for its qualities of relieving pain from tooth aches. The bark from this tree was suspended in 90% methanol for a week and re-suspended in chloroform for a week. After decanting and filtering each solution from the bark, the methanol and chloroform extracts were further concentrated using the rotary evaporator. The crude extracts that were obtained from polar and nonpolar solvent systems were examined in a TLC (Thin Layer Chromatography). Three separated fractions in polar residues and four separated fractions in nonpolar residues were yielded. R_f values for each spot clearly demonstrated successful separation. The crude extract will be subjected to flash column chromatography to obtain pure fractions of the extract. The gradient solvent system of hexane/ethyl acetate will be used in flash column chromatography. Spectroscopic analysis (NMR, IR, GC-Mass, and X-ray crystallography) will be employed to identify each fraction.

37. RNA Aptamer Selection Against Glucose Oxidase for Detection of Bacterial Meningitis During Colonization of the Nasopharyngeal Cavity

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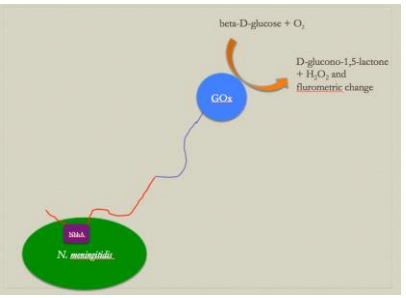
Bacterial meningitis is considered almost uniformly fatal and continues to have an unacceptably high morbidity rate despite the development of antimicrobial agents due to the rapidity of its pathology (12-24 hours after secondary stage). The development of a cost-effective and reliable diagnostic technique will be essential in moderating the spread of the disease.



I propose a handheld apatamer based diagnostic tool. Aptamers are oligonucleotide sequences selected through *in vitro* bead based selection that have a high affinity for a target given selected conditions. They are highly thermally stable, cost efficient, and are currently used in diagnostics. This diagnostic tool will use an aptamer for a reporter molecule, Glucose Oxidase (GOx) that conjoins with NhhA shown in Figure 1. NhhA anchors the bacteria to the nasopharynx during the initial phase of infection. The aptamer complex will detect the presence and concentration of the bacteria by detecting the electrical cell potential difference in the oxidative reaction using a platinum electrode in a glucometer-like portable device. This approach will be portable and efficient in resource-limited regions and allow for the development of a working theory of the threshold of bacterial concentration prior to initiation of secondary stages of infection.

38. Feeding of Neurotoxic Paraquat During Juvenile Stage Affects the Reproductive Performance in *Drosophila melanogaster*

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Paraquat (PQ) is a chemical pesticide most commonly used throughout the world to kill the herbs, shrubs and harmful insects in the agricultural fields. The use of PQ is very toxic to human and other animals. PQ causes neurodegeneration, and is a Parkinson's disease risk factor. Acute exposure of PQ also causes lung disorders, seizures, kidney failure, heart failure, coma, cancer etc. The fruit fly, Drosophila melanogaster, is a unique model used to study human diseases because they share 75-80% gene homology to humans.

Present experiment reports the effect of the feeding of PQ during larval stage on reproductive performances and stress tolerance using fruit fly. Paraquat at the dose of 1mM were fed once in 2nd larval instar till pupation. In 2nd set of experiment we fed 1mM PQ only in 3rd larval instar. We found that PQ fed larva emerged as functional adult with movement disorder and produce less number of offsprings. Interestingly, F1 generations of PQ fed parents also showed server movement deficit in young adult male and female flies. PQ fed parent flies as well as F1 progeny recorded to be less stress tolerance when the flies exposed to starvation stress. Our western blot analysis (protein profile of SOD1 (superoxide dismutase) reveals that SOD is one of the target for PQ. Since dopamine is the key molecule to control movement behavior and stress tolerance, we hypothesized that PQ affects dopamine neurons which intern effects negatively the reproductive function in female fly.

39. Determining the Role of Homologous Recombination in Replicative Transposition of *mPing*

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Transposable elements are mobile segments of DNA that make up a large portion of plant genomes. Class II transposable elements use a "cut and paste" mechanism in which the element is excised and reinserted elsewhere in the genome, making them powerful agents in genome evolution. One of these elements, *mPing,* has high transposition activity, and despite the fact that *mPing* utilizes a "cut and paste" mechanism, its copy number has been shown to increase over generations, suggesting the presence of a replicative transposition mechanism. This experiment will test if homologous recombination (HR) repair, a mechanism in which homologous sequences from elsewhere are used to repair double strand breaks, repairs *mPing* excision sites with an *mPing* containing homologous sequence. We measured repair of *mPing* excision sites in yeast using a reporter system in which *mPing* disrupts the *ADE2* gene, preventing cell growth until excision of *mPing* and subsequent repair of the *ADE2* gene.

Previous results showed that *ADE2* restoration was higher in haploid cells than in diploid cells, suggesting that HR repair may be occurring in the diploids. To confirm the role of HR repair, we are performing transposition assays in HR deficient strains created by knocking out the *rad51* gene. We predict that in the absence of HR repair we will see equal restoration of *ADE2* function in the haploid and diploid strains. If we can confirm that HR repair is occurring, we will attempt to directly identify cases of replicative transposition by analyzing *mPing* copy number in our strains.

40. Chronoamperometric Determination of Glucose in Sports Beverages

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Sports drinks have been heavily targeted toward athletes as a source of carbohydrates. Food processing and development laboratories are looking for more effective quantitation techniques to ensure compliance with food safety standards and to improve customer satisfaction of the weight and quality of the product. Enzymatic determination of glucose in several different commercially available sports beverages is performed using chronoamperometry. Glucose oxidase is used as an enzyme-based sensor to catalyze the oxidation of β-D-glucose to gluconolactone and hydrogen peroxide, which is electroactive. Chronoamperometry is an electrochemical technique that is used to apply a single potential step from a working electrode to induce a faradaic current from an oxidation reaction of H_2O_2 occurring at the electrode. The current is compared against a calibration of several glucose standard solutions to determine the unknown concentration of β-D-glucose in the sports drinks. The results are compared to the glucose colorimetric assay data points from previous biochemistry courses in order to validate the technique. Statistical analysis is used to compare the two methods in which the percent differences are determined for the samples: 13.9% for Blue, 41.3% for Red, and 56.3% for Green. Future work includes assessing and establishing method detection limits of chronoamperometry. Once this method has been validated, different enzyme-based sensors in new systems can be experimented with in the future to further electrochemical-based enzymatic determination methods.

41. Nicotine Exposure Alter Stress Tolerance Circadian Clock Functions in Fruit Fly, *Drosophila melanogaster*: Dopamine Synthesis Pathway Could be a Possible Target for Nicotine

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Nicotine is an alkaloid substance which is a derivative of the leaves from tobacco plant, *Nicotiana tabacum.* The chemical formula of nicotine is $C_{10}H_{14}N_2$ and found within cigarettes and other tobacco products. Once tobacco is consumed, it takes 10 seconds to enter the bloodstream and effects the brain. Nicotine considered to be an addictive substance and a leading cause of chronic obstructive pulmonary disease, epilepsy, emphysema, restless leg syndrome, dry socket and cancer, heart disease and stroke which eventually leads to death. The mood of action of nicotine in humans is poorly understood. Our lab previously reported that feeding of nicotine extract from cigarette and chewing tobacco declined the stress tolerance and cause movement disorder. We are interested to find out the nicotine effect on daily behavior pattern of fruit fly having mutations in different dopamine synthesis pathway using Trikenitics instrument. This instruments will record the movement behavior every 15 minutes interval. We are expecting that dopamine mutant flies will differentially respond to nicotine and thus, we can find the link between nicotine and dopamine synthesis pathway. We start the culture of fly mutants namely *catsup1* (produce high dopamine), *pale2* (produce low dopamine) and *VMAT* (defects in Vesicular Monoamine Transporter). W1118 (white eye) flies will be used as control with normal dopamine level. The young adult flies will be treated with nicotine (extracted from cigarette tobacco) mixed with 5% sucrose and transfer to the Trikenitics instruments to record the data. The experiment is in progress.

42. *Ypt4* and *lvs1* Regulate Vacuolar Size and Function in *Schizosaccharomyces pombe*

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Understanding the mechanisms that regulate organellar function and homeostasis can help us to better model and treat human diseases associated with improper organelle function. Characterization of the vacuole in the yeast species *Schizosaccharomyces pombe* can provide important information about the related human organelle, the lysosome. In this study, our goal was to better characterize the precise roles two genes, *ypt4* and *lvs1*, play in control of vacuolar size in yeast. In humans, the orthologue of *lvs1* is the LYST gene. Mutations in this gene have been shown to cause Chediak-Higashi Syndrome (CHS), a disease diagnosed by the presence of enlarged lysosomes in patient cells. The ortholog of *ypt4* in humans is RAB4, a tethering factor that functions in the endosomal pathway. Characterization of strains lacking *lvs1* or *ypt4* revealed that both strains had enlarged vacuoles, but did not exhibit changes in endocytosis or generalized secretion. *Ypt4Δ* cells exhibited a winged cell phenotype, indicative of defective polarized secretion to the cell septum, which *lvs1Δ* did not show. Both strains exhibited changes in growth in response to high levels of $CaCl_2$. Overexpression of lvs1-YFP rescued vacuolar size in *ypt4Δ* cells, but ypt4-YFP did not rescue *lvs1Δ*, suggesting that *lvs1* acts downstream of *ypt4* to drive vacuolar fission. Our results implicate both lvs1p and ypt4p in the control of vacuolar homeostasis and place lvs1p downstream of ypt4p.

43. Stereotypical Perceptions

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The current study examined how observations of pedestrians of different races and sexes influenced participants' perceptions about the car locking behaviors of a driver. Previous research has found that behaviors are monitored closely during interracial interactions because of a fear of another using stereotypes (Alexander et. al, 2012). In a 2 (pedestrian race: black vs. white) X 2 (pedestrian sex: male vs. female) design (driver was held constant across all conditions), we hypothesized that male pedestrians would be viewed as more threatening than females, and black pedestrians would be viewed as more threatening than white pedestrians. We further hypothesized that the race and sex of the pedestrian would influence participants' perceptions of the motivation behind the driver's car locking behavior. Facial expressions of emotions were recorded while participants watched the video using the Facial Action Coding System (FACS; Ekman & Friesen, 1978) to examine differences in responses to the video.

Hypotheses were partially supported. Participants' perceptions differed from those thought to be held by the driver. For example, participants rated white males as more likely to break into the vehicle than black males, but no differences were found in perceptions of the driver's attitudes. Contrary to prediction, no differences were found between males regarding perceived threat or suspicion. No difference was found between conditions regarding perceived motivation behind the driver locking the car. Most responses were related to either safety of personal belongings or habit. Implications and future directions will be discussed.

44. Diversity of Mosquito Species from North to South Florida

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This research project will discuss the variability of adult mosquitoes on a longitudinal scale of Florida. The species collected were from areas of Payne's Prairie Preserve State Park, Blue Spring State Park, Flamingo Everglades Park, and John Pennekamp Coral Reef State Park. The adult mosquitoes were collected by using a sweep net and by hand. Then were put into vials containing ethanol to preserve them for later identification in lab. Some species that were collected near freshwater areas had the most diversity. Mosquitoes in the lower section of Florida were mostly the salt marsh species (*taeniorhynchus*).

45. An investigation of the Factors Controlling Sponge Community Distribution on Red Mangrove Prop Roots in Key Largo, Florida

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Understanding the factors that control community structure and species distributions is a long-standing goal of ecology. Similar to other organisms, marine sponges are distinctive colonizers of hard substrates in near shore sub-aquatic areas. To determine if community patterns differ between protected and exposed habitats, we measured the distribution and diversity of sponge communities colonizing red mangrove (*Rhizophora mangle*) prop roots in two locations at the John Pennekamp Coral Reef State Park Key Largo, Florida. Sponge diversity, depth from surface and colony size was examined on 22 distinct prop roots in both protected and exposed areas. To determine if associations were evident, we performed a one-way analysis of variance test (ANOVA) for exposed and protected areas versus root length, sponges per root, species per root, and sponge size. Our analysis revealed no significant correlations between sponge species diversity, depth or the size of the colony in roots sampled in either exposed or protected waters. Similarly, a principal components analysis performed to determine the effect of habitat (protected/exposed) indicated no pattern of species differences. However, the outcome of our analysis may have been hampered by the limited size of our data set. For future work examining sponge community structure, we suggest both larger sample sizes as well as expanding study locations to larger geographical areas.

46. 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 68 species representing 16 different families. Of those 68 species, the sunflower family (ASTERACEAE) was most represented with 28 taxa while the legume family (FABACEAE) was representative by nine taxa. Once our annual bioinventory survey is complete, these specifics of this flora will be used as a baseline for prairie management and restoration. Additionally, we will use the data to publish a Black Land Prairie manager resource guide.

47. Precision Measurement of Distance, Angle and Consistency of the Autonomous Robot with Proportional, Integral, and Accelerometer Controls

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The future Robotics Team of the University of West Alabama is headed to compete in the 2017 IEEE Southeast Conference Hardware competition in Charlotte, NC. In this competition, the teams must design and build a robot that completes various stages of the competition. The robots must be completely autonomous presenting various challenges. Some of the many challenges involved in having an autonomous robot include precision in directionality, position, and degrees in turn. When attempting such a high level of precision one must account for errors. One way to account for errors is through Proportional Integral Control. The idea behind Proportional Integral Control is to read sensor values then compute the desired output. The sensors being read are optical shaft encoders that work by converting angler position of the motor into a digital output value. With these values from the encoder input through the PI control formula, the precision is greatly increased. In addition, precision we will be maximized is 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 angel and direction.

48. Application of *Tol2*-based Activation Tag Constructs for Zebrafish Mutagenesis

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Transposons are segments of DNA that can move from one region to another within the genome. The T o l *2* transposon from Medaka fish has successfully been used for transgenesis, integrating foreign DNA, into a wide variety of vertebrates. Our goal is to develop *Tol2* into a mutagenesis tool for gene discovery. Mutagenesis by transposon insertion, called transposon tagging, enables the discovery and analysis of gene function by causing mutations. Activation tagging, a type transposon tagging, is when a strong enhancer is positioned within the transposon. Activation tagging is used to learn about the function of genes by inducing overexpression. This is significant because many genes may otherwise be hard to study because of lethality or redundancy. Activation tagging has never been used for zebrafish, but is commonly used for gene discovery in plants.

Zebrafish can serve as vertebrate development models, therefore activation tagging within zebrafish allows for the discovery of genes that are important for vertebrate development. A *Tol2*-based activation tag, with a *h2afx* promoter sequence inserted in the middle of *Tol2* terminal inverted repeats (TIRs), was engineered using various molecular biology techniques (PCR, digestion, and sequence analysis).

Additionally, a DNA construct encoding *Tol2* transposase, which will allow transposition of the activation tag to occur, was produced. The integration of both constructs into zebrafish embryos is performed to measure transposition rates and look for altered gene function. To develop more active constructs for zebrafish mutagenesis, yeast transposition studies are also being performed in order to identify methods to increase transposition rates.

49. Pollinators, Pumpkins and Primers, oh my! A Preliminary Exploration of wild Bombus Impatiens Population Trends in Pennsylvania

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In Pennsylvania, *Bombus impatiens* is a pollinating bee species active in both natural and managed landscapes. Because of the potential economically significant pollination services provided by *Bombus impatiens* in agriculture, there is interest in understanding the population dynamics of *Bombus impatiens*.

We have completed several measures on *Bombus impatiens* foraging in dozens of commercial pumpkin fields throughout Pennsylvania over the course of 3+ years. We collected 200 bumble bee specimens from each field to conduct microsatellite fragment analysis to determine the number of unique bumble bee colonies represented in each of the 200 samples. We have completed preliminary analysis on 4 collections of bumble bee samples that were taken from 2 farms from 2013 and 2014. For this preliminary analysis, we used 10 primers at different loci to establish bumble bee sisterhoods. We determined that several of these primers needed to be substituted in order to provide a more accurate determination of sisterhoods. We further optimized the established micosat analysis protocols in order to get more consistent results. After that, we were able to produce data comparing colony numbers by year and by farm.

In those same fields we measured the rate *Bombus impatiens* visited pumpkin flowers throughout the bloom season. Future work will compare visitation rates and colony numbers to establish any potential correlations. We will also complete analysis on the remaining bumble bee collections taken from additional fields during additional years in order to approximate population trends for the agriculturally significant subset population of *Bombus impatiens* in Pennsylvania.

50. What's Eating the Bee? Landscape Structure and Complexity On Bumblebees and Their Parasites

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Understanding the effects of environmental issues produced by anthropogenic degradation of ecological communities has become increasingly important over recent decades. Bioindicators are one method used to assess the stability and health of ecosystems. An ecosystem component currently under threat is that of Bee pollinators. Bumblebees face a variety of pressures that influence their survival rates. The study of the interaction of non-hymenopteran (N-H) parasitoid communities in trophic systems is particularly understudied; however, recent works suggest that parasitoids are strong bioindicators of environmental health. Due to their high trophic level position and specificity, parasitoids are an ideal "indicator" for community stability. This study was conducted in order to determine the prevalence of conopids and mites for two species of bumblebees *(B. impatiens, B. bimaculatus)* at twelve different locations in urban and rural environments. The second study in this project aimed to determine if peak prevalence for mites and conopids differed between two landscape contexts. Bumblebees were hand collected, then assessed for mites, and were dissected in order to determine rates of conopid parasitism. Mite prevalence was affected by round and location type. Conopid prevalence was not impacted by location type or round. The variation in this study gives cause for further research understanding the effects of landscape fragmentation and urbanization on trophic interaction.

51. Distribution of Epiphytic Orchids in Florida's Fakahatchee Strand

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Many factors in an ecosystem may influence community structure and lead to different patterns of productivity of the communities. We determined the distribution factors of epiphytic orchids in the Fakahatchee Strand Preserve State Park in South Florida. For each orchid, the host tree species, height (ft.) in which the orchid was located on each host tree, the stage of development, and the presence of spikes, seed pods, buds, or flowers were documented. While collecting data, eight species of epiphytic orchids were identified. The most common orchids found were *Encyclia tampensis* (Butterfly Orchid), *Epidendrum amphistomum* (Dingy Star Orchid), *Vanilla phaeantha* (Oblonged Leaf Vanilla Orchid), and *Rigid epidendrum* (Rigid Orchid). Sixty percent of all individual epiphytic orchids were found on *Fraxinus caronliniana* (Pop Ash). When moving from only moist or saturated ground into a slough, with water depth reaching up to 2 feet, we found different orchid species. Epiphytic Orchids such as *Epidendrum amphistomum* and *Rigid epidendrum* were found on trees in the slough more often than *Vanilla phaeantha* which were found on trees where there was dryer ground. It is suggested by the data that there is a correlation between presence of standing water and a shift in orchid species.

52. Long-term Effects of Paraquat on *Drosophila melanogaster*: Neurological and Epigenetic Effects

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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 the gradual apoptotic death of the DA neurons and the development Parkinson's disease. 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.* The flies were exposed with 1mmM and 10mM PQ during the juvenile stages where we observed that PQ negatively affected larval migration. Future studies will focus on mating flies fed with PQ to determine the epigenetic effects on the dopamine pathway in subsequent generations. We hypothesize that PQ may influence key epigenetic factors resulting in defects in movement behavior. We plan to conduct studies on overall methylation and acetylation in flies fed with PQ. These experiments are ongoing.

Other activities and outreach offered by NSM

Tri-Beta Biological Honor Society

The Beta Phi Chapter of Tri-Beta is the sole biological honor society at The University of West Alabama. Tri-Beta is a society for students, particularly undergraduates, dedicated to improving the understanding and appreciation of biological studies and extending boundaries of human knowledge through scientific research. As such, Tri-Beta is one of the nation's most respected biological honor societies. The Beta Phi Chapter of Tri-Beta National Biological Honor Society was chartered at The University of West Alabama in 1999. Since that time, Beta Phi has installed over 150 regular members of Tri-Beta. The members of Tri-Beta at UWA are active in undergraduate research, as well as service to the university community. The organization introduces and orients students to the numerous biological disciplines through guest speakers, shadowing opportunities, volunteer activities, and working on undergraduate research projects.

Alpha Epsilon Delta

Alpha Epsilon Delta (AED) is a national health pre-professional honor society dedicated to the encouragement of scholarship and recognition of excellence. Pre-professional areas of interest include medicine, dentistry, veterinary and other similar health fields. The AED chapter at The University of West Alabama was chartered in 2010. Some of the benefits or membership are public recognition of outstanding scholarship, activities which promote interests in professional health, and establishment of contacts with health professionals. Requirements for membership are overall and science GPA's of 3.2 or higher. The science GPA includes biology, chemistry, physics and mathematics.

Science Saturdays

The College of Natural Sciences and Mathematics (NSM) at the University of West Alabama initiated the *Science Saturdays* outreach program in 2010. The program aims to acquaint area K-12 students to the exciting field of Science and Mathematics at an early age. The program provides students in elementary, middle, and high schools in and around Sumter County, Alabama, with opportunities to

experience hands-on learning activities in science. *Science Saturdays* activities are two-hour events held three times during each fall and spring semester. Faculty members from UWA host science exploration projects through a variety of activities such as, "What Went by?" to learn how to trace animal footprints, "Crime Scene Investigation series" to learn about fingerprinting and DNA analyses, and "Dr. Frankenstein" to learn about human anatomy. *Science Saturdays* activities are free of charge and are open to all children in the appropriate age groups advertised for each event. There is, however, a limit of 20 children per activity. Since the program started, over 900 K-12 students from 6 surrounding counties have participated in the program. Please visit the *Science Saturdays* website for more information and pictures of activities. http://www.uwa.edu/ScienceSaturdays

Science Coffee Shop

In 2013, the College of Natural Science and Mathematics, in coordination with the Center for the Study of the Black Belt, initiated the Science Coffee Shop series. These informal gatherings, hosted by The Coffee Shop on Monroe, provide an opportunity for UWA faculty and other scholars to meet with community members in a casual atmosphere and discuss a wide range of science topics. Science Coffee Shops have generated community-wide discussions about producing new crops adapted to climate change, the microbiology of beer, the BP oil spill and Alabama marine life, and others. Please visit the Science Coffee Shop website for more information and pictures of activities. http://mmorsy.wix.com/science-coffee-shop

Science Olympiad

Since 2004, the College of Natural Science and Mathematics has hosted the UWA Elementary Science Olympiad. This is an academic interscholastic competition for Grades 3-6 consisting of a series of individual and team events for which students prepare throughout the year. Participating students interact with one another, learn subject matter, and have fun with science. Participation in Science Olympiads has been directly linked to increased interest and achievement in science and math. Events in the ESO relate directly to National Science Education Content Standards and to Alabama Content Standards for Science.

West Alabama Regional Science Fair

The West Alabama Regional Science Fair is an Intel ISEF-affiliated fair serving the counties of Choctaw, Fayette, Greene, Hale, Lamar, Marengo, Marion, Perry, Pickens, Sumter, and Tuscaloosa. These competitions exist in nearly every state in the United States as well as in 40 foreign countries. All Intel ISEF-affiliated science fairs register with Society for Science and the Pubic and must consist of five participating high schools and/or 50 students in the ninth - twelfth grades. The 2014 West Alabama Regional Science Fair will sponsor a winning student's travel to the 2014 International Science and Engineering Fair to be held in Los Angeles, California from May 11 - 16, 2014. Each year, millions of students worldwide compete in local and school-sponsored science fairs; the winners of these events go on to participate in Intel ISEF-affiliated regional and state fairs from which the best win the opportunity to attend the Intel ISEF. The Intel ISEF unites these top young scientific minds, showcasing their talent on an international stage, enabling them to submit their work to judging by doctoral level scientists—and providing the opportunity to compete for nearly $4 million in prizes and scholarships.

STEM Freshman Seminar

UWA 101 (Freshman Seminar) is a required course for all entering freshmen. As biology, math, science, or computer science majors, students have the opportunity to take a special UWA 101 courses designed specifically for them through the UWA Project Engage Program funded by a Minority Science and Engineering Improvement Program grant from The United States Department of Education. In addition to the regular UWA 101 course content, such as campus resources, personal, social, and academic support skills development, and expanded university orientation, the STEM (Science, Technology, Engineering, and Mathematics) UWA 101 course integrates specific STEM-related content and provides students access to enhanced educational technology resources.

UWA BOSS

UWA Biology Opportunities and Scholarship for Success (BOSS) is a program funded by the National Science Foundation, NSF. The program provides scholarships for academically talented students demonstrating financial need, enabling them to enter the STEM

workforce or STEM graduate school following completion of a baccalaureate degree in biology. The UWA BOSS provides more than monetary support for student participants. As part of the project, students also partake in undergraduate research that better prepare them for the work force or for graduate studies. Students engage in professional development activities and peer mentoring, while also having a faculty mentor who works closely with them as they assume the rigorous curriculum.

UWA's Project Engage

UWA's Project Engage is a capacity-building program designed to increase the retention rates of students. It is aimed at underrepresented groups majoring in science, technology, engineering, or mathematics (STEM), and focuses on their freshman and sophomore years through intensive academic and personal mentoring. A second purpose of Project Engage is to increase graduation rates of STEM students through their continued participation in project activities during the second year and beyond.

The Alabama Onsite Wastewater Association Training Center

The Alabama Onsite Wastewater Association Training Center (AOWATC) was established in 1997 because of a growing need for education in the rapidly changing wastewater field. The organization is dedicated to expanding public awareness of water quality issues, with a particular emphasis on wastewater management. The center was established with funding from the United States Environmental Protection Agency through the Alabama Department of Environmental Management, and by donations from the University of West Alabama and other contributors. The center is a member in a partnership that includes many federal, state, and local agencies, including the Alabama Onsite Wastewater Association, the Tombigbee Resource Conservation and Development Council, the Alabama Department of Public Health, the Alabama Onsite Wastewater Board, the Alabama Soil and Water Conservation Committee, and the Sumter County Soil and Water Conservation District.

Sumter County Nature Trust

The Sumter County Nature Trust was established in 1985 through a gift from Doctors Ralph and Margaret Lyon, both UWA Professors Emeriti. The Lyons, who lived in Sumter County for over thirty years, chose this avenue as a means of expressing their love for the county, for nature, and for people. The Trust is committed to identifying and preserving the natural resources of Sumter County, informing citizens about such matters, sponsoring environmental education activities, and developing sites where citizens can enjoy and appreciate the environmental treasures of the Black Belt Region. Endowment income provides funds for activities initiated by the Trust, as well as matching grants for individuals and organizations interested in fulfilling the goals of the Trust.

Fossils of the Black Belt

A one-day workshop on fossils for high school teachers is held each October, run by the University's paleontologists in partnership with researchers from the Geological Survey of Alabama. Continuing Education credit is offered.

Graduate Schools Participants

- Alabama College of Osteopathic Medicine
- Alabama A&M University
- Auburn University
- Delta State University
- Embry Riddle Aeronautical University
- Lake Erie College of Osteopathic Medicine
- Lincoln Memorial University-DeBusk College of Osteopathic Medicine
- McWhorter School of Pharmacy (Samford)
- The University of Mississippi
- UAB | The University of Alabama at Birmingham
- UAB | School of Nursing
- University of Alabama
- University of Alabama in Huntsville
- University of West Florida
- UWA – Conservation Biology
- William Carey University College of Osteopathic Medicine

Exhibitors

- Jefferson County Personnel Board
- Mississippi State University - CDE
- UWA – Division of Economic Development & Outreach
- UWA – Online

Acknowledgements

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