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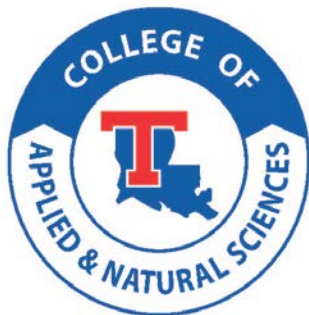
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**College of Applied and Natural Sciences
ANS Day & ANS Research Symposium
Louisiana Tech University Student Center**

April 12, 2018

8:00 – 10:00 AM Oral Presentations - Names of oral presenters are listed below.
(*Carson Taylor Hall Room 227*)

- 8:00-8:05 Introduction - Dr. Bill Campbell, Associate Dean for Research
- 8:05-8:17 Jason Holderieath, Assistant Professor, School of Agricultural Sciences and Forestry
- 8:17-8:29 Julie Rutledge, Associate Professor, School of Human Ecology
- 8:29-8:41 Landon Sims, Undergraduate student, B.S. in Biology.
- 8:41-8:53 Casey Morin, Graduate Student, M.S. in Biology
- 8:53-9:05 Saif M. I. Bar, Gergana G. Nestorova, School of Biological Sciences
- 9:05-9:17 India Pursell, Undergraduate Student, B.S. in Biology
- 9:17-9:29 Colby Sharp, Graduate Student, M.S. Biology
- 9:29- 9:41 Claire Jones, Graduate Student, M.S. in Molecular Science and Nanotechnology
- 9:41-9:53 Mengcheng Liu, Graduate Student, M.S. in Biology
- 9:53-10:05 Connor Gruntz, Undergraduate Student, B.S. in Environmental Science

8:30 – 11:30 AM Poster Viewing Session – Poster presenters will be in attendance.
(*Main Floor of Student Center*)

Posters will be presented by students and faculty members from academic units within the College of Applied and Natural Sciences

11:30 – 1:00 PM Lunch Buffet - Free for ANS students, faculty, staff, and invited guests
(*Main Floor of Student Center*), tickets available in academic unit offices

12:15 - 1:00 PM ANS Student and Faculty Awards
(*Main Floor of Student Center*)

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ORAL PRESENTATION ABSTRACTS

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Technology Solutions for Better Teaching

Jason Holderieath¹

¹Assistant Professor of Agricultural Business, Agricultural Sciences and Forestry, Louisiana Tech University

Being a professor is a dream job. However, there is more to be done than time to do it, and quality teaching takes time. Intuitively, we know that multiple choice exams are a second-best evaluation tool and research shows that students actively engaged will have better outcomes. Creating engaging content and avoiding multiple choice exams takes time. Thankfully, there are some tools available to help.

I will present three technology tools that can help faculty do a better job with a binding time constraint. *Gradescope* is a website that can speed scoring student work and improve grading objectivity. *Top Hat* is a student engagement tool that overcomes several common classroom problems. *YouTube* videos can provide outside help for students.

Gradescope can speed grading by using machine learning and sound design principles. Student work with a fixed format is scanned (or submitted electronically) and matched to a student roster with the help of machine learning. Multiple choice and short answer questions are then grouped for grading. Essay questions are presented one at a time, for each student, without identification of the student. The grader compares each student's work to a rubric. The rubric has the advantage of being able to be re-weighted and updated as trends are discovered in the grading process.

Top Hat is an online ecosystem consisting of web-tools and phone applications. Instructors can take *location specific* attendance, poll the class, ask reinforcing questions, and encourage discussion. The environment helps break the ice as students are less afraid to ask questions and make comments as they see that they are not alone. The interface also puts the instructor's slides on their device in sync with the lecture and makes them available outside of class.

YouTube videos can help reinforce student learning. A recent mini-grant has provided resources to create videos that will strengthen specific skills that students may miss in lecture. I will present a video and a summary of how it was made.

Taken together, or individually, these tools are an investment. There is a learning curve, and none of them are free. I hope to show that, for some faculty, the trade-off is advantageous.

Early Childhood Educators' Self-Reported Food Insecurity Impact on Observed Classroom Food Environment

Peyton M. Percle¹, Emily A. Byley², Julie M. Rutledge³ and Taren M. Swindle⁴

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There has been an increased interest in research focusing on the impact early childhood educators (ECEs) have on children's health outcomes. Current research indicates that a large number of ECEs "come from low-income families and work in a field that receives ... a salary only slightly higher than the federal poverty guideline" (Whitebook, Phillips, Howes, 2014). ECEs' behaviors during mealtimes may be negatively influenced by their past or present food insecurity (FI) status. Mealtime is a vital part of children learning communication skills and healthy eating habits. Children from low socioeconomic status families generally spend the majority of their meals with ECEs, increasing the importance of the school food environment for children's health outcomes. Data regarding ECEs' food insecurity (FI) were collected from a two-item screen for food insecurity based on the USDA's Household Food Security Survey Module (HFSSM). Observations of classroom food environment were completed at a local Head Start. Teacher fidelity to evidence-based practices and interventions was observed during weekly food experiences as part of a classroom-based nutrition curriculum, We Inspire Smart Eating, and were completed once per month, for 8 months using a 24-item tool. Mealtime observations occurred three times throughout the school year in each classroom using TABLE Talk (Swindle, Rutledge, Dix, & Whiteside-Mansell, 2017). In total, 58.3% of educators indicated current FI. An ANOVA was run to compare the change in supportive and unsupportive comments by ECEs at mealtime from baseline to 5 months after intervention training (controlling for experience, education, and age). There was a significant difference for change in unsupportive comments based on FI Status but not for change in supportive comments. FI and Food Secure (FS) ECEs exhibited similar use of positive, supportive practices at mealtimes. FI ECEs were twice as likely to exhibit negative, unsupportive practices at meals (e.g., pressuring children to eat, discouraging food manipulation) than FS ECEs. Importantly, chi-square analyses indicated no differences in comments between FI and FS ECEs during fidelity observations. The rates of FI for these ECEs is 20% higher than the national average of FI among families in poverty. FI among ECEs may be an important barrier in effectively implementing nutrition interventions. This is important given the increasing focus of Head Start and other childcare programs for obesity prevention and nutrition promotion as shown in the recent (2017) nutrition updates in the Child and Adult Care Food Program and National Association for the Education of Young Children standards.

Fluorescence Turn-On Sensor to Characterize Quaternary Folding Structure of Transthyretin

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Protein misfolding contributes to the pathogenesis of neurodegenerative and chronic diseases, such as Non Alcoholic Fatty Liver Disease (NAFLD). NAFLD has become the most common liver diseases in the majority of developed countries. Though the mechanisms underlying the disease have yet to be fully understood, obesity and insulin resistance are known contributing factors. We hypothesize that excess free fatty acids, which are characteristic of obesity, provoke protein misfolding and contribute to disease pathogenesis. Investigators have developed small-molecule, fluorescence turn-on sensors to detect misfolded proteins. In our study, we describe use of a fluorescence sensor based on a coumarin derivative to detect the folding state of transthyretin (TTR) in liver cells. This model was selected because liver cells are known to secrete TTR and protein misfolding in liver cells may have a role in the development of NAFLD. TTR mRNA expression in H4IIE rat and HepG2 human liver cells was determined by qPCR, TTR protein expression was measured by Western Blot, and TTR protein misfolding was assessed using a fluorescence turn-on sensor specific for the properly folded and assembled quaternary TTR protein.

Ant and Detrital Communities Impacted by Bluestain Fungi (Ascomycota: Ophiostomatoid) Inoculation in Coarse Woody Debris

Casey Morin¹, Juliet Tang², Courtney Siegert³, Nathan Little⁴, John Riggins⁵, Natalie Clay⁶

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Global change is driving biodiversity loss and altering the distribution and intensity of biotic interactions within communities. One example is the increasing population of bark and root beetles due to warmer climate, which are major disturbance agents in southeastern US coniferous forests. Bark beetles kill thousands of trees annually, which ultimately become coarse woody debris (CWD) that is uniquely pre-inoculated with ophiostomatoid (bluestain) fungi. Bluestain fungi is vectored by bark beetles and root weevils during the attack of the host tree and does not degrade the wood but attracts invertebrate species, such as mites and termites. These species can support predatory species, such as ants. Ants are widespread and abundant and are frequently the dominant predator in invertebrate communities. Although ants are common ecosystem engineers that can have significant impacts on decomposer communities, how ants impact CWD decomposer communities remains relatively unexplored. Because bluestain fungi attracts invertebrate species that are common prey of ants, we hypothesized that bluestain fungi will increase ant diversity and alter ant species assembly in CWD. Additionally, we predicted that ant communities in CWD would differ from the local ant species pool due to large habitat differences. To test this, 72 loblolly pine trees were inoculated with one of five bluestain treatments or water as a control in 2011. The four bluestain species used are typically vectored by 2 aboveground bark beetles and 2 root weevils, the fifth treatment was a combination of 2 bluestain species. Two randomly selected trees from each treatment were then felled at six different times over a four-year period. In 2015, ~1m x 25 cm diameter logs from felled trees were collected and invertebrates extracted from the logs. Ant species and other invertebrates were identified from 3 year old CWD using only pine trees felled in October 2012 and collected in March 2015 (n=12). To determine if CWD ant communities differ from the local species pool, we collected ants in summer 2017 and spring 2018 via hand sampling, pitfall traps, baiting, and leaf litter and wood collection. We collected 24 ant species from CWD. The average ant richness in bluestained wood is ~2 fold greater than in controls. Wood inoculated with *Ophiostoma ips* fungi trended greater average ant richness (9 ± 2.8) by ~72% versus controls. The majority of ant species from CWD tended to be generalist predators, indicating a general increase in prey rather than an increase in a certain prey species. Ant richness from the local species pool is still being determined but preliminary results suggest the CWD serves as an environmental filter by selecting against certain ant species. Additionally, preliminary results suggest that invertebrate communities differed in bluestained CWD from the controls. CWD

constitutes a significant carbon store in forest ecosystems. Changes in bluestained CWD detrital communities will likely impact wood decomposition rates and nutrient cycling.

Lab-on-a-chip calorimetric immunosensor: computational analysis and feasibility study

Gergana G. Nestorova¹, Saif M. I. Bari

2

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We report calorimetric lab-on-a-chip immunoassay for rapid quantification of analytes in biological samples. The feasibility of the technology was demonstrated via accurate measurement of the concentration of the inflammatory cytokine TNF- α in human astrocytes cell culture media. This microfluidics technology offers multiple advantages over traditional immunoassays. Since the method is based on detection of the heat released during an enzymatic reaction, the assay can be performed using different enzymes. The method permits the substrate to be introduced multiple times after the thermoelectric signal returns to baseline level that increases the statistical significance of the results. The immunoassay was performed in a microfluidic device with an integrated antimony/bismuth thermopile sensor that has 60 thermocouple pairs. The device had two inlets and single outlet and was fabricated using xurography technique. The fluid flowing through inlet 2 was hydrodynamically focused within the reaction zone located above the measuring junctions of the thermopile. Anti-TNF- α monoclonal antibody was used to capture the analyte that was followed by detection with glucose oxidase-conjugated secondary antibody. Glucose (55mM) was injected through a sample loop into the fluid flowing within the microfluidic device. Nanovolt meter connected to the thermoelectric sensor recorded the voltage change caused by the enzymatic reaction. COMSOL simulations were performed to analyze the effect of flow velocity of inlet 2 on the glucose concentration within the reaction zone. The amount of glucose decreased as inlet 2 flow rate was reduced. The magnitude of the thermoelectric signal was proportional to the concentration of TNF- α in the biological sample. Standard calibration curve was created using serial dilutions of synthetic TNF- α (0-2000 pg mL⁻¹) by plotting the area under the curve of the signal versus the concentration of the analyte. The equation of the calibration curve was $y=0.0314x+2.6927$, $R^2=0.9942$. The concentration of TNF- α was quantified using cell culture medium from lipopolysaccharide (100 ng mL⁻¹) treated and non-stimulated human astrocytes. The limit of detection of the microfluidics calorimetric assay was 9.88 pg mL⁻¹ and the limit of quantification was 30 pg mL⁻¹. The estimated concentration of TNF- α was 165 pg mL⁻¹ and 170 mg mL⁻¹ using microfluidic system and conventional absorbance plate reader respectively.

The Use of Biomimetic Hydrogels to Direct Stem Cell Differentiation for Tissue Engineering Applications

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Human mesenchymal stem cells (hMSCs) are a multipotent stem cell used in cell based regenerative therapies with over 600 clinical trials being conducted for the treatment of conditions like leukemia, autoimmune disease, cardiovascular disease, and orthopedic injury. hMSCs have the ability to self-renew and the potential to differentiate into many cell types, including those that make up bone, fat, and cartilage. In order to harness the potential of stem cells for regenerative medicine applications, there is a growing interest in the generation of biomimetic scaffolds to facilitate the growth and differentiation of specified tissue types. However, despite the research in the area of biomaterials for regenerative tissue scaffolds, there remain many questions about how cells interact with these scaffolds and how the properties of the materials influence cell behavior. We have analyzed the response of hMSCs seeded on Poly (ethylene glycol) dimethacrylate (PEGDMA) hydrogels to determine how the cells behave on materials of different elasticities. Attachment studies, immunofluorescence staining, and qRT-PCR were used to quantify and verify adipogenesis of hMSCs. Hydrogel biocompatibility was confirmed in mouse embryonic stem cells (mESCs) and hMSCs as they adhered to and survived on hydrogels of different elasticities. In addition, IF and qRT-PCR confirmed an influence of hydrogel elasticity on cell state, that will continue to make contributions to the field striving to characterize and optimize biomaterial-cell interactions for tissue engineering applications.

Avian Use of a Bottomland Hardwood Afforestation Site in the Red River Alluvial Valley

Colby W. Sharp¹, Heidi L. Adams², William B. Patterson²

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²Assistant Professor, School of Agriculture Sciences and Forestry, Louisiana Tech University

Bottomland hardwood forests cover about 2.8 hectares of the original 10 million hectares that once existed in the southeastern United States. These losses have led to an emphasis on afforestation of retired agricultural land. It is important evaluate changes in wildlife communities as these afforested stands mature. For instance, topographic variation within them can lead to certain tree species becoming better established in certain areas compared to others, leading to an afforested stand with forest types of differing species. Previous research at an 809-ha afforested bottomland hardwood stand near Coushatta, Louisiana identified seven forest types. We conducted point count surveys at 28 point locations evenly distributed among the forest types at the afforested stand six times during the avian breeding (i.e., June-August, twice/month), recording detected species and its distance from point. We used DISTANCE 7.0 to estimate a detection function and avian density within each of the forest types. Avian diversity was calculated for each forest types using Shannon's Diversity Index. Preliminary results for woodland bird density in each of the forest types ranged from 1.698 bird/ha in willow oak (*Quercus phellos*) to 26.181 birds/ha in sweet pecan (*Carya illinoensis*) during the 2016 breeding season. Bird density for the 2017 breeding season in each forest types ranged from 4.879 birds/ha in sweetgum (*Liquidambar styraciflua*) to 20.405 birds/ha in sugarberry (*Celtis laevigata*) – persimmon (*Diospyros virginiana*). Shannon's Diversity Indices for 2016 diversity analysis ranged from 2.320 (H max = 2.565) in sweetgum to 2.636 (H max = 2.890) in sweet pecan, with diversity analysis in 2017 showing changes with sweet pecan increasing by 0.149 (H max = 3.045) and sugarberry – persimmon at 2.399 (H max = 2.944). The results from this study will aid in developing if forest management recommendations to promote breeding bird use of the afforested bottomland hardwood stand.

The Use of Reactive Oxygen Sensitive Green Fluorescent Protein to Determine Reactive Oxygen Species Production in *E. coli* and *Candida albicans*

Claire E. Jones¹, Patrick L. Hindmarsh²

¹ *Molecular Sciences and Nanotechnology Graduate Student, School of Biological Sciences Louisiana Tech University*

² *School of Biological Sciences, Louisiana Tech University*

Candida albicans is an opportunistic fungal pathogen commonly found in the mucosal tissue of the human body. In immune-compromised patients, *C. albicans* causes candidiasis, which can be fatal when the yeast causes systemic fungal infections. It is currently treated with broad-spectrum antifungals, but antifungal resistant stains are emerging. Reactive oxygen species (ROS) are produced as a stress response by the cell to antifungal drugs, making it possible to test the effectiveness of drug therapies. A reactive oxygen sensitive yeast enhanced GFP (royGFP), with mutations at S147 and Q204 where the amino acids are replaced with cysteine (S147C and Q204C), make it possible to measure the production of ROS by the change in fluorescent excitation. In the presence of ROS agents we have observed changes in excitation confirming the functionality of our royGFP construct. In testing in *E. coli* we found high levels of expression of the yeast codon optimized royGFP, which lead to its inclusion in the project. We are currently working to optimize the ROS experiments in *C. albicans* and further develop ROS experiments in *E. coli*.

The role of Notch3 signaling pathway on the stem cell statement

Mengcheng Liu

M.S. Biology, College of Applied and Natural Sciences, Louisiana Tech University

Adipose-derived stem cells (ASCs), a critical tool for tissue regeneration, are a member of adult stem cells with multipotency and capability of self-renewing. However, the mechanism of adipogenesis remains poorly understood and can be better characterized through inducing differentiation of ASCs and investigating individual factors and pathways. The Notch signaling pathway is involved in cell proliferation, development, and differentiation. We have successfully performed knockdown of Notch3 with Notch3-targeted siRNA and observed increased adipogenesis through oil red o staining and increased transcript level of adipocyte markers such as PPAR γ and Srebp-1c. However, we did not see significant effects of Notch3 knockdown on cell viability and proliferation. In the future, we will perform co-immunoprecipitation to investigate potential protein-protein interactions between Notch3 and adipocyte transcription factors. With the progress of our research, we will have a better understanding of cell fate control during tissue regeneration and differentiation.

Effects of Low-Level Additions of Salt on Decomposition Rates and Plant Sodium Concentrations in a Southeastern, US Riparian System

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²University of Central Arkansas, Biology Department, Conway, AR 72034

³University of Arkansas, Department of Biological Sciences, Fayetteville, AR 72701

Decomposition rates can affect carbon storage and carbon dioxide release in ecosystems. Sodium is a limiting resource in many ecosystems and because heterotrophs, like detritivores, rely on sodium for many physiological processes, they will seek out salt in ecosystems with low sodium availability. However, most terrestrial ecosystems away from coastlines contain almost no naturally occurring salt. Human activity has greatly increased the amount of salts found in many environments. Although rivers and streams can carry nutrients and sediments long distances, very few studies have examined the impacts that salt has on riparian systems. Increased sodium can stimulate decomposition directly, or indirectly through increases in leaf sodium concentration. We tested how low-level salt additions would impact decomposition rates and plant sodium concentrations in riparian systems. We predicted that even low-level sodium additions would increase decomposition rates and plant leaf sodium concentrations in riparian systems. We delineated 20- 1 x 1 m plots adjacent to the bank of Wafer Creek (Ruston, LA). We randomly assigned 10 plots as salt (NaCl) treatments which received 500mg in 0.75 L reverse osmosis water (these levels match slight to moderate risk for plants in irrigation water) and 10 plots as controls, which were treated with 0.75 L reverse osmosis water. Each plot contained 4 litterbags that each had 3g of red maple leaves (10 plots contained an additional 4 litterbags that contained 3g of filter paper). Plots were watered with their respective treatment every two weeks. Litterbags were collected at days 0, 7, 21, 89, and 257. Ivy, grass, and oak plant samples for sodium analysis were collected at days 149, 205, and 247. Specifically, we collected live leaves from three species of plants spanning a diversity of functional traits commonly found in riparian systems (*Smilax pumila*, a sedge (*Carex* sp.), and river oaks (*Quercus nigra*)). Over 89 days, the initial litter bags collected had no difference in litter decomposition between low-level sodium plots and control plots. However, they were ~25% decomposed and the last litterbag samples have not been collected. Conversely, low-level sodium inputs had large effects on plants. We found that *S. pumila* and *Carex* sp. contained 1.4 times more salt and *Q. nigra* had 5.4 times more salt than conspecifics on the control plots after 149 days. Plant samples from day 205 and 247 are currently being analyzed. Together these results suggest that low-level sodium additions may not have a significant effect on the decomposition rates in riparian systems but will alter sodium concentrations in a diversity of plant leaves. The decomposition rates not increasing could be caused by the sandy soils found along Wafer Creek. Sandy soils have a high rate of leeching, which could decrease the amount of salt available to detritivores. The amount of salt available to detritivores could be further decreased because plants took up some of the salt initially applied to the plots. Furthermore, salt is toxic to many plants, so the uptake of salts may negatively affect the general health of the plants. Abscised leaves that contain salts may result in longer retention of those salts in the soil. Further experiments must be done to test these hypotheses.

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Exploring the benefits of adding Regano[®] to the diet of nursery pigs

Kristin Schof¹, Mark Murphey², and Ashley Keith³

¹*Animal Science, School of Agricultural Sciences and Forestry, Louisiana Tech University*

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Research has shown the oil, regano, from oregano grown around Greece is beneficial to livestock in many ways. Consequently, the product Regano[®] has been developed for use in livestock species, such as pigs. Regano has a high content of phenolic acids and flavonoids, which contribute to its high antioxidant activity. Since the digestive system of young pigs is not fully developed, they have a higher chance of contracting intestinal parasites and a variety of illnesses. Furthermore, studies suggest the oil reduces mortality rates and treatment rates with Regano[®] are lower compared to commercial drugs for scours, a major concern in young pigs. Regano[®] is also being utilized as a natural anthelmintic in various livestock species. Decreasing the incidence of illness often results in increased feed efficiency, which may be measured in pounds of average daily gain. The objective of this study is to determine the benefits of adding Regano[®] to the diet of nursery pigs in order to prevent illness by internal parasites and to increase growth rates by increasing feed efficiency. To test this, weanling pigs were fed a starter ration *ad libitum* that was formulated to meet 100% of their nutrient requirements set by the National Research Council. Pigs were then randomly assigned to two groups, each with an equal number of males and females. The groups either received a water source containing the recommended dosage of Regano[®] (TRT; n=7) or a water source without Regano[®] (CON; n=7) for 49 days. For baseline levels of intestinal parasites, fecal samples were collected on Day 0. Administration of Regano[®] through their drinking source for TRT pigs began following initial collections. Both fecal samples and weights were then collected and recorded on Days 7, 21, 35, and 49 of the trial. Immediately following collection, fecal samples were processed and analyzed under a microscope to determine the presence or absence of intestinal parasites. Furthermore, dosage of Regano[®] was recalculated following each weight collection to ensure proper dosage rate as the pigs grew. Throughout the trial, no intestinal parasites were noted in any of the samples for either group. This is most likely attributed to the fact that the pigs were housed in pens on concrete and not exposed to soil or grass, where most intestinal parasites are picked up by livestock. It should also be noted that in large commercial operations, most pigs are housed indoors on concrete floors that are cleaned daily. However, some producers are moving against this and beginning to allow access to the outdoors, increasing exposure to parasites. Additionally, there was no difference ($P>0.05$) in average weight or average daily gain between groups on Days 0, 7, 21, 35, or 49 of the trial. This could possibly be due to a small sample population. Further research is needed on pigs exposed to parasites through soil and with a larger sample population to fully investigate the potential of Regano[®] as an anthelmintic and to increase feed efficiency in weanling pigs.

Impacts of incorrectly measured heights on timber appraisals

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Heights are commonly measured using the tangent of angles. Many traditional hypsometers produce height estimates based on establishing the vertex of the angle from a known, instrument calibrated distance. Unless corrections are made when the vertex is established at a distance other than the calibrated distance, heights will be incorrect. Using incorrect heights in say tree volume equations will produce errors in timber appraisals. Timber appraisals are conducted to determine the value of a forest to calculate how much revenue should be received for the standing timber. This simple study quantified the potential impacts of such errors when conducting loblolly pine (*Pinus taeda* L.) timber appraisals.

In a stand of 50 trees that are 80 ft tall, and when the desired distance for the hypsometer is 66 ft, but one stands 62 ft from the tree, the estimated per acre value is \$3,830. If truly standing 66 ft from all 50 trees the estimated per acre value is \$3,598. This is a difference of \$231. In a 40 acre stand this is a meaningful error amount of \$9,253. If, for example, a forester coordinates 30 timber sales a year these errors could become extremely meaningful.

Assessing internal parasite loads of sheep and goats in Animal Science courses

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The curriculums featured in School of Agricultural Sciences and Forestry often offer a multitude of hands-on experiences in the field to stimulate and support classroom lectures. More specifically, the Animal Science curriculum features several courses which teach topics on beef, sheep and goat production, all of which feature aspects of research and production opportunities on Tech Farm. A major concern of livestock production, particularly in sheep, goat and beef production, is the control of internal parasites. While this is a concern throughout the life of these animals, it is of particular concern in young animals prior to and immediately following weaning. Moreover, current research shows that internal parasites are developing a resistance to many of the commercial anthelmintics, resorting in the research of new management methods and products for control of internal parasites in all species. Both livestock producers and veterinarians utilize several techniques to determine parasite loads and anemia (a result of high parasite loads), including FAMACHA scores (sheep and goat production), hematocrit levels or packed cell volume, and fecal egg counts with McMaster slides and protocol. Teaching these procedures enhances the students' experiential learning by allowing them to apply knowledge of animal health and handling to both veterinary medicine and livestock management strategies. Although it fits into many courses, the first course to assess this laboratory project was ANSC 224, Introduction to Livestock Management. Students were introduced to research from peer-reviewed manuscripts and learned protocols for assessing FAMACHA scores, hematocrit levels or packed cell volume, and fecal egg counts with McMaster slides. They divided into groups and performed these procedures on mature ewes and growing sheep currently housed on Tech Farm. Students then discussed the results they collected and suggested management protocols for treatment and prevention of internal parasites in sheep and goats on Tech Farm. The project was also assessed by asking students to complete a survey on their learning experience. Survey questions, answered on a scale of 1-10, included: 1) How much did this project enhance your learning experience? Average response: 9.5; 2) how much do think this project will enhance your chosen profession in the future? Average response: 9.5; and 3) How well do you feel this project will enhance your current or future livestock management practices? Average response: 9. Positive comments included: "Makes me more excited about my chosen profession (vet)."; "Allowed hands-on learning, making the information easier to apply to real-life circumstances.", "It will definitely help a lot. The only way to improve medicine and disease prevention is to improve medical equipment and technology.", and "I already feel like I know so much more in the first few hours of this lab than I did in past science courses. It definitely pushed me out of my comfort zone. I felt challenged to overcome long time fears." Based on a largely positive response from the students, this will continue to be incorporated in future Animal Science courses, spanning to include goats and cattle.

Utilizing Regano[®] for internal parasite control and increased feed efficiency in organic lamb production

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Young lambs are exceedingly vulnerable to internal parasites due to their underdeveloped immune system. In order to ascertain an alternative to commercial anthelmintics, Regano[®] was administered to lambs (n=24) from weaning through their early growth period. More specifically, to investigate the impacts of oral administration of Regano[®] as an anthelmintic and to increase feed efficiency, weanling lambs (n=24; 6 weeks of age) were randomly assigned to be fed a grower ration containing the recommended dosage of 100mg of Regano[®] per pound of body weight (TRT) or the same ration without Regano[®] (CON) for 60 days. Both TRT and CON groups had equal numbers of males and females. Both groups were allowed to graze together for 8 hours following their morning feeding, then penned by group each night when fed. Additionally, CON lambs were given a standard, commercial anthelmintic (Valbazen[®]) on Days 1 and 31. This is concomitant with basic production practices of growing lambs. For baseline levels of internal parasites, fecal and blood samples were collected at Day -7 and 0. Following administration of either Regano[®] or Valbazen[®] on Day 1, both blood and fecal samples were collected and FAMACHA scores were assessed. Immediately following weekly collections, fecal samples were analyzed to determine concentrations of *Haemonchus contortus*, *Moniezia sp.*, *Trichuris ovis*, and *Eimeria spp.* and hematocrit levels were analyzed. Furthermore, lambs were weighed weekly to adjust daily rations according to standards set by the National Research Council. Weights were also utilized to calculate average daily gain of each lamb. There was no difference (P>0.05) in levels of *Haemonchus contortus* of TRT and CON lambs on Days 0, 14, 28, 35, 42, 56, or 61. However, CON lambs did have significantly (P<0.05) lower levels of *Haemonchus contortus* than TRT lambs on Day 21. Similarly, there was no difference (P>0.05) in total levels of internal parasites (*Haemonchus contortus*, *Moniezia sp.*, and *Trichuris ovis* combined) on Days 0, 14, 28, 35, 42, 56, or 61. However, there were significantly (P<0.05) lower levels of total internal parasites on Day 21 in CON compared to TRT lambs. Likewise, no difference (P>0.05) was seen in levels of *Eimeria spp.* between groups on Days 0, 14, 28, 35, 42, 56, or 61 but CON lambs did have significantly (P<0.05) lower levels of *Eimeria spp.* than TRT lambs on Day 21. There was no difference (P>0.05) in average daily gain of CON compared to TRT lambs throughout the duration of the trial. Lastly, FAMACHA scores were associated with hematocrit (packed cell volume) weekly, which did not differ (P>0.05) between groups. Results from this study suggest that oral administration of Regano[®] through daily feedings may serve as an anthelmintic for producers focused on decreasing the use of medications in their flocks. It also decreases the need to frequently handle, and subsequently stress, lambs.

Influence of Container Color, Media Depth, and Subsequent Light Availability on Stem Elongation of Longleaf Pine

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Genetically pure longleaf pine (*Pinus palustris*) seedlings differ from other southern pines by not exhibiting an extension of a hypocotyl or stem during germination. However, hypocotyl extension in longleaf pine has been observed, and it is believed by some that this elongation is an indication that hybridization has occurred with loblolly pine (*Pinus taeda*), thus, forming a hybrid species known as Sonderegger pine (*Pinus x sondereggeri*). During propagation, true longleaf pine buds tend to remain flaccid near the growing media level in the container. In nature, Sonderegger pines can naturally occur where longleaf and loblolly pines are in close proximity of each other and when pollen release occurs simultaneously. As a routine practice in the nursery, Sonderegger pines are culled during processing and packing when the elongated stems with terminal buds are evident. General knowledge at the present time is that Sonderegger pines are undesirable due to their non-merchantable form years after planting.

Earlier research has shown that even when longleaf pine hypocotyl extension occurs, elongation can cease at some point in the growing season; then, development can continue as normal (unpublished data). It is not fully understood why hypocotyl extension occurs in longleaf pine grown from certain seedlots. However, there are two theories being proposed: 1) some seedlots collected from longleaf pine cones are contaminated with hybrid seeds and are exhibiting hypocotyl extension that is not true to longleaf pine genetics or 2) environmental factors such as light availability during seed germination in a container with varying depths of growing media are influencing growth.

To test this theory, longleaf pine seed was sown in RL98 StubbyTM container cells that were either filled to normal levels or partly filled leaving the top one-third of the cell free of growing media. The seedlings that develop in cells partly filled may be affected by the dimmer light conditions and be more likely to express hypocotyl extension. White and black container cells were seeded in equal numbers to test the influence of light reflection and absorption on germination and subsequent hypocotyl extension. By understanding the effect light availability has on the expression of stem elongation, methods for accurate and early detection of longleaf pine hybrids in nurseries may be improved. Our null hypothesis is that the level of growing media in white or black container cells will have no effect on longleaf pine hypocotyl extension.

The Product Analysis of Men's Athletic Pants

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The purpose of this project was to determine how apparel construction affects the fit, performance, and cost of a garment.

To find the sizing, garments were measured at the waist, hip, in-seam, out-seam, and crotch before laundering and after 10 launderings. The original and washed measurements were compared to each other as well as the standard sizing measurement to determine fit for each brand. To determine the construction of the garments, we evaluated what kind of seams were used to construction each brand based on the Federal Standards for seam type and stitching classes. To compare garment labels, we looked for aesthetic similarities between our three brands, and they all had the same characteristics. Then we looked for differences in fiber content, country of origin, care requirements, fabric construction, and size, as well as differences in tag appearance based on color and writing. The cost to manufacture a pair of pants from each brand was determined based on the construction characteristics of the pants including material and trimmings, labor, packaging, as well as duties and taxes.

When comparing size and fit between the three men's athletic pants, none of them measured up to their standardized sizing chart. Russell's measurements on the original garment met the company's standard sizing chart, but they shrank more than the other two pants. The basic construction of all three of our garments are the same. The main costing difference between each garment is their country of origin.

Based on research, BCG is the overall best brand of athletic pants. All of BCG's measurements followed the standard sizing chart. It had the lowest rate of shrinkage averaging only an inch, while Nike and Russell both had flawed sizing. BCG's original pants fit their standard sizing chart before and after being washed, while both Nike and Russell shrank several inches after being washed. Although Nike is presumed best by many customers, their original pants had smaller measurements than the standard size. BCG also excelled in cost because they had the lowest selling price after all costs were added up. It performs the same functionalities as Russell and Nike, but BCG's material cost, packaging cost, and taxes are all cheaper.

Product Quality Analysis of Pencil Skirts: How Does Production Affect the Garment?

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The purpose of this project was to determine how garment construction affects product quality, performance, fit, and cost.

Pencil skirts from three different store were evaluated for construction, sizing and fit, and cost. Garment labels were reviewed description of labels, fiber content, RN number, country of origin, care requirements, and extra voluntary information. Sizing specifications were evaluated by measuring the waist, hips, center front length, and center back length. Measurements were taken on the original and garment that was washed ten times for each brand. Cost sheets were completed for women's skirts by examining the garments for materials, trimmings, and construction. Construction characteristics were evaluated to determine construction techniques for stitch and seam types. Design and fit characteristics were evaluated for shaping methods and styling.

The data indicates there are many differences between the skirts. They all are pencil skirts with a slim fit. However, the quality of each skirt is very durable and contains unique features such as dynamic seams and trimmings. Production and cost wise, each garment has different costs from production. Sizing and fit is an important factor when it comes to the garment quality and fit. H&M was the only garment that had a big difference when it came to standard measurements. For Gianni Bini and Valerie Stevens, the hip and waist measurements were close in standard sizing.

In conclusion, the skirt that performed the best in durability, cost, and production is the H&M skirt. The garment is a good price with good strength and quality. For the price, you get an overall good skirt with an added lining. This skirt was only a cent more than the Valerie Stevens skirt, but it is the best deal for extra support and overall quality in the garment. This product gives consumers the most for their money.

Analysis of the Structural Characteristics and Their Effect Fit and Performance of Men's Chino Pants

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The purpose of this project was to compare similar men's chino pants from three different brands at various price points in order to determine whether or not there are differences in quality based on the individual design and construction properties of each garment.

The garment label, construction characteristics, sizing and fit, and the cost to manufacture three pairs of men's chinos, from three different brands were evaluated. For each brand, the construction characteristics, sizing and fit measurements, and cost of an original pair, and a pair of pants washed 10 times were examined. The cost to manufacture a pair of pants from each brand was determined based on the construction characteristics of the pants including material and trimmings, labor, packaging, as well as duties and taxes. Construction characteristics such as embroidery, stitch types, and seam types. Each brand was visually evaluated to determine construction techniques. The original and washed pants for each brand were measured at the waist, hip, leg in-seam, leg out-seam, and crotch and the measurements were recorded. The original and washed measurements were compared to each other as well as to the standard sizing measurement to determine fit for each brand.

Upon concluding our analysis of each garment, we found varying measurements among the original, standard, and washed pants. Each garment incurred shrinkage throughout each of the measured areas. Of the three garments, Faded Glory had the least amount of overall shrinkage, while H&M and Roundtree and Yorke had comparable shrinkage. The construction of each of the garments analyzed were very similar. The use of different materials and techniques used in each garment is reflected in the price point with Roundtree and Yorke being the most expensive brand. Further research confirmed that the fit of each garment will vary slightly after several wash cycles, but share comparable ratios of original to wash measurements.

After completing the analysis of men's chino pants, the results confirmed that all three brands are very similar. Despite the cheaper price point of Faded Glory and the claimed higher quality of Roundtree and Yorke, H&M yielded measurements and construction similar to that of the other brands, while maintaining the closest measurements to the original sizing, as well as at a reasonable price point, making it the best option for meeting customer serviceability.

Analysis of Apparel Structural Characteristics to Determine Effects on Fit, Performance, and Cost of Womens' Athletic Shirts

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Customer serviceability relies on grasping the overall apparel construction and structural characteristics and how it affects the garment's performance and fit. Customers unconsciously ignore the importance of the garment construction and how various elements such as laundering, structural traits, country of origin, and the cost to manufacture affect it. The purpose of this project was to determine how apparel construction affects fit, performance, and cost of a garment.

Women's athletic shirts from three different stores were analyzed for construction, sizing and fit, and cost. The garment labels were analyzed for country of origin, description of the labels, fiber content, permanent care requirements, the RN number, and any extra information. Sizing specifications were analyzed by taking measurements in the bust, waist, hip, and sleeve length of the shirts to ensure a good fit. We measured the original unwashed sample and the washed sample and compared the measurements to their company's standards.

The costing sheet accumulated all the costs associated with the products including the material (fabric), trimmings, labor, packaging, duties/taxes, and indirect costs. Construction characteristics were analyzed to determine the techniques used for the stitch and seam types. Fit and design characteristics were and analyzed for their shaping methods. Extra specifications were noted as well.

The construction of the shirts revealed that BCG had the cheapest wholesale selling price compared to Under Armor and Danskin Now. The garment sizing data revealed that BCG had the least amount of shrinkage. Waist measurements for the original and washed shirt did not meet the standards. Each garment had a printed-on label in the inner back of the shirt that displayed the brand, size, and country of origin as well as a woven care label attached to the side.

In conclusion, after analyzing all the data charts BCG was the best option for meeting customer serviceability.

Analysis of the Effect of Construction and Fit on Performance of Women's Chinos

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It is known that the construction of garments determines the way they will fit and perform when worn. The purpose of this project was to compare the construction of three different brands of similar women's chinos to determine how construction affects fit, performance and price.

Labeling, shaping methods, construction techniques, sizing specifications, stitch/seam specifications, shape and support, and cost were analyzed for each of the brands. The sizing and fit were determined by measuring the waists, hips, leg in/out-seams, and crotches of each garment with a tape measure. The measurements were recorded for both original and after ten launderings. Cost for materials and labor were also calculated. This included the material cost, trimmings cost, and labor cost, packaging, duties/ taxes, indirect costs and the total cost. With all the costs, the total cost and the selling price was calculated. Each pair of pants were analyzed for the construction techniques used. Each seam and stitch was analyzed and labeled by their specific seam and stitch type and numbering.

The results for all three brands were strikingly similar. The construction of each of the garments analyzed were very similar. Each garment had mostly lock and chain stitching providing durability for customers. Ralph Lauren showed the least amount of shrinkage. Even though each brand shrunk they would still fit the standard for waist measurement. However, they would not fit the standard for hip measurement. Each of the garments label location and description of the labels were the same for each brand. The content of each of the garments vary slightly and minimally affect the individual serviceability of each garment.

After reviewing all of the results, H&M proved to be the best out of all three brands. Although Ralph Lauren had the least amount of shrinkage, they are the most expensive for customers to purchase. The Faded Glory chinos proved that it is worth the extra money to purchase better quality garments, like H&M, because of how large the overall shrinkage was. Ralph Lauren's wholesale price was a few cents lower than H&M which means the price is only \$60 higher because of the name brand. Customers who purchase the H&M chinos will experience a great fit for a reasonable price.

Textile Properties of Men's Athletic Pants

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The purpose of this research project was to test the performance of three different brands of men's athletic pants from Nike, BCG, and Russell to determine if there are any differences based on textile properties.

The general construction of each of the pants was evaluated including; yarn structure, weave structure, method of coloration, fabric weight, and thread count. To test the dimensional stability, one garment of each brand was marked with four 10 inch squares, two being horizontal and two being vertical. The marks were measured after being laundered one time, three times, and then ten times to measure dimensional stability. Each garment's stain resistance was measured by putting peanut butter, apple sauce, grape jelly, butter, red wine, oil, ketchup, mustard, and ranch dressing, letting the stains dry and then washing the garments. The stains were rated using the AATCC Staining Scale. Colorfastness of the fabric was tested for chlorine and non-chlorine bleach, home laundering, and crocking. The colorfastness tests were rated using the AATCC Gray Scale for Staining. Wickability was tested by holding a 10- inch strip of each fabric in a glass of water for 5 minutes and then measuring the distance the water traveled in the allotted time.

Russell had the greatest shrinkage after the first laundering exceeding the minimum industry standard allowed for shrinkage. The appearance retention of BCG and Russell were very similar after laundering both having minimal wrinkles. Nike performed the worst among the three brands in appearance retention, colorfastness to laundering, colorfastness to perspiration and wickability. All brands resisted staining but the only stain that wasn't resisted was the ketchup stain on the Nike brand. Russell had the best performance in colorfastness to laundering with perfect scores while Nike and BCG not meet perfect scores on a few laundering tests.

The performance of BCG and Russell athletic pants proved exceptional compared to Nike. Since BCG performed the same as or better than Russell, it is the best buy for product in terms of quality and performance.

Textile Properties Effects on the Serviceability of Women's Chinos

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The purpose of this project was to compare three different women's chino pants from Faded Glory, Lauren Ralph Lauren, and H&M to determine if there are differences based on textile properties.

The general construction of each of the pants was evaluated including; yarn structure, weave structure, method of coloration, fabric weight, and thread count. To test the dimensional stability, one garment of each brand was marked with four 10 inch squares, two being horizontal and two being vertical. The marks were measured after being laundered one time, three times, and then ten times to measure dimensional stability. Each garment's stain resistance was measured by putting peanut butter, apple sauce, grape jelly, butter, red wine, oil, ketchup, mustard, and ranch dressing, letting the stains dry and then washing the garments. The stains were rated using the AATCC Staining Scale. Colorfastness of the fabric was tested for chlorine and non-chlorine bleach, home laundering, and crocking. The colorfastness tests were rated using the AATCC Gray Scale for Staining. Wickability was tested by holding a 10- inch strip of each fabric in a glass of water for 5 minutes and then measuring the distance the water traveled in the allotted time.

Faded Glory women's chinos had the most shrinkage after three and ten launderings, and exceeded the industry standard allowed for shrinkage. Lauren Ralph Lauren and H&M were significantly below the industry standard allowed for shrinkage. The appearance retention among all three brands were very similar. Faded Glory performed the best with resisting color rub off during dry and wet crocking. Lauren Ralph Lauren and H&M women's chinos performed well during dry crocking, but showed average color rub off during wet crocking. H&M performed the worst for resistance to staining. Due to the darker fabric of Faded Glory, less stains were shown.

The test results for women's chinos in this project reported that all three brands were very much alike. Though the Faded Glory chinos are the cheapest, the H&M pants would be the best for meeting serviceability and consumer expectations. The H&M chinos performed almost exactly the same as the Lauren Ralph Lauren chinos, but the H&M chinos are more affordable.

Textile Properties of Pencil Skirts: Does Price Matter?

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The purpose of this research project was to test the performance of three different brands of pencil skirts from Gianni Bini, Valerie Stevens, and H&M to determine if there is any differences based on textile properties. The general construction of each skirt was evaluated.

The construction included yarn structure, weave structure, fabric weight, and thread count. To test the dimensional stability for each skirt was measured by hand tacking four marks (front length and width and same for the back) that were 10x10 inches or 10x5 inches depending on width and length of skirt. The skirts were laundered once and the marks were measured for recording dimensional stability. The same process was done after the skirt was laundered three times and ten times. Appearance retention was also tested on the laundered skirts to compare wrinkle resistance to unlaundered skirts. Just like dimensional stability, appearance retention was compared after one, three, and ten washes. To test the ability of fabrics to release oil stains during laundering, different everyday substances were applied to our fabric sample. The substances were peanut butter, apple sauce, red wine, butter, oil, ketchup, ranch dressing, mustard, and grape jelly. After the sample sat overnight and was washed, and compared to the AATCC Resistance to Staining Chart. To see if the fabric bleaches easily, we each used two fabric samples, one drop of bleach on one and one drop of non-chlorine bleach on the other. We let the samples sit for twenty-four hours and then rinsed them. The samples were rated on a fail or pass basis with any sign that it was stained. Wickability was tested by holding a ten inch strip pinned to a pencil in a glass of water. The fabric was held on the top portion of the water to test if the fabric was wickable. The distance the water traveled up the fabric was measured after five minutes.

Gianni Bini had the greatest shrinkage after the first laundering. However, the other two brands exceeded the industry standard for shrinkage. The appearance retention of Gianni Bini was the best overall after laundering. All brands passed the non-chlorine bleach test. Gianni Bini was the only brand to pass the chlorine bleach test. When tested for colorfastness to perspiration, all brands exceeded the minimum industry standard of three. Although the fiber contents were oleophilic, none of them held on to oils. All of the brands scored a perfect five which outperformed the minimum industry standard of three.

The performance of the skirts did not reveal an exceptional skirt for any one brand, but it varied on all aspects. Gianni Bini had the better quality fabric overall. Since Gianni Bini's advantages outweighed the disadvantages, it is the best buy in terms of quality.

Textile Properties of Blue T-Shirts: Does Price Indicate Quality?

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The purpose of this project was to compare three similar t-shirts of different brands and fiber contents for performance and construction to determine how their performance differed. The general construction and fabric performance was tested. The general construction included yarn structure, weave structure, method of coloration, fabric weight, and thread count.

Dimensional stability was tested by measuring a 10-inch length and width on the front and back of each specimen. The specimens were laundered and measured after one wash, three washes, and ten washes and compared to the original measurement to evaluate any shrinkage.

Appearance retention was recorded for each specimen after one, three, and ten washes and rated according to AATTC Reference Standards. Colorfastness to perspiration, laundering, crocking, chlorine- and non-chlorine bleach were tested on each of the specimens according to AATTC test methods. They were rated against the AATTC Gray Scale for staining. A rating of five represents the least amount of staining, while a rating of one represents the worst amount of staining.

When we tested for dimensional stability, the Hanes sample shrunk the least and maintained its color the best out of the three samples. While the other samples showed a light amount of frosting on the seams, the Hanes sample showed no frosting after laundering. The industry standard for resistance to staining is greater than or equal to a 3. The Hanes sample exceeded this standard on all stains except for mustard.

Although all the garments are similarly priced and would have the same end use, we concluded that the Hanes brand was the best garment overall for customers. The Hanes brand had the best dimensional stability and experienced the least amount of color loss when laundered. This garment also retained its appearance best out of all the samples and featured no color loss along seams or hems.

Testing Women's Athletic Shirts: Which is Better?

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The purpose of this project was to compare similar athletic shirts from three brands at different price points to determine if there are differences based on textile properties.

A dimensional stability test was performed by measuring and marking ten inches in the length and width on the front and back of each shirt using tacks. If ten inches was not reached, we measured to the seam without crossing it and recorded the original measurements. The shirts were washed according to recommended care instructions and calculated by measuring between the tacks, after one wash, three washes and after ten washes appearance retention was evaluated using AATCC appearance retention scales. Colorfastness to bleach and non-chlorine bleach were tested by placed a drop of each onto the fabric and rated the color change. Colorfastness to crooking was tested using a crook meter and AATCC test method on the non-laundered shirt and the laundered shirt. Colorfastness to perspiration was tested by using a mixture of vinegar, salt and water to stimulate perspiration. Wickability was tested by holding a strip of the sample and barely dipped it in a glass of water for five minutes and measured how fast the water moved up and through the fabric. The colorfastness to laundering was tested using a multi-fabric strip and fabric sample placed in water with detergent and water for five minutes, stimulating a washing machine. Resistance to staining was tested by applying multiple foods in strips on a sample. The sample dried over night and was laundered according to care instructions. The specimens were evaluated according to the AATCC resistance to stain scale.

Danskin Now and Academy had the least dimensional stability, both ranging out of industry standards, when compared to Under Armor, which mostly maintained its shaped, even after 10 washes. Across the board, each garment shared similar results when it comes to resistance to staining, wickability, colorfastness to perspiration, and colorfastness to laundering.

Performance across women's athletic shirts was quite consistent across the brands, with minor discrepancies among them. Under Armor had the best results in most of the tests. Despite being a lighter fabric, compared to Danskin, Under Armor's appearance retention held better, which might have something to do with the higher thread count. And although it is more expensive, it is the better buy overall.

Textile Properties of Men's Chino Pants: Does Price Matter?

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The purpose of this project was to compare three pairs of similar pants with different price points to evaluate if there are differences based on textile characteristics.

The fabric characteristics of the pants were evaluated for following characteristics: fiber content, yarn structure, weave structure, method of coloration, are information, fabric weight, and thread count. Dimensional stability was evaluated by measuring the front and back length and width. The measurements were measured after one, three, and ten launderings. Resistance to staining was tested by applying peanut butter, apple sauce, red wine, butter, oil, ketchup, ranch dressing, mustard, and grape jelly to the fabric. After laundering, the stains were rated using the AATTC Staining Scales. Colorfastness to perspiration, home laundering, crocking, and chlorine and non-chlorine bleach were tested on each pant according to AATTC test methods. The colorfastness tests were rated using AATTC Gray Scale. Wickability of the fabric was test by taking a 10-inch sample strip of each pant, and holding it into a glass of water. The distance of water traveled up the specimens was measured after being held in the water for 5 minutes

When testing dimensional stability the Faded Glory pants had the least shrinkage. The pants all wrinkled the same. Faded Glory had the best crocking. The Faded Glory pants were the worst in staining, Rountree and York following closely. The results revealed that price was no indication of quality regarding the selection of the pants. When comparing the results the lowest price pants, Faded Glory, actually performed better on several test as compared to the two higher priced pairs of pants.

In conclusion, where consumers are concerned, the Faded Glory pants would make the best pair of pants to purchase. The pants have the lowest price but proved better than the Roundree & York and H&M men's pants in several areas making them the best option at an affordable rate.

Evaluating four inosine-uridine preferring nucleoside hydrolases in *Bacillus anthracis* for decontamination strategies

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Bacillus anthracis is a spore-forming bacterium that is the infectious agent in anthrax. The spore induces disease in a host through a process called germination, which is the conversion of a dormant spore into a metabolically active vegetative cell. Given that vegetative cells and germinated spores are more easily killed than dormant spores, adding a germination step to decontamination strategies is a current idea under investigation. Specific molecules such as alanine and inosine are germinants that induce germination by binding to receptors. Inosine-uridine preferring nucleoside hydrolase (IunH) is a spore surface protein that is responsible for the breakdown of the germinant inosine into non-germinants hypoxanthine and ribose, preventing inosine from inducing germination immediately. Interestingly, there are four hydrolase paralogs in the *B. anthracis* genome, two that are spore associated, IunH and IunA, and two in the vegetative cell, BAS2236 and BAS4961. Previous work in the lab has shown *iunH* mutant spores have no detectable nucleoside hydrolase activity and germinate more completely than wt spore populations. An insertion mutant *iunA* has reduced spore-associated activity and an exosporium assembly defect. Two possibilities for the reduced activity are that IunA has weak catalytic activity or IunA impacts exosporium assembly which reduces the amount of IunH present. Therefore, we decided to express and purify all four hydrolase genes to establish which of the four proteins are functional enzymes. We incorporated this project into the Honors Microbiology course at Louisiana Tech. To date, the students have successful PCR products for three of the hydrolases and have purified the DNA inserts to clone into *E. coli* expression plasmids pBAD24 and pBAD33. Future steps include purifying protein via His-tag technology and measuring hydrolase activity of purified proteins. If a protein has catalytic activity we will screen inosine analogs for enzymatic inhibition. Identification of inosine hydrolase inhibitors may prove to be a viable target which will contribute to our long-term goal of developing novel strategies for decontamination.

The Role of NOTCH3 in Determining Adipose Derived Stem Cell Fate

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The NOTCH signaling pathway has been shown to play a vital role in determining cell fate of human Adipose Stem Cells (hASCs) and Mesenchymal Stem Cells (MSCs). Misregulation of the pathway is responsible for specific developmental diseases and cancers, including breast cancer. To date, the role of the four individual NOTCH receptors has not yet been characterized in adult stem cells. The aim of this project is to characterize the role of NOTCH3 in the maintenance and differentiation of hASCs. NOTCH3 appears to have the highest level of expression of the four receptors in hASCs. siRNA-mediated knockdown of NOTCH3 shows that while self-renewal and cell viability is unaffected by the loss of NOTCH3, there is a significant increase in adipogenesis when cells are encouraged to differentiate into adipocytes. This suggests that the NOTCH3 pathway is used to regulate adipogenic stem cell fate. We hypothesize that differentiation is caused by the contact dependent pathway. Future studies include a Notch 3 knockdown's effect on the levels of Notch ligands Jagged 1 and 2, and delta like ligand 1, 3, and 5. Since regenerative medicine relies heavily on controlling stem cell fate, the characterization of the NOTCH signaling pathway will act as a gateway for clinical advances.

Phylogeography and Cryptic Diversity of Slimy Salamanders (*Plethodon glutinosus* complex) in the Interior Highlands

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The presence of cryptic species can result in underestimates of biodiversity and hamper conservation efforts. The 16 species of Slimy Salamanders (*Plethodon glutinosus* complex) are distributed throughout the eastern United States and show little to no morphological variation, having been described primarily using genetic data. Three species, *P. albagula*, *P. kiamichi*, and *P. sequoyah*, are known from the Interior Highlands (Ouachita Mountains and Ozark Plateau), but our knowledge of species diversity and distributions in this region is based on genetic analysis of only 15 populations. To better understand biodiversity patterns, we collected salamander tissue samples from >200 localities throughout the Interior Highlands of Arkansas, Missouri, and Oklahoma and sequenced the mitochondrial *ND2* gene. Phylogenetic analysis revealed that: 1) the range of *P. kiamichi* is broader than previously recognized, 2) *P. sequoyah* is nested within *P. albagula*, 3) the range of *P. kisatchie*, a species from the West Gulf Coastal Plain of Louisiana and southern Arkansas, may extend into the region, and 4) an undescribed cryptic species may be present. Species divergences occurred during the Pleistocene, beginning ~2.5 million years ago. Our results indicate that the current understanding of diversity and distributions of species of the *P. glutinosus* complex in the Interior Highlands is inaccurate and in need of revision. Future work will incorporate nuclear loci and employ explicit analyses for delimiting species.

Amphibian oviposition site selection preferences in response to leaf litter chemical characteristics

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Leaf litter plays an important role in the forest ecosystem, such as impacting various processes and hindering erosion. While there is variability in the chemical and nutritional properties of leaf litter, the effects that these variables have on organisms within the environment is not well known. These different nutrients and compounds could play a role in the behavior of organisms, specifically animals that utilize ponds within the ecosystem, since the tree leaves leach compounds into the water they fall in. One type of these compounds are tannins, a type of organic secondary compound that has deleterious effect on tadpoles. Amphibians have complex life cycles, and one of their life stages involves laying their eggs in a body of water. Female frogs have been observed to oviposit in ponds where their offspring will have the highest chance of survival, which in turn will increase their fitness in the environment. In order to evaluate this behavioral response, we will be placing 45 wading pools at LA Tech South Campus. These pools will vary in the species of leaf litter input with fifteen different tree species treatments, replicated three times. We will be observing the water quality (conductivity, pH, dissolved oxygen) over time within each pool. We will be measuring the response of the tree frogs by counting the number of eggs laid in each pool and examining effects of the treatment by looking at the correlation between oviposition site selection and water quality, leaf chemistry, and treatment type.

Multilocus Genetic Investigation of Species Limits in the Caddo Mountain Salamander (*Plethodon caddoensis*)

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Biodiversity conservation is vital for maintaining healthy functioning ecosystems and requires accurate knowledge of species diversity. However, delimiting species can be challenging when different species are similar in appearance. In such cases, genetic data can be used to correctly identify species and define their ranges. The Caddo Mountain Salamander (*Plethodon caddoensis*) is a terrestrial forest-dwelling salamander endemic to a small section of the Ouachita Mountains of Arkansas. Previous work using mitochondrial DNA found the species comprises four phylogeographic lineages with genetic divergences as high as those typically observed between distinct species of *Plethodon*. At this level of divergence, we might expect the Caddo Mountain Salamander to contain multiple species with no obvious visual differences between them. To identify species within *P. caddoensis*, we sequenced multiple nuclear loci for 6–10 individuals from each of the four phylogeographic lineages and performed several analyses for delimiting species using genetic data. We conclude there is a high likelihood that *P. caddoensis* is composed of more than one species. Future work will incorporate additional nuclear loci and use morphometric analysis to determine if species delimited using genetic-based methods can be distinguished morphologically.

The effects of leaf tannin concentration on water quality

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The leaves that fall from trees during the fall and winter seasons can change the quality of the water in natural ponds. Leaves retain secondary compounds called tannins, which function to protect plants from pathogens and herbivores. Tannins can potentially affect the development of aquatic organisms by altering the water quality, such as pH and dissolved oxygen. To evaluate how tannin concentration affects water pH and dissolved oxygen concentration, we used four different tree species: Chinese Tallow, Water Oak, Southern Magnolia, and Red Mulberry. For each species, we measured out three different quantities of ground and whole leaf samples and soaked them in 600mL of water. After soaking the leaves for three days, the tannin concentration, pH and dissolved oxygen concentration were measured for each water sample. Tannin concentrations were variable among the tree species. With increased tannin concentrations, there was a decrease in both water pH and dissolved oxygen concentration. While tannin concentration had little effect on the variability of the pH, it had substantial effect on the dissolved oxygen concentration. Reduced dissolved oxygen concentrations can be detrimental to aquatic life by reducing survival and growth. Low dissolved oxygen concentrations can also force organisms that can survive in low oxygen conditions to expend more energy to obtain oxygen. As such, leaves with high tannin concentrations may negatively affect pond organisms by lowering oxygen concentrations.

Temperature interaction with density on the growth and survival of a common generalist Butterfly

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Warming temperatures have the potential to disturb species interactions, organism phenology, and alter the natural ranges of species. Organisms vary in their responses to climate change ranging from no response to range shifts and evolutionary adaptations. Ecotherms, like Lepidopterans (moths and butterflies) are particularly sensitive to changes in temperature.

Lepidopterans impact ecosystem productivity because they facilitate pollination, directly impact plant biomass through herbivory, and are prey for higher trophic levels. Many species have large ranges and develop with cohorts of variable densities on host plants. Thus, how different lepidopterans are affected by warming temperatures can have large consequences on ecosystem function.

We tested the hypothesis that high temperature and caterpillar densities would accelerate growth and decrease survival. Our hypotheses were first that higher temperature levels would increase growth rates and survival by speeding up metabolic processes, and that caterpillars raised in lower temperatures would have the opposite effect. Second, we hypothesized that higher density levels would increase growth rates through intraspecific competition but also increase mortality. We used painted ladies (*Vanessa cardui*) to test our predictions due to its widespread range and generalist diet. We setup four treatment groups to test how different densities of lepidopterans would respond to temperature: 1) low density + low temperature, 2) low density + high temperature, 3) high density + low temperature, and 4) high density + high temperature. Temperatures were determined using temperature predictions for the years 2040 – 2059 for Texas and Michigan based on high CO₂ emissions, which represent part of the southern and northern range of *V. cardui* for the high and low treatments respectively. The density levels for the treatments were taken from lepidopteran density experiments that were based on field observations of cohort size. 2nd instar caterpillars (from Carolina BiologyTM) were reared until pupation or death. We measured mortality and growth rates over 3 weeks.

Temperature and caterpillar density impacted both the growth and survival of caterpillars. However, temperature had the largest impact on larval mortality, while density had the largest effect on growth rates. Specifically, increased temperatures correlated with higher larval mortality, and higher population densities correlated with increased growth rates. Contrary to predictions, high temperature had the highest mortality with only 10-20% survival after 1 week compared to 50% in low temperatures.

These results suggest that warming temperatures could cause increased mortality in Painted Ladies along their equatorial range. This could result in local extirpation in the southern portion of their current range and an increase in their northern range. Increased growth rates were observed in higher density treatments in the absence of any resource limitation and all other factors were controlled besides density, which suggests that increased population densities innately triggers increased growth rates. One possible explanation for this is that Painted Ladies have evolved plasticity for growth based on larval densities due to typical environmental selection pressures such as competition high larval density in natural habitats. This is also seen in locusts, however more research is needed to determine the mechanism.

That Water Stinks! Will Changes in Water Quality Alter Blue Crab Response to Pesticides?

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Every year, over half a billion pounds of pesticides are used in urban and agricultural areas to control pest species and increase crop yields. These chemicals often end up in streams and estuaries where they can impact aquatic non-target organisms. While many studies examine the lethal impacts of pesticides on aquatic organisms, few studies examine the sublethal impacts of pesticides which can impair animal function and impede the animal's ability to forage, find mates, etc. To understand how sub-lethal concentrations of insecticides carbaryl and fipronil impact the behaviors of estuarine organisms, we will conduct behavioral laboratory assays on blue crabs (*Callinectes sapidus*). During these assays, crabs will be fed snails twice over five days to examine the insecticides' impacts on foraging behavior. However, feeding the crabs may cause the water quality to degrade, which could alter the crabs' behavior and potentially compound the impacts of the pesticides. To establish how water quality will be impacted during the blue crab feeding assays, we conducted a preliminary experiment in which we fed blue crabs snails and compared the water quality to crabs which were starved over 5 days (N=3). Comparisons of the water quality showed ammonia levels were significantly higher on day 2 and day 5 for crabs that were fed snails, while nitrite levels differed on day 2, demonstrating that ammonia and nitrite levels increase the day following a feeding. As a result, crabs will be fed snails on day 3 and day 5 of the pesticide laboratory assays to delay the degradation of the water quality as a result of feeding. In future experiments, we will expose blue crabs to sub-lethal levels of carbaryl and fipronil in laboratory assays to establish how the pesticides alter blue crab behaviors.

The Influence of Land-Use Change on Loggerhead Shrike Population Decline in Lincoln Parish

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Since the 1940's, the Loggerhead Shrike (*Lanius ludovicianus*) has faced population declines throughout its continental range. These population declines have been attributed to the spraying of biocides, changes in land-use, and increasing competition from human-tolerant species. Loggerhead Shrike numbers are declining in Louisiana as well and are a species of conservation concern. Louisiana Tech ornithology students collected information about shrike nest sites from 1976 - 1989. We used these data to determine if changes in land-use could explain the reduction in shrike population in Lincoln Parish. We used ArcGIS to plot the historic nest sites. Landscape features of 8ha nest site territories were characterized using four variables important for habitat selection in shrikes: perches, tree cover, open land, and water. The amount of area in each variable was compared between historical and current maps to determine land-use changes. No shrikes were found at the historic nest sites, so all nesting territories were used in our analyses. The amount of open area significantly decreased, while perches and tree cover significantly increased. Shrikes need open land and perches for hunting. Our results suggest that the amount of open area for hunting is critical for sustaining Loggerhead Shrikes more so than the number of perches. This information can be used to improve conservation of shrikes in our area.

Developing Novel Redox-Sensitive Fluorescent Proteins “royRFP” and “roxyYFP” to Detect Cellular ROS

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Reactive oxygen species (ROS) are reactive molecules and free radicals derived from molecular oxygen. ROS are the cause of oxidative stress in cells, and can damage cellular components such as DNA, lipids, and proteins. Recent studies have shown that ROS play an important role in fungicidal action of antifungals; however, the specific action causing cell death is unknown. In addition, it has been proposed that a common mechanism exists for bactericidal antibiotics, including the production of ROS. However, the mechanism and extent to which ROS are involved is widely debated. Therefore, further studies must be conducted to determine the specific relationship between antimicrobials and ROS production. This is particularly important because of the growing public health concerns regarding antibiotic and antifungal resistance. Here we present two novel and genetically encoded redox-sensitive fluorescent proteins developed by our lab to detect cellular ROS. These fluorescent proteins are redox-sensitive through the substitution of cysteines at certain surface exposed residues which allow the formation of disulfide bonds in oxidizing environments. This disulfide bond in turn distorts the chromophore of the protein, altering its fluorescent properties. Our novel biosensors “royRFP” and “roxyYFP” are engineered variants of RFP (red fluorescent protein) and YFP (yellow fluorescent protein), respectively. Initial data show that these redox-sensitive fluorescent reporters may be reliable and effective tools for detecting cellular ROS. We anticipate these biosensors to provide new methods for studying antimicrobial resistance in *Escherichia coli*, and *Candida albicans*, as well as a screening platform for novel antibiotics and antifungals.

Do differing enrichment methodologies affect the belowground productivity of *Spartina alterniflora*?

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Coastal marshes, composed dominantly of *Spartina alterniflora* grasses, provide nursery habitats for marine species, food and habitat for migratory birds, and support commercial and recreational fishing. Yet, throughout the past 200 years, Louisiana's coastal wetlands have been significantly declining due to sea level rise, subsidence, and anthropogenic impacts. Enrichment, or introducing nutrients to the affected areas, may facilitate marsh growth and production; however, research disagrees if *Spartina* nutrient enrichment increases or reduces the belowground biomass. This disagreement is important because a decrease in belowground biomass increase marsh susceptibility to erosion and may reduce the ability of marshes to keep up with sea level rise. Results of previous studies on belowground production may disagree due to different enrichment methodologies in which nutrients are introduced by either dissolving fertilizer directly into the water column (mimicking eutrophication) or by adding fertilizer to sediments. We hypothesized that this enrichment location, above or belowground, may affect *Spartina* production patterns. To determine how nutrient location would impact the production of *Spartina alterniflora*, we enriched 0.25m² plots of marsh with Osmocote fertilizer. The plots were enriched in three different ways: aboveground only, belowground only, or a combination of above and below (additively and substitutively) for a total of N=7. To measure how nutrient delivery impacted belowground biomass, we used ingrowth bags and cores taken from each treatment. Core samples were washed and sorted into live and dead root and rhizome biomass, then dried and weighed to a constant weight. Ingrowth bags were sorted for live biomass and then dried and weighed. Nutrient enrichment did not significantly affect root production in any treatments of the ingrowth bags. The impacts of fertilizer enrichment on belowground biomass at differing depths in core samples will be discussed. Understanding the effects of nutrients on belowground biomass is important for restoration efforts which seek to protect marshes from subsidence, erosion, and sea level rise.

Effect of s on mitochondrial DNA copy number

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Radiation and oxidative stress contribute substantially to multiple pathological processes in the nervous system. Mitochondrial DNA (mtDNA) is particularly susceptible to damage due to the lack of protective histones. Aberrations in the mitochondrial DNA (mtDNA) copy number has been reported in broad range of primary human cancers. Alteration of mtDNA content may be a pivotal factor in eliciting mitochondrial deficient activities and contributing the cancer pathogenesis. Therefore, the present study aims at investigating mtDNA copy number changes in human astrocytes after treatment with various dosages of radiation and oxidative-stress inducing chemical sodium dichromate. Cells were exposed to proton radiation (0.5Gy, 1.5Gy, and 3Gy) and X-rays (0.5Gy, 1.5Gy) at Willis-Knighted Cancer Center, Shreveport, LA. To induce oxidative stress, the astrocytes were treated with 10mM NaCr₂ and 50mM NaCr₂ for 16 hours. Following radiation treatment, the cells were incubated for 24 hours in humidity incubator. The total DNA was purified and the quality and quantity of the nucleic acid was assessed using NanoDrop 2000c instrument. Changes in mtDNA copy number were determined using real-time qualitative PCR (qPCR) couple with high-resolution melt analysis. Two pairs of primers were used in the two steps of the relative quantification of mtDNA content. One primer pair was used for the amplification of the ATP synthase(ATP) gene in mtDNA. Another primer pair was used for the amplification of the nuclear beta-2- microglobulin (B2M) gene. Baseline levels of mtDNA numbers were obtained using nontreated cell line. The relative quantification of mtDNA was determined based on the difference of the cycle threshold values (Ct) between the two genes. The results from this study showed that exposure to radiation and oxidative-stress inducing chemicals is associated with increase in mtDNA copy number that is indicative of stress response to mitochondria dysfunction.

Identification of novel miRNAs that regulate OGG1 mediated DNA repair

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Reactive oxygen species induce modifications of the DNA bases that are implicated in cancer development and progression as well as aging and age-related neurological disorders. The base excision repair mechanism had evolved to repair the mutations induced by oxygen radicals. The objective of this study is to identify novel microRNAs that regulate the expression of 8-oxoguanine glycosylase (OGG1), an enzyme that plays an important role in the DNA base excision repair pathway. Altered expression of OGG1 leads to accumulation of modified bases, DNA damage, and increased rate of nucleic acid mutation. To simulate conditions of oxidative stress, human astrocytes were treated for 16 hours with 10 μ M sodium dichromate. OGG1 mRNA and protein expression levels were assessed via RT-qPCR and protein simple Wes® assay. Comet assay analysis were performed to assess the level of oxidative stress induced DNA damage. RNA extracted from treated and non-treated cells was sequenced using Ion Proton small RNA sequencing platform. OGG1 mRNA and protein expression levels were significantly reduced after treatment with sodium dichromate. Comet assay analysis confirmed high levels of oxidative stress induced DNA damages. MicroRNA sequencing revealed that large number of microRNAs are up regulated following treatment with sodium dichromate. Bioinformatics analysis was implemented to identify potential microRNAs targets that bind to the 3'UTR region of the OGG1 mRNA gene. Those include miR-20b, miR-33, miR-let7, miR- 103, and miR-491. The binding between the potential miRNA candidates and OGG1 gene will be validated via immunoprecipitation studies.

The role of MED31 in the regulation of mesenchymal stem cell state

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Mediator, a large protein complex exclusive to eukaryotes, is a master regulator of cell-type specific gene expression. Mediator functions as a molecular adaptor that, with the help of DNA looping, connects activators bound at enhancers to the transcription pre-initiation complex (PIC) located at the promoter where it recruits RNA Polymerase II. Our research focuses on how Mediator influences the state of differentiating bone marrow-derived mesenchymal stem cells (MSCs). Bone marrow-derived MSCs are harvested from adult donors and, in addition to their ability to self-renew, can differentiate down chondrogenic, osteogenic, and adipogenic lineages. Published research demonstrates that Mediator complexes with major coactivators in the adipogenesis pathway. We performed siRNA-mediated knockdowns of MED31 prior to inducing adipogenic differentiation assays to determine the role of MED31 in directing proper differentiation. The MSCs remained viable post-transfection under standard culture conditions but displayed reduced adipogenic differentiation as demonstrated by images of cell morphology, adipose vesicle staining, and patterns of gene expression. These results suggest MED31 is important for appropriate Mediator function in regulating human MSC adipogenic differentiation. Such information elucidates the biomolecular requirements for proper regulation of MSC differentiation, and this broader understanding of Mediator's function in MSCs will help foster their continued use in clinical applications such as regenerative medicine.

Digital Painting course prepares students for Pre-Medical Illustration

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Medical Illustration is an effective tool that allows people to more clearly and accurately visualize medical and other scientific information. There are many applications in the medical illustration field, but one of the most common is education, whether the artwork is used in textbooks, courtrooms, or online. The Visual Integration of Science Through Art (VISTA) program at Louisiana Tech University aims to use art to more effectively communicate scientific material. One class offered by this program is a Digital Painting class which teaches students how to “paint” entirely digital pieces using Photoshop software. This class and medium gives students an experience similar to working in the medical illustration field. The final project in the class is a biological illustration piece that depicts a process or structure that is being researched at the university. The goal of the project is to create a visually pleasing design while remaining scientifically accurate.

The Role of Notch3 in Self-Renewal of Adipose Derived Stem Cells

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Stem cells are distinguishable by their ability to 1) self-renew and 2) under certain conditions they can be induced to become specialized cells with specific functions. Their multipotency makes stem cells ideal for tissue engineering. Tissue engineering aims to regenerate damaged tissues but is an area of medicine that requires a significant amount of research and optimization before it can be widely used in the clinic. Notch signaling is a signaling pathway uniform for all metazoans and is critical in development, niche maintenance, and differentiation. In a previous study it was determined that the knockdown of Notch 3 has no effect on cell proliferation or viability. In order to validate these observations and determine if there was any impact on cell state or gene expression in the absence of Notch3, we performed RNA-Seq 72 hours after an siRNA-mediated knockdown of Notch3. The research presented here specifically investigates the effects of Notch3 knockdown on ANKRD1, NDRG2, SCRIB, IF144, CDKN3, LINC, MBTPS, and ACTC1 in human Adipose Stem Cells (hASC), genes that showed significant up or down regulation following knockdown. Primers were designed and optimized for each of these genes using end point PCR. Once optimized the primers were tested against the knockdown and control samples and results were compared with the RNA-seq data. Quantitative real-time PCR was then used to measure the effect of Notch3 knockdown. Future work will aim to further characterize the relationship between Notch3 and these affected genes to better explain mechanisms that regulate ASC self-renewal and multipotency. Understanding the cellular interactions of Notch3 will enhance future clinical applications of tissue engineering.

***Candida albicans* Plasmid Project**

Drake Heinz and Patrick L. Hindmarsh

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Candida albicans is a commensal fungus that is highly an important human pathogen that is actively researched due to the high mortality in immunocompromised populations. One roadblock in *C. albicans* research is the lack of molecular tools, in particular replicating plasmids. This project will develop an autonomous replicating plasmid that can replicate and be maintained in *C. albicans*. Our plasmid will have a *C. albicans* specific origin of replication and a segregation mechanism allowing the plasmid to be segregated into the daughter cells. We have previously knocked out Ura3 from a strain of *C. albicans* and our plasmid will express this protein to and in the maintenance of the plasmid in *C. albicans*. Ura3 is a gene that codes for an enzyme in the uracil pathway required for *C. albicans* growth. The plasmid will include a multiple cloning site (MCS) that will allow expression of heterologous proteins. The first protein expressed from our plasmid will be the common reporter green fluorescent protein (GFP).

Input of Invertebrate Biomass following Storm Events Links Aboveground and Belowground Systems

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Ecosystems have both above-ground and below-ground components that are inextricably linked yet are often studied separately. Ecological interactions in above ground systems have the potential to indirectly influence the below ground system biota by altering the quality and quantity of resources transferred from above- and below-ground systems. Natural processes like meteorological events can bring in high winds and drenching rains that have the ability to flush vegetation, biota, and excess water from the top of the canopy to the base of the tree. One of the main transfers from forest canopies to soils is from stemflow, which is the flow of water down the trunk of a tree that is responsible for nutrients from the canopy to the base of the tree. However, little is known about the transference from above- to below- ground systems. We tested the hypothesis that major storm events transfer significant quantities of invertebrate biomass from above- to below- ground systems. Specifically, we predicted that this transfer of invertebrates constitutes a considerable source of nutrients. To determine how storm events impact the quantity and quality of invertebrate input from canopies to forest floor we setup stemflow collectors in a heavily dense oak-hickory forest at Sessums National Area in Starkville, Mississippi. A tree stem-flow collar comprised of polyethylene tubing was placed around 18 selected oaks and hickories. Within twenty-four hours of each storm event, water was collected from each bin and inverts sifted in a 0.25mm diameter sieve. Inverts were then pooled together after each storm event, placed in a 250ml vial, and preserved in a 70% methanol solution to later be identified to family and to determine biomass and chemistry.

There was a total of 1790.95 inches in rain and 14 storm events from March 2015 to June 2016. Our preliminary results indicated that the greater the storm event the lower the amount of insect biomass transferred from canopies to the forest floor. There was a high diversity of invertebrates (21 Orders) among the samples with an average of 16 ± 4.5 orders per sample. Beetles (Coleoptera) had the greatest biomass in our initial samples (14.7%), and drove the negative relationship between stemflow and invertebrate biomass. When Coleoptera were removed from the total biomass of invertebrates, there was no relationship between stemflow and invertebrate in our initial results indicating a consistent input of invertebrate biomass (17.4 ± 3.5) with each storm event. These results suggest that during less intense storm events, invertebrates, and beetles in particular, may not take as much shelter as they would during more rain. Above- and below- ground systems are affected by any change in environment since the tree serves as a link. This exchange of invertebrate biomass following storm events between above- and below- ground systems impacts both the canopy and the forest floor; therefore, as the canopy loses these nutrients, the forest floor is able to gain these nutrients. This promotes a high availability of resources for tree growth and ecosystem function for potential organisms at the base of the tree. The nutrients from this nutrient cycling can stimulate more invertebrates to inhabit either the canopy or the base of the tree by increasing nutrients trees can use for growth. Thus, the transfer between the two subsystems are continuously in motion.

Using a Reactive Oxygen Species Sensitive GFP to Detect Antibiotic Function

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In many cases, Reactive Oxygen Species (ROS) are known to be generated in bacterial cells in response to antibiotics. As increasing resistance among pathogens has rendered antibiotics and antifungals less and less effective, it is imperative to test for novel compounds. The goal of this project is to develop a bio-sensor that can detect ROS production by bacteria in the presence of antibiotics. This bio-sensor can then be used to identify novel antibiotics and antifungals.

We have modified a yeast enhanced Green Fluorescent Protein (yGFP) to be ROS sensitive. Using site directed mutagenesis, we introduced point mutations S147C and Q204C to thus allow us to discern in vitro antibiotic activity by measuring the levels of ROS. RoyGFP (reactive oxygen sensitive yeast enhanced GFP) was inserted into cells to enable us to compare the minimum concentration to generate ROS with the MIC. Since hydrogen peroxide mimics the effects of ROS, we added various concentrations of hydrogen peroxide to *E. coli* cells with our modified GFP plasmid. Our results showed that 0.5mM of hydrogen peroxide yielded the strongest ratiometric difference between the wild-type GFP and the royGFP. Various antibiotics such as Kanamycin and Norfloxacin will be tested on *E. coli* antifungals such as Fluconazole and Ketoconazole will be tested on *Candida albicans* using this method. *E. coli* cells will be tested first to ensure the protocol is functional. I will be generating a BFP cell called azurite using the mutations T65S and V244R, as the final plan will be to be able to target various organelles and their localization signals in fungi with corresponding fluorescent proteins to be able to isolate and monitor their ROS generation. The ensuing results could not only lead to a novel technique to test antibiotics and antifungals, but it could also shine a new light on the development of new compounds.

Seeing, Hearing, and Walking in your Patients Shoes: An Aging Simulation

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Because aging misconceptions are widespread in our society, it is important to consistently emphasize that aging people, like all people, are diverse. Common afflictions experienced by some older adults can influence their ability to be self-sufficient and affect their quality of life. First level undergraduate nursing students participated in a fun and engaging aging simulation sensitivity training program that allowed for reflection through engagement. Each activity in the ASiST aging simulation reinforced the importance of being aware of the older person's level of function. As the learner's progressed through the simulation exercises, they began to relate to the challenges faced by some seniors and think about their ability to accomplish activities of daily living as well as instrumental activities of daily living. The project uses a simulation kit designed by the Oklahoma Healthy Aging Initiative (OHAI), a program of the Donald W. Reynolds Department of Geriatric Medicine at the University of Oklahoma Health Sciences Center. Two aging awareness simulation kits were purchased through an Innovative Instruction Grant funded by the LA Tech College of Applied and Natural Sciences. The simulation design includes five 15 minute stations to simulate neuropathy, hearing loss, vision loss, language impairment, and mobility/balance difficulty. Students rotate in pairs through the stations and are given tasks to perform while wearing or using props to simulate selected deficits. Following the simulation, students fill out a five question survey designed by OHAI which asks them to rate their experiences on a Likert scale regarding increased understanding of age-related impairments, understanding of ADLs/IADLs and ability to live independently, how the experience will affect their nursing practice, usefulness of the simulation tool, and any additional comments.

The Effect of Patient Portals on the Quality of Care of Patients

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Technology in healthcare is constantly evolving and bringing forth various technological methods to improve the care of patients. Over time, there have been many different implementation efforts in the United States to kick start technology within the healthcare system. For instance, the development of an electronic health record changed the healthcare industry in its entirety. The implementation of an EHR was not a smooth transition for every facility that chose to implement, but the more features that were presented in an EHR as well as the more incentives that were produced from Meaningful Use, there was an influx in facilities that chose to implement an EHR. With the evolution of an EHR, there came a feature known as a patient portal. A patient portal is a system that is linked to a patient's electronic health record that allows the patient twenty-four-hour access to their medical information, education, results, and communication with a physician. "Without a patient portal as an intermediary, the patient would not be able to access the data in the electronic health record" (Kruse, Bolton, & Freriks, 2015). This demonstrates the need for a patient portal so the patient can remain engaged and knowledgeable as to their course of care, but is there truly an effect of the implementation of a patient portal on the quality of care that a patient receives? Patient engagement and a high quality of care is, after all, the reason we are all in healthcare. The need for patient engagement regarding their continuum of care is very important because lost or missing information can be detrimental to at home care or communication of health to another physician. There have been many conflicting opinions on whether a patient portal effects the quality of care in patients, but through literature research and quantitative methods of research involving the exact benefits of a patient portal, physician perspectives, patient perspectives, and patient literacy, it became clear that a patient portal has a strong impact on the quality of care that a patient receives as well as the quality of care that a physician can provide.

Physicians Reluctance to Change Related to Quality and Improvement

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Health care is constantly changing, growing, and becoming more complex. As an industry, we find that it is sometimes hard for everyone to keep up with these changes. In particular, physicians seem to be one of the main problems when it comes to implementing new technology, regulations, standards, or ways of practicing. Some physicians feel that they know what is best and leave little to no time for learning new ways. This can halt progress in health care.

Electronic Health Record systems have been a giant step forward for health care, yet physicians cannot seem to stay on top of documentation or make the change from paper records. Health Information Management, particularly Quality and Improvement, has a tremendous role in this area. If physicians are not documenting correctly or using the EHR programs efficiently, it can affect the entire healthcare organization. Numerous setbacks can occur when physicians put off documenting, charting, or signing forms. Because of the lack of information and incomplete patient records, the release of information, billing, and data collection will be at a standstill. As a Health Information Management employee, the responsibility will fall on our department to ensure the physicians get on board and complete all of their tasks.

There must be a reason or certain barriers physicians face that make them reluctant to change. For a healthcare organization to run smoothly, everyone must be on the same page and be open to improvement. In order for this to happen, however, not only the issues but the solutions, must be identified. How can we as Health Information Management employees, promote quality and improvement by focusing on the Physicians and the problems or challenges they face that make them reluctant to change?