



April 7
2015



CREATE @ **STATE**

A Symposium of Research, Scholarship & Creativity

Table of Contents

Schedule	2
Map	3
Presentation Schedule	4
Poster Presentations.....	8
Oral Presentations.....	33

Student Research Council Executive Committee

Christopher Elms		Santiago Gonzalez	Jacob Steele
Molly Tibbs	Morgan Tripod	Christopher Aaron Tollett	Rachel Welicky

Faculty Advisory Committee

Agriculture & Technology.....	Tina Gray Teague
Business	Jim Washam
Media & Communication	Po-Lin Pan
Education & Behavioral Sciences	Dawn Weatherford
Engineering.....	Zahid Hossain
Fine Arts.....	Christopher Wilson
Humanities & Social Sciences	Debbie Chappel-Traylor
Nursing & Health Professions.....	J. Stephen Guffey
Sciences & Mathematics.....	John Hershberger
University College	Nikesha Nesbitt



Welcome to the fifth celebration of Create @ State: A Symposium of Research, Scholarship & Creativity. Create @ State is an annual event dedicated to the pursuit of research and creativity at Arkansas State University. The Office of Research and Technology Transfer is pleased to sponsor this event. The presentations showcase the scholarly activity from students all across our campus. I am proud of the intellect, creativity and innovation taking place at Arkansas State. This event is a testament to the rich learning experiences that are provided by our outstanding faculty. I hope you will participate in as many of the day's activities as possible. Congratulations, Arkansas State students!

Best regards,

Andrew T. Sustich

Andrew Sustich, P.h.D.
Vice Provost for Research and Graduate Studies



Schedule

8 – 9 A.M.

Presenter Registration and Poster Set Up, Centennial Hall

9 – 11 A.M.

Session A: Oral Presentations, Various Locations

Posters on Display

LinkedIn Photo Booth Open, Alumni Lounge

11 – Noon

Session B: Panel Presentations, Various Locations

Poster Presentations (Public is Welcome), Centennial Hall

LinkedIn Photo Booth Open, Alumni Lounge

Noon – 12:30 P.M.

Poster Judging (Judges Only), Centennial Hall

LinkedIn Photo Booth Open, Alumni Lounge

12:30 – 2:30 P.M.

Buffet Lunch, Heritage Plaza Lounge

Plenary Session, “The Power Formula for LinkedIn Success: Special College Student Edition”

Wayne Breitbarth, Auditorium

2:30 – 4:30 P.M.

Session C: Oral Presentations, Various Locations

LinkedIn Photo Booth Open, Alumni Lounge

5 – 6 P.M.

Awards Ceremony, Auditorium

Presenter and Faculty Mentor Reception, Heritage Plaza Lounge



Map (Third Floor, Student Union)



- Room Used
- Room Not Used

- | | |
|-----------------------------|-------------------------------------|
| 1) 1909 Suite | 9) Heritage Plaza Lounge |
| 2) Alumni Lounge | 10) Mockingbird Room |
| 3) Auditorium | 11) Saint Francis River Room |
| 4) Centennial Hall | 12) Pine Tree Room |
| 5) Spring River Room | 13) Multicultural Center |
| 6) Cache River Room | 14) White River Room |
| 7) Diamond Lounge | 15) Black River Room |
| 8) Green Room | 16) Arkansas River Room |



create

Presentation Schedule

Session A, 9 – 11 A.M.

CACHE RIVER ROOM

Precision Agriculture Methods

- Use of Soil Electrical Conductivity to Characterize Heterogeneous Soils on the Judd Hill Foundation Farm
Amanda Mann
- Evaluation of Seeding Densities and Soil Texture on Yield and Profit of Cotton Grown in Northeast Arkansas
Ray Benson
- Development of a Wireless Sensor Network for Monitoring and Managing Wetting Front Advance During Irrigation Events
Yin-Lin Chiu
- Analyzing the Impact of Furrow Irrigation Planning Tools and Polyacrylamide on Irrigation Advance Rates
Austin Lewis
- Soybean Irrigation Timing Using Evapotranspiration Cues
Justin Chlapecka
- Impact of Cover Crops on Measured Edge-of-Field Sediment and Nutrient Loading from Production-Sized Cotton Fields in Mississippi and Craighead Counties, Arkansas
Nadine Straitt

MOCKINGBIRD ROOM

Psyche and Asclepius

- Motivational Interviewing to Assess Academic Achievement
Caraline Vaughn, Kiara Smith
- The Impact of Credit Card Cues on Willingness to Spend in Undergraduates
Molly Gibson, Alyssa Skinner, Erin Faisst
- The Factors of Crime Control vs. Due Process Orientation
Alex Swenson
- Impact of Personally Relevant Information and Gender on Students' Interest in Science
Corey Green
- Motivational Interviewing with Middle School Students: A Quasi-Experimental Study Testing the Effects of Fidelity and Interviewer Type on Grade Outcomes
Michelle Cebada Sencion, Brandon Clay
- Entrapment and Intellectual Disability
Meagan Thomas
- The Use of Speech-in-Noise Testing as a Measure of Hearing Aid Benefit
Morgan Caples Thrasher
- Perceptions of Northeast Arkansas Hospice Nurses on their Emotional Well-Being and Coping Interventions while Working with Death and Dying
Johnna Heern

SAINT FRANCIS RIVER ROOM

Devices That Transform

- Laser Control with a Spatial Light Modulator
Masakazu Hori
- Development of an 8-Bit Avr-Based Audio Signal Processing Apparatus
Clayton Kardas

- ## SPRING RIVER A ROOM

- Deep Into That Darkness Peering: A Creative Approach to Genre Theory
Jacob Buechler, Dylan Travis, Rachel Williamson
- Patriarchy, Religion, Oppression and Devotion in Chimimanda Ngozi Adichie's *Purple Hibiscus*
Andrew Smith
- Dealing with Daesh (ISIL), Al-Qaeda's Strategy in the Middle East and a New Global Security Threat
Hazim al-Momani
- Planting the Future: Rice's Beginnings in Western Poinsett County
Danny Russell
- Stadium Financing: Do Taxpayers Benefit From the Presence of a Professional Stadium?
Jonathan Best, Thomas Hooper, Payton Burr
- Arkansas State Women's Basketball: How to Increase Attendance and Support
Nathan Nelson, Jacob Lindley

Numbers Don't Lie: Mathematical and Computational Studies

- ## Session B, 11 A.M. – 12:30 P.M.

CACHE RIVER ROOM

- ## SAINT FRANCIS RIVER ROOM

-
- A collection of 30 grey icons representing various scientific fields. The icons include: a clipboard with a heart rate line, a test tube, a camera, a petri dish with cells, a molecular structure, a pill, a thermometer, a flame, a gear, a magnifying glass, an eye, a download arrow, a U-shaped magnet, a lightbulb, a calculator, a gear, a test tube, a large gear, a microorganism, a flask with bubbles, a gear, a round-bottom flask, a microscope, a lightbulb, a planet with a ring, a DNA helix, a hand with a drop, a book, a satellite, a camera lens, a molecular structure, and a mortar and pestle.



create

Session C, 2:30 – 4:30 P.M.

AUDITORIUM

Triumph: Artistic Vision versus Real-World Boundaries

- The Outer Limits of Instrumental Technique
Gunner Basinger
- Bollywood Film: Affecting the Bangladeshi Wedding Rituals
Dithi Hasnat
- African-Americans, Portrayal on Primetime Sitcoms Over the Years
Candace Evans
- *The Run Through* (Short Film)
Evan Pierce
- *The Immortal Game* (Short Film)
Austin Lott, Blake Stanage, Ethan Woolard, Jody Barker

CACHE RIVER ROOM

Keeping Our Nation's Freshwaters Fresh

- Analysis of Cache River Watershed: Possible Sources of the Dissolved Lead, Copper and Total Dissolved Solids Impairments
Molly Kennon
- Determining Effectiveness of Conservation Practices Based Upon Water Quality Parameters and the BMP Tool in the Outlet Larkin Creek Watershed
Sarah Vogt
- Looking for Lead in All the Wrong Places?
Mary Kilmer
- Bioaccumulation of Cadmium in Invertebrates Along the Buffalo National River Due to Historic Lead and Zinc Mining Operations
Jacob McCauley
- Effects of Natural Sources on Nutrient Levels in Channelized and Natural Streams
Shelby Chappell
- Water Quality Characterization of a Tailwater Recovery System Associated with Agricultural Production
Ethan Leonard

MOCKINGBIRD ROOM

Discoveries in Animal and Plant Science

- Decreased Movement Related to Parasite Infection in a Diel-Migratory Coral Reef Fish
Rachel Welicky
- Integrating a Plant-Specific, Designer-Sugar Polymer Technology for Enhancing the Expression and Stability of Recombinant Fish Interleukin-22
Alyssa Caparas
- Home Range and Habitat Use of Foraging Gray Bats (*Myotis grisescens*) from Five Maternity Sites in Northern Arkansas
Patrick Moore
- Expression of Thermostable Endo-Arabinase for Generating Functional Oligosaccharides from Plant Cell Wall for Colon-Specific Health Benefits
Ningning Zhang
- High Throughout Phenotyping of Rice Lines to Determine Salinity Tolerance
Nathan Tripod
- Basis for Engineering the Thermally Tolerant Pectin Methyltransferase (TT-PME) in Sugar Beets for an Improved Processing Trait
Jose Tovar



- Palladium Catalyzed Synthesis of Stilbenes
Paige Kirby
- Stilbenoid Production in Hairy Root Cultures of Muscadine Grape: Effects of Methyl Jasmonate and Cyclodextrin
Tyler Knapp
- DNA Barcoding to Identify Arkansas Native Plants with Potential Anti-Leukemia Activity
Greg Phelps

SPRING RIVER A & S ROOMS

Simplify, Safeguard and Sustain: The Impact of Engineering

- Arkansas Climate: With or Without Uniform?
Hannah Tyler, Megan Land
- Arkansas Drought Variability
Hunter Egan
- Research and Development of Improved Football Helmets to Aid in Concussion Studies
Cecilia Clark
- Investigation of Low Temperature Cracking and Fatigue Resistance of Asphalt Concretes with Reclaimed Asphalt Pavement
A. M. Feroze Rashid
- Effects of Polyphosphoric Acid Modifications of Asphalts
Istiaque Mahmud
- The Kinetic Subsystem of Light: A Lagrangian Approach
Cheyenne Sheppard
- Synthesis of Vanadium Electrolyte for Use in Vanadium Redox Flow Batteries
Benjamin Eckerson, Cameron Nolen
- Test-Bed Preparation and Performance Analysis of a Single-Cell, Advanced Vanadium Redox Flow Battery
Rabiul Islam, Benjamin Eckerson, Cameron Nolen



Poster Presentations

Abstracts Listed in Alphabetic Order by Lead Presenter

create



CREATE @ STANFORD

Coming

COLLEGE OF NURSING AND HEALTH

BY KERRHOLTER, KELLY LANFORD, SHANNON

Introduction

Purpose

Integrative learning is a complex and interdisciplinary process that involves the integration of knowledge, skills, and attitudes from various disciplines to solve complex problems. This process is essential for the development of a well-rounded professional who is capable of addressing the challenges of the 21st century. The purpose of this research is to explore the effectiveness of integrative learning in the context of nursing and health care education. The study will focus on the experiences of students who have completed an integrative learning program and will examine the impact of this program on their academic and professional development. The research will also explore the role of faculty and other stakeholders in the implementation of integrative learning and will provide recommendations for the future of this approach in nursing and health care education.

Methods

The research involved a comprehensive review of the literature on integrative learning and a survey of nursing and health care professionals. The survey was designed to explore the current state of integrative learning in these fields and to identify the challenges and opportunities associated with its implementation. The data from the survey was analyzed using descriptive statistics and was used to inform the development of the research program. The program will involve a series of workshops and seminars that will focus on the development of integrative learning skills and the application of these skills to the practice of nursing and health care.

Results

Current statistics on STEM education in the U.S. highlight the challenges facing educators and policymakers, making it clear that the U.S. must do more to build a strong STEM workforce. It is a national priority to increase the number of students who pursue STEM careers, and this requires a concerted effort from all sectors of society. The research presented in this poster will provide valuable insights into the current state of STEM education and will offer recommendations for the future of this field. The research will also explore the role of integrative learning in the development of a strong STEM workforce and will provide recommendations for the future of this approach in STEM education.

Conclusion

The research presented in this poster will provide valuable insights into the current state of STEM education and will offer recommendations for the future of this field. The research will also explore the role of integrative learning in the development of a strong STEM workforce and will provide recommendations for the future of this approach in STEM education. The research will be presented at the annual meeting of the American Association of Colleges and Universities and will be available in a report that will be published by the National Science Foundation.

References

1. National Science Foundation. (2012). *STEM Education in the U.S.* Washington, D.C.: National Science Foundation.

2. American Association of Colleges and Universities. (2013). *STEM Education in the U.S.* Washington, D.C.: American Association of Colleges and Universities.

3. National Science Foundation. (2014). *STEM Education in the U.S.* Washington, D.C.: National Science Foundation.

4. American Association of Colleges and Universities. (2015). *STEM Education in the U.S.* Washington, D.C.: American Association of Colleges and Universities.

5. National Science Foundation. (2016). *STEM Education in the U.S.* Washington, D.C.: National Science Foundation.

Science, Technology, Engineering and Mathematics

Bairgi, Biswajit – Graduate
biswajit.bairgi@mail.AState.edu

SCRAP TIRES IN PAVING MATERIALS: AN INNOVATIVE WAY TO ELIMINATE MOISTURE DAMAGE OF PAVEMENT

More than 300 million scrap tires are being generated every year in the U.S., and their proper disposal has become a major concern. Although use of scrap tires for ground tire rubber (GTR) in asphalt mixes is becoming a common practice, no studies have been identified on its moisture damage potential. This research aims to evaluate moisture susceptibility of GTR-modified asphalt binders through surface-free energy (SFE) analysis utilizing the Sessile Drop Method. A commonly used performance grade (PG) binder (PG 64-22) modified with different dosages (0, 10, 15, and 20 percent) of GTR were used with three different probe liquids (water, formamide and ethylene glycol) for contact angles measurement. The SFE of five different aggregates (sandstone, granite, gravel, basalt, limestone) were used to evaluate the work of adhesion and compatibility ratio (CR). It is seen that SFE increased with the addition of GTR. The work of adhesion of all binder aggregate systems also increased with increase of the GTR content in the absence of water (dry), but decreased in the presence of water (wet). All asphalt aggregate systems showed their corresponding CR value greater than 1.5 with 20 percent GTR, indicating very-good-improved moisture damage potential.

Faculty Mentor: Zahid Hossain, Civil Engineering, mhossain@AState.edu

Barnes, Brittany – Undergraduate
brittany.barnes1@mail.AState.edu

REVIEW OF POLYACRYLAMIDE IMPACTS AND BENEFITS ON IRRIGATION MANAGEMENT, SOIL CONSERVATION AND CROP PRODUCTION IN THE MID-SOUTH

Arkansas is one of the leading states in acres irrigated. Although beneficial to crop production, irrigation can have negative impacts, such as irrigation-induced soil erosion. This soil degradation is an ongoing significant global problem, and this creates a need for irrigation management practices to improve the irrigation efficiency as well as soil and water quality conditions. Polyacrylamide (PAM) is a high molecular-weight chemical polymer that is a highly water-absorbent, and when mixed with irrigation, water stabilizes near surface soil particles, decreasing the potential for soil erosion. This literature review will describe the effect of PAM on soil erosion, water infiltration, movement of nutrients and sediments, and crop yields in agricultural areas. The use of PAM in western U.S. agricultural areas has shown positive water retention results in furrow-irrigated systems. This review provides the status of PAM application research in Mid-South agricultural areas, with an emphasis on irrigation efficiency, soil conservation and water quality through its application.

Faculty Mentor: Michele Reba, USDA Agricultural Research Service, michele.reba@ars.usda.gov

Co-Authors: Tina Teague, Deborah Leslie

Barnett, William – Undergraduate
william.barnett2@mail.AState.edu

DEVELOPMENT OF SOYBEAN DOUBLED HAPLOID SYSTEM

Soybean is a major food and feed source throughout the world. New soybean cultivars are needed to combat emerging disease and pest problems, and to adapt to changing climatic conditions. Doubled haploid breeding systems are not currently available for soybean, but have been shown to reduce the time and cost of developing new cultivars by 50 percent in other crops. Haploid plants may arise from gametic cells, such as the immature pollen grains housed in floral anthers. Through an internship sponsored by the Arkansas State Plant Board, we grew donor soybean plants in growth chambers under defined conditions and applied a 4 C cold shock to either donor plants or to excised floral buds to induce gametic cells to convert to plantlet development. Floral buds that were 3 – 5 mm long were surface sterilized and the anthers excised under aseptic conditions using a dissection scope. Anthers (n = 100/replication) were cultured in the dark on defined media at 4, 11, 18, 25, and 32.5 C for three months and then scored for gametic responses. Not all replications have been scored as yet, but preliminary observations suggest that culture at 11 C may be better for gametic response.

Faculty Mentor: Gregory Phillips, Plant and Soil Science, gphillips@AState.edu

Co-Authors: Martina Garda, Kumar Bade, Nathan Williams



Booth, Amber – Undergraduate
 amber.booth@smail.AState.edu

INSECT CONTROL TERMINATION IN IRRIGATED AND RAINFED MANAGEMENT ZONES IN CENTER PIVOT-IRRIGATED COTTON

Cotton (*Gossypium hirsutum*) is a perennial plant, but it is grown as an annual in the mechanized cropping systems of the USA. Because of cotton's perennial nature, crop managers use plant maturity cues for late season decisions including termination of insect pest control. In fields with center-pivot irrigation, plants in rain-fed corners reach the final stage of crop susceptibility earlier than plants under the irrigated circles, presenting opportunities for zone management. A replicated field trial was used to validate the use of plant-based cues to time the final insecticide application for *Lygus lineolaris* (Hemiptera: Miridae) in irrigated and rain fed zones. There were three treatments: 1) conventional blanket insecticide spray, 2) zone management with application exclusively for irrigated plants excluding rain-fed plants, or 3) untreated. Treatments were arranged in a randomized, complete block with three replications. Timing of the application was after plants in rain-fed zones were beyond the end-point of susceptibility to *Lygus*, while plants in irrigated zones were still at a susceptible stage. With use of zone management there were no yield penalties, and insecticide costs were reduced by 14 percent. Results support use of zone management in timing insecticide termination, having both economic and environmental benefits.

Faculty Mentor: Tina Gray Teague, Plant and Soil Science, tteague@AState.edu

Brooks, Johnvonta – Research Assistant
 johnvont.brooks@smail.AState.edu

EFFECT OF SUCROSE ON THE PRODUCTION OF STILBENOIDS IN HAIRY ROOT CULTURES OF PEANUT

Stilbenoids are phenolic compounds that are produced by plants as a defense mechanism against pathogen attack. Interestingly, these compounds also exhibit diverse biological activities with potential applications in human health. In order to produce these bioactive compounds, hairy root cultures of the peanut were established. To induce the production of stilbenoids, the hairy root cultures were exposed to different elicitors, including methyl jasmonate and cyclodextrin. In this research, we studied the effect of sucrose on the production of stilbenoids during the elicitation period. Sucrose, a disaccharide, is one of the most important molecules that plants metabolize from photosynthesis. Sucrose, a carbon source of fuel and structure to plants, affects the growth of roots in culture medium. Previous studies have shown sucrose can affect the production of secondary metabolites by acting as a signaling molecule. To this end, we studied the effect of different concentration of sucrose on the production of selected stilbenoids, including resveratrol, arachidin-1 and arachidin-3, in hairy root cultures of the peanut. The stilbenoids were analyzed by HPLC at 48, 96, 144 and 192 hours of elicitation period. Our results suggest certain concentrations of sucrose have an effect on the yield of stilbenoids.

Faculty Mentor: Fabricio Medina-Bolivar, Biological Sciences, fmedinabolivar@AState.edu

Castillo, Sonia – Undergraduate
 sonia.castillo@smail.AState.edu

ASSESSING FOLIAR ASCORBATE CONTENT IN RICE DIVERSITY PANEL AND SELECTED MAPPING POPULATION LINES WITH VARYING LEVELS OF SEEDLING COLD TOLERANCE

Early spring plantings of rice can have poor stands because of cold temperatures. Our previous studies have shown *Arabidopsis* high ascorbate (AsA) lines are tolerant to cold stress. We hypothesized that in rice, cold tolerance is also associated with high AsA content. A mapping population that is segregating for a transposable element, mPing, was evaluated for germination under cold temperatures. A subset of these lines that were considered tolerant or sensitive to cold were evaluated for foliar AsA content under normal (30 C) and cold (12 C) conditions at vegetative stage 4. We found no significant differences in AsA content under normal conditions, while under cold stress, some lines had significantly higher AsA content. However, these increases were not associated with high cold tolerance at germination, indicating AsA plays a role in the cold-stress response, independent of that at germination. Currently we are evaluating seedling AsA content in a rice diversity panel (RDP1) that has been genotyped and phenotyped extensively. We will associate varying AsA content with genetic and phenotypic variation through genome wide-association analysis with the goal to determine how AsA may be related to stress response and, ultimately, so more resilient rice varieties can be developed.

Faculty Mentor: Argelia Lorence, Chemistry and Physics, alorence@AState.edu

Co-Authors: Benjamin Steckling, Molly Tibbs, Anna McClung, Georgia Eizenga, Susan McCouch

Cease, Megan – Undergraduate
megan.cease@smail.AState.edu

PECTIN METHYLESTERASE ACTION REDUCES SUGAR BEET PULP WATER BINDING FOR REDUCED ENERGY INPUTS DURING BEET PROCESSING

The North American sugar beet industry annually generates tens of millions of tons of wet pulp residue. A high cost (30 percent of the energy in a beet processing plant) is incurred by pressing and drying beet pulp to reduce its water content from 90 percent to 15 percent. The sugar beet pulp is highly hydrophilic because it is rich in pectin, a complex cell wall polysaccharide that entraps water. We are investigating two pectinases, a thermally tolerant pectin methylesterase (TT-PME) and a thermostable endo-arabinanase (TS-ABN), for improved pulp pressing through calcium-mediated pectin cross-linking. We hypothesize action by PME and ABN on pectin structures in beet root cell walls will modify pulps functional properties, resulting in a reduced water-binding capacity through enhanced calcium cross-linking. For this study we developed an in-vitro functional assay to assess PME and ABN treatments supplemented with calcium. We present evidence that PME action dramatically reduces water binding in the presence of calcium, having an effect about three-fold greater than pulp treatments with calcium alone. In contrast, ABN treatment (independent or in combination with PME and calcium) has no significant effect on water-binding. These results provide proof-of-principle for recombinant TT-PME expression in sugar beet roots.

Faculty Mentor: : Brett Savary, Agriculture and Technology, bsavary@AState.edu

Co-Author: Jose Tovar

Chowdhury, Nazmul – Graduate
nazmul.chowdhur@smail.AState.edu

EVALUATION OF STRUCTURAL HEALTH OF ARKANSAS INTERSTATE HIGHWAY SYSTEM

As a part of a major pavement rehabilitation program in 2001, several sections of Interstate 30 and Interstate 40 in Arkansas were rubblized and overlaid. Many of the pavements constructed during this program were exhibiting a severe level of premature cracking. Most of these severely cracked asphalt pavements are located west of Conway on Interstate 40; while the pavements east of Little Rock on I-40 and I-30, which were constructed at virtually the same time, exhibit much less cracking. The main objective of this study is to evaluate root causes of poorly performing pavements by full forensic evaluation of Good, Poor and Medium performing sections. To this end, historical traffic, weather, mix-design data, and rutting and cracking development over the life of the pavement have been collected and analyzed. Moreover, cylindrical pavement cores were collected from the aforementioned three sections for mechanistic evaluation. The long-term pavement performance data and laboratory testing of these pavement sections suggests higher fines and asphalt ratio (F/A), and initial high roughness could cause the premature cracking. It is expected this study will be a helpful tool to the highway department to prevent future premature pavement deterioration of the state highway network.

Faculty Mentor: Zahid Hossain, Civil Engineering, mhossain@AState.edu

Creameans, Jarrod – Undergraduate
jarrod.creamean@smail.AState.edu

HAIRY ROOT CULTURES OF ANNATTO: A POTENTIAL SUSTAINABLE SOURCE OF BIOACTIVE COMPOUNDS

Annatto (*Bixa orellana*) is a tropical plant native to South America that is currently used in traditional medicine. In previous research, hairy root cultures of annatto were established as a sustainable source for bioactive compounds with potential for applications in human health. To this end, compounds with antimalarial activity were identified in extracts from the hairy roots. To further investigate the production capabilities of the hairy roots, the cultures were co-treated with the elicitors methyl jasmonate and cyclodextrin for different periods. Extracts from the co-treated cultures were analyzed by HPTLC and HPLC. Our results suggest selected compounds were induced upon elicitation, which may represent novel bioactive compounds in this species.

Faculty Mentor: Fabricio Medina-Bolivar, Biological Sciences, fmedinabolivar@AState.edu

Co-Authors: Denzel McGregory, Lingling Fang



Darrington, Robert – Business Management, Undergraduate

robert.darringt@gmail.AState.edu

USE OF NANOCLOCKS AS ALTERATIVE MODIFIERS FOR BUILDING LONGER LASTING PAVEMENTS

Limited funds for roadway infrastructures in the United States make it very difficult for transportation agencies to keep roads structurally sufficient. Having longer-lasting asphalt pavement materials allows for counties, cities and states to be able to improve roads and keep the infrastructure up-to-date. Traditionally, synthetic polymers are used to modify base asphalt binders to withstand heavy traffic loads and extreme weather conditions. However, polymer-modified asphalts are about 75 percent more expensive than the base binders. On the other hand, nanoclays (very fine clay particles), which are naturally abundant, environmentally friendly and very inexpensive, can potentially be an alternative to highly expensive polymers to modify asphalt binders. To this end, this study evaluated rutting (permanent deformation) and moisture resistance (stripping) of nanoclays-modified binders through mechanistic and fundamental science approaches. It was observed that a small amount (two percent by the weight of binder) of nanoclays increased the rutting resistance by about 30 percent. Properly treated, nanoclays-modified binders were also found to be effective in resisting moisture-related damages. Findings of this study are expected to be helpful for pavement professionals in developing and using alternative asphalts toward building longer-lasting pavements.

Faculty Mentor: Zahid Hossain, Civil Engineering, mhossain@AState.edu

Davis, Crystal – Undergraduate

crystal.davis1@gmail.AState.edu

GENETIC REQUIREMENTS FOR HAIRY ROOT CULTURES IN *OPUNTIA HUMIFUSA* (CACTACEAE)

Hairy root cultures are plant organ cultures used in the biosynthesis of secondary metabolites and the study of plant metabolism. Hairy root cultures require no external hormones to maintain high growth rates, are genetically stable and produce a broad range of secondary metabolites in high amounts. These root cultures are established by gene transfer from bacterial plasmids of *Agrobacterium* to the plant host genome. In general, plants require the integration of *rolC* and *aux1* genes to achieve consistently high growth rates. Analysis of three lines of *Opuntia humifusa* hairy roots indicates integration of *aux1*, an auxin biosynthesis gene, is not required to have high growth rates. Interestingly, two types of hairy root morphology have been observed, morphology of typical hairy roots with desired cell division with elongation, and a second type of callus-like root tips that show greatly reduced elongation. We will extract DNA and conduct a PCR analysis of 15 different lines, including two lines with callus morphology, to determine if the reduction in elongation of root tips is associated with the *aux1* integration. This study could increase scientific understanding of the plant hormone auxin by demonstrating the effects of high concentrations of the hormone in *Opuntia* root tissue.

Faculty Mentor: Travis Marsico, Biological Sciences, tmarsico@AState.edu

Co-Author: John Kilmer

Edmonds, Kyle – Undergraduate

kyle.edmonds@gmail.AState.edu

IMPORTANCE OF COMPLIANCE MIST-NETTING SURVEYS FOR NON-TARGET SPECIES, ESPECIALLY OZARK BIG-EARED BATS IN ARKANSAS

For more than 15 years, the Ozark-St. Francis National Forest in Northern Arkansas has been conducting compliance mist-netting within several five-mile buffers of known Indiana bat (*Myotis sodalis*) hibernacula, following the guidelines of the Endangered Species Act. Indiana bat monitoring, since 2010, has resulted in 29 Ozark big-eared bat (*Corynorhinus townsendii ingens*; COTO) captures. Pregnant females were captured both in 2013 and 2014. Although most captures were near known COTO bachelor sites and minimally used hibernacula, the capture of two pregnant females was not. Directionality and timing was used to isolate probable maternity roost locations. A roost was located in a large talus area in July, in close proximity to the location of the pregnant female captured in 2014. This location is a suspected maternity roost, but was not confirmed in order to minimize disturbance. The location was re-checked in January and was not being used as hibernacula. The 2013 capture was 4.8 km from the newly discovered roost and ongoing searches are planned for 2015. As the Ozark big-eared bat is difficult to detect with acoustic monitoring devices, our captures indicate mist-netting is an invaluable tool for collecting data on "non-target" bat species while conducting compliance mist-netting.

Faculty Mentor: Thomas Risch, Biological Sciences, trisch@AState.edu

Co-Author: Patrick Moore

Elms, Christopher – Undergraduate
christop.elms@smail.AState.edu

ENGINEERING A THERMOSTABLE ENDO-ARABINASE IN PLANTA FOR POST-HARVEST RECOVERY OF FUNCTIONAL OLIGOSACCHARIDES FROM CELL WALL POLYSACCHARIDES

Varieties of sugar beets (*Beta vulgaris* L.), while a table sugar resource, are being explored as alternative bioenergy crops. To make the use of sugar beets in biofuel production economically feasible, an effective method of recovering value-added products from the beet pulp byproduct should be developed. Functional oligosaccharides, like feruloylated arabino-oligosaccharides (FAOs), can be extracted from the beet pulp with hydrolytic enzyme processing. FAOs may be used in food and feed applications for healthful colon function as implicated by prebiotic, anti-inflammatory and mucosal immunomodulatory activities. The long-term goal of this project is to engineer energy beets with *in planta*-expressed glycosyl hydrolases for either *in vivo* or post-harvest modification of cell wall polysaccharides, facilitating production of industrial sugars and recovery of functional oligosaccharides from regional crops. This project aims to provide a proof-of-concept by engineering, in tobacco, a novel designer polymer tag consisting of 18 tandem repeats of a Ser-Pro-Pro-Pro-Pro motif, or (SP4)18 and attaching this to a thermostable 1,4-endo-arabinase (ABN) that can selectively cleave the arabinan chain of beet pulp polysaccharides to release FAOs. I predict that the designer polymer will facilitate accumulation of ABN in the plant cell wall matrix and stabilize ABN from proteolytic degradation.

Faculty Mentor: Jianfeng Xu, Agriculture and Technology, jxu@AState.edu

Co-Authors: Brett Savary, Ningning Zhang

Fang, Hong – Graduate
hong.fang@smail.AState.edu

ENGINEERING A NOVEL GLYCOPEPTIDE AS A MOLECULAR CARRIER FOR THE THERMOSTABLE E1 ENDOGLUCANASE EXPRESSED IN PLANTA

One main problem with biochemical conversion of lignocellulosic biomass to biofuels and biobased products is the recalcitrance of biomass to enzymatic digestion. Re-engineering the chemical and structural characteristics of the plant cell wall by *in planta* expression of cell wall-modifying enzymes represents a promising solution. In our study, a thermostable E1 endoglucanase from *Acidothermus cellulolyticus* was engineered into tobacco as fusion with a (SPPPP)18 tag to improve the processability of the plant biomass. The (SPPPP)18 tag consisting of 18 tandem repeats of Ser-Pro-Pro-Pro-Pro motif is able to direct extensive O-glycosylation with oligo-arabinosides in plant cells. This novel glycopeptide presumably functions as a molecular carrier to direct the accumulation of the expressed E1 in cell wall matrix and protect the enzyme from proteolytic degradation.

Faculty Mentor: Jianfeng Xu, Agriculture and Technology, jxu@AState.edu

Co-Author: Brett Savary

Gander, Ben – Undergraduate
ben.gander@smail.AState.edu

COST EVALUATION OF FARM SCALE SOYBEAN PRODUCTION FOR SOYBEAN MEAL AND OIL

The soybean has been known as the miracle bean in Arkansas. As the input costs of corn rise, commodity costs of cotton decline and soybean prices soar. The stage is set for the soybean to be the staple in Arkansas row-crop production. The commodity of the soybean seed holds many more opportunities. The option of a farm scale system to produce bio-based products and biodiesel is one way Arkansas farmers can expand their operation. Why sell a product when it can be refined better on the farm in the off-season to gain profits and protect the operation from outside costs of production? The opportunity to set up a farm scale system to process part of that farm's soybean seed production in the off season to ensure employment for farm workers and to produce more products for sale should be considered by Arkansas farmers. In this research project, a farm scale biofuel system was used to determine the economic opportunities by exploring the quantity of soybean seed that can be processed, the amount of meal and oil that can be produced, the amount of oil that can be refined into biodiesel, and the cost of production.

Faculty Mentor: Kevin Humphrey, Agricultural Education, jhumphre@AState.edu



Haas, Leevi – Undergraduate
leevi.haas@smail.AState.edu

WATER QUALITY COMPARISONS AMONG THREE TAILWATER RECOVERY SYSTEMS

Water levels of the Mississippi Alluvial Aquifer, in the Lower Mississippi River Basin, are declining at a greater rate than what can be recharged because of increases in groundwater withdrawal. Since conventional crop production practices rely exclusively on groundwater aquifers and rainfall for irrigation, sustainable agriculture in Arkansas will require substantive investment in water storage and a diverse array of irrigation techniques. Sustaining groundwater supplies also involves consideration for potential water quality changes that can occur within and downstream of production sites. Previous characterizations based on measured phosphate concentrations have shown significant differences ($p < 0.01$; $p < 0.01$) between ditches and reservoirs at Gibson Switch (GS)-1 and GS-3, respectively. Similarly, nitrite concentrations were significantly different ($p < 0.01$) between ditches and the reservoir at GS-3. Differences in turbidity have been found spatially at GS-1 ($p < 0.01$) and temporally at GS-2 ($p < 0.01$). Ongoing characterizations will support more-thorough comparisons of water quality among production sites, given their varying landscape characteristics as they impact post-irrigation water storage and reuse.

Faculty Mentor: Jerry Farris, Biological Sciences, jlfarris@AState.edu

Co-Authors: Ethan Leonard, Michele Reba

Harken, Cole – Undergraduate
matthew.harken@smail.AState.edu

WILD STRAIN RED FLOUR BEETLE SURVIVAL AND MORTALITY RATES

For this study, we are looking at survival rates of a wild strain of red flour beetle (*Tribolium castaneum*). A-State has active colonies of lab and wild strain red flour beetles. The wild strain used for research has not had as good of a survival rate as the lab strain. In this study, we have set up an experiment to figure out why the wild strain is not surviving as well. For the experiment we are raising neonates from pre-existing RFB from the wild strain colonies, living off of rice flour and brown rice. These neonates are being kept separately to distinguish between the two colonies. These neonates will then be placed in 10 different testing vials of 1gram of five different rice fractions: rice flour, bran, milled whole rice, milled broken rice and brown rice. This one gram of fraction per vial will be enough to sustain the neonate until pupation. We will have 50 samples from the rice flour colony and 50 samples from the brown rice colony. Once all of the neonates are in place, the testing vials will be monitored throughout their life cycle and we will check for mortality/survival rates from each fraction.

Faculty Mentor: Tanja McKay, Biological Sciences, tmckay@AState.edu

Herren, Nicole – Graduate
nicole.herren@smail.AState.edu

Walker-McCorkle, Taylor – Undergraduate
nicole.herren@smail.AState.edu

INTERNAL PARASITES FOUND IN SMALL RUMINANTS GRAZING ON TYPICAL ARKANSAS PASTURES

Our primary directive is to identify and quantify the presence of *Haemonchus contortus* (barber pole worm) and *E. arloingi* (coccidia) affecting small ruminants grazing on pasture in Craighead, Mississippi and Poinsett counties. Problems frequently seen in animals suffering from these parasitic organisms include lesions confined to the small intestines, which can become hemorrhagic or ulcerated, and includes sloughing of the smooth muscle of the digestive system at a rate in which the animal is unable to compensate. Other problems include severe diarrhea, emaciation, anorexia, dehydration and weight loss. If not treated in time, the animal usually succumbs to secondary infection or blood loss. To precisely determine the parasite load, fecal samples will be taken from all animal subjects and tested within 24 hours to ensure a quality sample and accurate fecal egg count. A questionnaire will be given to each participant to determine any correlations between management practices and parasite loads. By mapping these parasites we hope to determine the current effectiveness of common treatments (anthelmintics) and management practices of small ruminant herds in the region.

Faculty Mentor: Kevin Humphrey, Agricultural Education, jhumphre@AState.edu

Co-Author: Christina Ballard

Iseyemi, Oluwayinka – Graduate
oluwayinka.iseyemi@smail.AState.edu

CARBON SEQUESTRATION POTENTIAL IN AGRICULTURAL DRAINAGE DITCHES

Agricultural drainage ditches are primary wetlands within the production landscape. Like most wetlands, these ditches are capable of providing ecological functions, including flood control and nutrient filtration. This study investigated the potential for carbon sequestration within replicated experimental conventional, and controlled (with weirs) agricultural ditches. The study compared soil organic carbon concentration (gCkg^{-1}), and organic carbon pool (kgCm^{-2}) within 3 cm soil depths between ditch treatments. Soil organic carbon concentrations were quantified using the loss-on-ignition method. Soil bulk density was also determined for each ditch treatment. Mean soil carbon concentration in ditches with weirs was similar to mean soil carbon concentration in ditches with no weirs ($16.68 \pm 0.49 \text{ gCkg}^{-1}$ vs. $16.47 \pm 0.46 \text{ gCkg}^{-1}$; $p = 0.76$). Similarly, bulk densities (0.67 Mg m^{-3} , on average) and organic carbon content in ditches yielded comparable carbon pools. The average carbon pool in ditches with weirs was similar to the average carbon pool in ditches with no weirs ($28.08 \pm 0.75 \text{ kgCm}^{-2}$ vs. $27.88 \pm 0.68 \text{ kgCm}^{-2}$; $p = 0.84$). The studied experimental drainage ditches can then be considered as carbon sinks, suggesting agricultural drainage systems offer optimum environment for carbon sequestration.

Faculty Mentor: Jerry Farris, Biological Sciences, jlfarris@AState.edu

Co-Authors: Steve Green, Seo-Eun Choi, Matthew Moore

Jones, Jerry – Undergraduate
jerry.jones@smail.AState.edu

ION CHROMATOGRAPHY CHARACTERIZATION OF PARTICLES COLLECTED FROM NORTHEAST ARKANSAS

The chemical composition of atmospheric aerosols is influenced by their sources, whether coming from an urban or a rural environment. This study was performed to characterize and compare the chemical composition of aerosols found in areas of rural and urban Northeast Arkansas. A mini-particle collector was used to collect aerosol samples from two sites, Jonesboro, Ark., (urban) and Joiner, Ark., (rural). The two towns are located 40 miles apart. The collected aerosols were analyzed using ion chromatography (IC). The majority of aerosols collected were found to contain chlorine, fluorine, bromine, nitrate and phosphate components. One sample collected from Jonesboro contains sulfates, an indication of high industrial activities.

Faculty Mentor: Hashim Ali, Chemistry and Physics, hali@AState.edu

Co-Author: Bryant Fong

Jones, Kenny – Undergraduate
kenny.jones@smail.AState.edu

Rath, Mary – Undergraduate
mary.rath@smail.AState.edu

Hook, Alexandra – Undergraduate
alexandra.hook@smail.AState.edu

Loerch, Starlene – Undergraduate
starlene.loerch@smail.AState.edu

Martin, Lindsey – Undergraduate
lindsey.martin@smail.AState.edu

Ross, Alexis – Undergraduate
alexis.mross@smail.AState.edu

REHYDRATION OF DESICCATED FISH SPECIMENS IN THE ARKANSAS STATE UNIVERSITY MUSEUM OF ZOOLOGY ICHTHYOLOGY COLLECTION

The Arkansas State University Museum of Zoology (ASUMZ) Ichthyology Collection represents an important resource for students of the university and the scientific community. The collection houses approximately 13,000 specimen lots from 23 of the contiguous states. Unfortunately, numerous lots (greater than 600) have experienced desiccation as a result of unsuitable storage containers and intermittent curation in recent decades. As a part of a larger effort to restore the ASUMZ Ichthyology Collection into a viable teaching and research resource, the main objective of this project was to salvage dehydrated fish specimens. Additionally, the efficacy of rehydration of select specimen lots is compared among two methods: (1) a simple surfactant-based method that used a soap solution; and (2) a simple method using only distilled water in a sealed, high humidity chamber. Preliminary results indicated positive water weight gain in fish for both methods being tested. However, specimens being rehydrated in the soap solution exhibit a more timely absorption rate compared to specimens placed in high humidity chambers. While it is still inconclusive as to which rehydration method performs better, specimens subjected to both methods returned to a more flexible and hydrated state, making them useful for future research, measurement and analysis.

Faculty Mentor: Brook Fluker, Biological Sciences, bfluker@AState.edu



Kahill, Klarissa – Graduate
klarissa.kahill@smail.AState.edu

ARTIFICIAL RECHARGE OF THE MISSISSIPPI RIVER VALLEY ALLUVIAL AQUIFER: A WATER QUALITY STUDY

Water depletion of the Mississippi River Valley Alluvial Aquifer (MRVAA) has been a concern since the 1900s. As crop production expanded across Arkansas, use of the MRVAA for irrigation increased. With agriculture as the foundation of Arkansas' economy, an abundant and sustainable water supply is essential to this region. Artificial Recharge (AR), the increase in groundwater by artificial means, has been a method under research since the early 1960s. Water quality issues like high sediment load and high nutrient concentrations deemed AR unsuccessful during that time. The current study focuses on quantifying and comparing water quality of potential AR sources. The sources include selected on-farm reservoirs and their associated ditches. The sources were compared against groundwater well samples for pH, nitrogen, phosphorus, sediment and selected metals to determine the location (site), and time (months) that AR would be most effective. In addition, a filtration test was completed using a rice hull bio-filter to address the sediment issue, a known barrier to widespread AR. It was expected a lower sediment load, nutrient and metal concentration would exist during winter months, and sediment and turbidity levels would decrease after source water passed through the bio-filter during the filter test.

Faculty Mentor: Michele Reba, USDA Agricultural Research Service, michele.reba@ars.usda.gov

Co-Authors: Jerry Farris, Deb Leslie, John Czarnecki, J.R. Rigby

Konvalina, Johnny – Graduate
john.konvalin@smail.AState.edu

TESTICULAR CYCLE AND SPERMATOGENESIS IN THE ROUGH GREENSNAKE (*OPHEODRYS AESTIVUS*)

We examined the testicular cycle and spermatogenesis in the rough greensnake (*Opheodrys aestivus*) from snakes collected over a period of 19 years in Arkansas. Seasonal seminiferous tubule histology revealed a temporal strategy of germ cell development. Using light microscopy we photographed different cell types and constructed a cell wheel showing the entire spermatogenic cycle. To examine the testicular cycle, we picked 10 seminiferous tubules at random from each month and measured the seminiferous tubule diameter and epithelial height. We found that tubule diameter was smallest in April, increased to peak length in June, and returned to pre-breeding levels by October. Epithelial height exhibited a similar pattern with an increase in height from April to June, followed by a drastic decrease in height in July. September and October showed the lowest epithelial height. Evidenced by our findings, *Opheodrys aestivus* exhibits pre-nuptial spermatogenesis. More studies of this nature are needed to give us a clearer picture of spermatogenesis within the suborder *Serpentes*.

Faculty Mentor: Stan Trauth, Biological Sciences, strauth@AState.edu

Co-Author: Mike Plummer

Lee, Zachary – Undergraduate
zachary.lee1@smail.AState.edu

ENGINEERING MOLECULAR CARRIERS FOR DIRECTING EXPRESSION OF CELL WALL-MODIFYING ENZYMES IN PLANTA

Genetic manipulation of the chemical and structural characteristics of the plant cell wall with *in planta* expression of cell wall modifying (CWM) enzymes represents a promising solution to overcome the recalcitrance of plant biomass and make wall materials more accessible to deconstruction. However, many *in planta* expressed CWM enzymes targeted to the apoplast/cell wall matrix tend to be restrained in the cytoplasm membrane, and subject to rapid proteolysis. This project aims to exploit the plant-specific hydroxyproline (Hyp)-O-glycosylation "code" for de novo design and engineering of novel designer glycopeptide tags that can function as a molecular carrier for CWM enzymes expressed in planta. The engineered molecular carrier presumably facilitates the enzyme deposition into the cell wall matrix while stabilizing it from proteolytic degradation. To provide a proof-of-concept, two designer glycopeptide tags, one consisting of 51 tandem repeats of Ala-Pro motif and the other consisting of the proline-rich linker fragment of the *Acidothermus cellulolyticus* E1 endoglucanase, was each engineered into tobacco plants as fusion with a reporter protein, enhanced green fluorescence protein (EGFP). Their Hyp-O-glycosylation pattern and potential function as a molecular carrier for directing the accumulation of the tagged-protein (EGFP) in the cell wall matrix will be investigated.

Faculty Mentor: Jianfeng Xu, Agriculture and Technology, jxu@AState.edu

Manne, Siddhardha – Graduate
siddhard.manne@smail.AState.edu

DRIFT POTENTIAL OF SELECTED SPRAY NOZZLES USED IN MODERN AGRICULTURAL APPLICATIONS

An improved understanding of spray drift, pertaining to different nozzles used in modern agricultural applications, can help to minimize the negative impacts of drift on productivity, the environment, and human health and lead to more sustainable outcomes. A study was carried out on 10 different nozzles to compare the spray characteristics and measure their relative drift potentials. The flow rate, droplet size and spray coverage for each spray nozzle was measured at variable pressures and varying nozzle heights. Then the data was used to calculate relative drift potential. The results from this study will lead to a ranking of the nozzles tested based on drift potential.

Faculty Mentor: Peter Ako Larbi, Agricultural Systems Technology, plarbi@AState.edu

Martin, Lindsey – Undergraduate
lindsey.martin@smail.AState.edu

DEVELOPING A BALLOON-BORNE SPECTROMETER

Balloon SAT is an education outreach and research program that uses weather balloons as a tool to measure high-altitude conditions. A balloon-borne spectrometer allows measurement of the intensity of UV to NIR radiation as a function of altitude. Different wavelengths of light are indicative of certain atmospheric reactions such as sulfur sequestration, reactions of volatile organic carbon (VOC) and reactions of polycyclic aromatic hydrocarbons (PAH). Data collected aboard the flights revealed a trend supporting usual UV absorption along with a strong trend for cyan that maxed out detectors. Current efforts are trying to interface a spectrometer with a tablet in effort to make the research more cost-efficient and lightweight.

Faculty Mentor: Tillman Kennon, Chemistry and Physics, tkennon@AState.edu

Co-Author: Bryant Fong

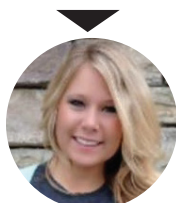
Morris, Earl – Undergraduate
earl.morris@smail.AState.edu

INVESTIGATION OF THE ROLE OF MYO-INOSITOL OXYGENASE IN VITAMIN C SYNTHESIS AND ITS EFFECTS ON THE GROWTH AND STRESS TOLERANCE OF TOBACCO PLANTS

Vitamin C (L-ascorbic acid, AsA) plays a key role in protecting animal and plant cells from oxidative stress. Humans are unable to synthesize vitamin C and must therefore acquire it from the diet. Elevating AsA content in plants increases their nutritive value, lengthens their shelf life, and positively affects their tolerance to stresses. The Lorence Group has demonstrated that *Ara-bidopsis* plants over-expressing a myo-inositol oxygenase enzyme (MIOX4) have elevated AsA and display enhanced growth rate, biomass accumulation and tolerance to multiple stresses including salt, cold, heat and pollutants. However, little is known about the effect of over-expressing this enzyme in other species. In this work, we will present our progress on the characterization of tobacco lines that express the AtMIOX4 transgene using a high-throughput phenotyping platform and the response of these lines to salt stress. Using 3,3-diaminobenzidine, we are also able to correlate AsA content and the presence of reactive oxygen species (H₂O₂) within the leaves of the transgenics compared to controls. One important aspect of this research plan is access to a highly sophisticated phenotyping instrument (Scanalyzer HTS, LemnaTec). Using high-throughput screening, this nondestructive method allows for highly precise phenotyping compared to traditional methods.

Faculty Mentor: Argelia Lorence, Chemistry and Physics, alorence@AState.edu

Co-Authors: Jessica Yactayo-Chang, Zachary Campbell, Gabriela Rodriguez



KATIE BLALACK, UNDERGRADUATE NURSING STUDENT

"In my research I have learned more about the research process, expanded my writing skills, learned how to think critically and analyze information, and improved my time management abilities by working on my research while keeping up with my studies."



Morrissey, Heather – Undergraduate
heather.morrissey@smail.AState.edu

ANTISENSE CONTROL OF PERICARP EXTENSIN EXPRESSION

Antisense DNA is commonly used to silence genes within an organism. A short sequence, which is complementary to the gene one wants to silence, is inserted into an organism. When the antisense RNA binds with the mRNA of the target gene, the cell degrades that mRNA using dicer proteins, thus removing the mRNA and the protein it would encode. HRGP is an extensin protein found in the cell walls of plants. The promoter used to drive the antisense gene is expressed in the pericarp of developing seeds. Corn embryos (12 – 15 days post pollination) will be transformed with *Agrobacterium* containing the antisense extension construct. The embryos will then be transferred to a series of growth media, in order to regenerate transformed plants. Once the young plants have grown large enough, they will be transferred to soil, where the plants will grow and produce viable seeds. The F1 seeds will be harvested and subjected to RNA gel blot analysis in order to identify where the antisense alters the expression of the HRGP.

Faculty Mentor: Elizabeth Hood, Agriculture and Technology, ehood@AState.edu

Co-Authors: Andrei Dabul, Nathan Hood

Paul, Nayan Kumar – Graduate
nayankum.paul@smail.AState.edu

PUSH-PULL PHENOMENON OF A DIELECTRIC PARTICLE IN A RECTANGULAR WAVEGUIDE

The electromagnetic force acting on a Rayleigh particle placed in a rectangular waveguide is studied. The particle is excited using the lowest order TE₁₀ mode. It is determined the particle is laterally trapped at the high-intensity region of the electric field and either pushed away from or pulled toward the light source. This push-pull phenomenon depends on whether the frequency of the light wave is above or below the cutoff frequency (i.e. the particle can be pushed or pulled by tuning the frequency). While conventional optical tweezers rely on a balance of scattering and gradient force in the propagation direction, the phenomenon predicted here switches between the two forces near the lowest cutoff in a waveguide.

Faculty Mentor: Brandon Kemp, Electrical Engineering, bkemp@AState.edu

Payne, Geoffrey – Undergraduate
geoffrey.payne@smail.AState.edu

CHARACTERIZATION OF SEDIMENTATION AT BIG LAKE NATIONAL WILDLIFE REFUGE, MANILA, ARKANSAS

Big Lake National Wildlife Refuge is a somewhat unique, naturally formed lake that intersects agriculture and wildlife management. It is designated as a sump for regional flood control by the U.S. Army Corps of Engineers, while simultaneously mandated as a wildlife refuge by the U.S. Fish and Wildlife Service. This intersection of resource responsibilities has presented contrasting challenges, given the sediment loads experienced in the Little River drainage system. Large loads associated with episodic high flows into the lake system have historically driven transition to shallower conditions and resulting adaptation in its flora and fauna. To characterize the levels of sediment entering the Big Lake system, we used three ISCO 6700 series auto samplers to sample 24-hour periods for seven events at three sites within the refuge. We found sediment levels varied significantly (p-value).

Faculty Mentor: Jerry Farris, Biological Sciences, jlfarris@AState.edu

Co-Authors: Jeremy Bennett, Michele Reba

Phillips, Cassie – Undergraduate
cassie.phillips@smail.AState.edu

HEAT STRESS IN DEVELOPING CORN SEEDS

With the onset of climate change, it is very important to the world food supply that we develop heat tolerant crops. The goal of this project is to understand the mechanisms of how crop plants tolerate heat stress. Two inbred lines of corn, one heat sensitive and one heat-tolerant, will be subjected to short-term high heat. Then the ears will be harvested at 24 and 48 hours, and RNA isolated. The RNA will be sequenced to understand the array of genes that respond to heat. The protein component will be analyzed in-house from the developing kernels. I will develop a system of heat that stresses the corn ears and extract the resultant ears for RNA and protein isolation. Results from these experiments will be useful preliminary data for research projects focused on achieving robust heat-resistant plants that will produce high yields in the face of global warming.

Faculty Mentor: Elizabeth Hood, Agriculture and Technology, ehood@AState.edu

Co-Author: Andy Pereira

Rahaman, Mohammed Ziaur – Graduate
mohammed.rahaman@smail.AState.edu

CHARACTERIZATION OF BINDERS IN THE REGION USING MULTIPLE STRESS CREEP RECOVERY TEST

The widely used performance grade (PG) specification was developed based on the study of unmodified binder, but most of the DOTs in the Southern Plains Transportation Center region, including the Arkansas Highway Department of Transportation, have been using PG tests for grading and characterizing polymer modified binders (PMBs) and warm mix asphalt (WMA). From field experience, the present method fails to predict the rutting and cracking performance of PMBs and WMA. This study explores the feasibility of using the multiple-stress creep recover (MSCR) test to characterize PMBs and WMA. To this end, different binders (PG 64-22, PG 70-22 and PG 76-22) from various refineries around the region and WMA prepared from Sasobit®, Advera®, and Evotherm™ were being investigated in the laboratory. These binders were tested at different temperatures (64, 70 and 76 C) and stress levels (0.1, 3.2 and 10 kPa), mimicking local climate and traffic conditions in accordance with the MSCR method. We observed the value of creep compliance and percent recovery value were repeatable and highly correlated with field experience. The MSCR test appears to be a better tool than the PG specification for characterizing polymer modified asphalts.

Faculty Mentor: Zahid Hossain, Civil Engineering, mhossain@AState.edu

Ray, Brianna – Undergraduate
brianna.ray@smail.AState.edu

Howell, Berlin – Undergraduate
berlin.howell@smail.AState.edu

Scott, Christina – Undergraduate
christin.scott@smail.AState.edu

FEEDING ORDER PREFERENCE OF SHEEP

The purpose of this study is to evaluate feed order preference behavior of sheep enrolled in a feeding trial designed to determine the effects of camelina meal on internal parasite control. The study involves adult sheep (n = 57), consisting of hair (Katadhin x St. Croix) and wool (Suffolk x Hampshire) breeds during the traditional lambing season. The sheep are brought into the loading area and are allowed to come in of their own free will, splitting themselves into three groups. The sheep are individually loaded into pens. The research presented will determine if preferential order exists as to when individual sheep choose to enter the feeding pens. The research will seek to determine if there are behavioral tendencies driving individuals to enter first. Variables that will be evaluated include breed/type, gender and treatment assignment. Additionally, the effects of lambing on feed-order preference will be evaluated both pre- and post-lambing.

Faculty Mentor: Stephanie Pulley, Animal Science, spulley@AState.edu

Co-Author: J. Kevin Humphrey

Ring, Rebecca – Undergraduate
rebecca.ring@smail.AState.edu

CHARACTERIZATION OF B73 MAIZE HYDROXYPROLINE-RICH GLYCOPROTEIN PROMOTER EXPRESSION

The gene that encodes hydroxyproline-rich glycoprotein, or extensin, is found as a single-copy in the inbred maize line B73. As the primary cell wall protein, extensin provides cell strength and flexibility during growth and is highly expressed in reproductive tissues of maize. Differential expression levels of extensin in various tissue types suggest complex regulatory controls and are of specific interest for tissue-specific targeting of foreign proteins in transformed plants. This study focuses on characterizing B73 maize extensin promoter activity via transient expression of the reporter gene β -glucuronidase (GUS). The objectives of this project include 1) PCR amplification of the extensin promoter sequence from a previously established BAC clone, 2) generation of a plasmid vector containing the core promoter sequence upstream of GUS and an herbicide resistance gene and 3) transient transformation of maize embryos with the aforementioned plasmid. Visualization of GUS staining in the embryo will reveal the promoter's activity.

Faculty Mentor: Elizabeth Hood, Agriculture and Technology, ehood@AState.edu

Co-Author: Audrei Dabul



Roberts, Jarod – Undergraduate
jarod.roberts@smail.AState.edu

Cable, Brandon – Undergraduate
brandon.cable@smail.AState.edu

THE IMPACT OF MULTIPLE BOTTLE CONDITIONS ON THE CONSUMPTION OF QUININE IN RATS

Research in the area of nicotine self-administration in rats has demonstrated a relationship between multiple bottle conditions and consumption. It is possible post-ingestive effects of nicotine may be partially responsible for these findings. To our knowledge, no work has been done to separate the olfactory/gustatory influences of nicotine solution from its post-ingestive effects. In order to approach this end, the impact of multiple bottle conditions on the voluntary consumption of quinine solutions will be investigated. Sixteen female Sprague Dawley rats will be given a choice between one bottle of quinine solution (0.02 g/L) and one bottle of water for 10 days, after which time three bottles of quinine solution will be added to create a five-bottle choice paradigm for approximately 25 days. Subjects will then be returned to the standard two-bottle choice arrangement. It is predicted under multiple bottle conditions, rats will consume more quinine solution than when under two-bottle choice conditions, indicating environmental availability, in particular, is a critical factor in the voluntary consumption of bitter tasting fluids by rats. The implications of these results for the interpretation of studies using oral self-administration methods in the rat and drug literature will be discussed.

Faculty Mentor: Kristin Biondolillo, Psychology and Counseling, kdbiondo@AState.edu

Co-Author: Barrett Schein

Rusher, Anthony – Undergraduate
anthony.rusher@smail.AState.edu

CHRONIC ORAL NICOTINE INTAKE AND HEPATIC CYP2B1 ACTIVITY IN RATS

CYP2B1 is the enzyme primarily responsible for nicotine metabolism in rats. This metabolic pathway yields the nicotine metabolite cotinine, which is often used as a biomarker for nicotine exposure and metabolism. In previous studies from this lab, cotinine levels dropped over time when rats consumed 30 µg/mL oral nicotine. We hypothesized chronic nicotine intake led to decreased CYP2B1 activity and consequently lowered cotinine levels. To test this, we isolated rat liver microsomes from control and experimental rats, and then measured CYP2B1 activity using the oxidation of 7-ethoxy-4-trifluoromethylcoumarin as a marker reaction. The assays showed no noticeable differences in the rate of CYP2B1 activity between the control and experimental animals. Consequently, nicotine intake at this study's concentration and duration did not affect intrinsic CYP2B1 activity in the liver.

Faculty Mentor: Amy Pearce, Psychology and Counseling, apearce@AState.edu

Schratz, Samuel – Graduate
samuel.schratz@smail.AState.edu

CHARACTERIZATION OF ROOST TREES OF THE SOUTHEASTERN MYOTIS IN THE BOTTOMLANDS OF ARKANSAS

Little is known about the roosting ecology of the southeastern myotis (*Myotis austroriparius*) on the Cache River National Wildlife Refuge, which is one of the largest continuous tracts of bottomland forest in the Mississippi Alluvial Plain. Accordingly, the objective of this study was to describe characteristics of roosts selected by southeastern *Myotis*. We affixed transmitters to 14 bats, One juvenile male, one juvenile female, six adult males and six adult females. Bats tracked daily to their roost trees for the life of the transmitter. Roosts were discovered from seven bats with some bats used multiple roosts. Nine of the 12 roost trees were water tupelos (*Nyssa aquatica*) with large basal hollows; other trees included black tupelo (*N. sylvatica*), red maple (*Acer rubrum*) and American sweetgum (*Liquidambar styraciflua*). We conducted emergence counts at six roost trees with three containing 300 or more bats. We harp-trapped a known tree twice over a one-month period to determine roost occupancy composition. At each roost tree, we measured diameter at breast height (DBH), tree height, canopy coverage and basal area. Roost trees had a larger DBH, higher basal area, and higher canopy coverage as compared to random trees.

Faculty Mentor: Thomas Risch, Biological Sciences, trisch@AState.edu

Co-Author: Virginie Rolland

Sheppard, Cheyenne – Graduate
cheyenne.sheppard@smail.AState.edu

BALAZS THOUGHT EXPERIMENT REVISITED: THE RELATIVISTIC ELECTROMAGNETIC APPROACH

For the past century, optical forces within media have been studied. These studies led to the formulation of two competing momentum models, the Abraham momentum and the Minkowski momentum. Recent discoveries have identified the Abraham momentum as being the kinetic momentum, while the Minkowski momentum is given as the canonical momentum. In light of this, many new technologies and applications, such as optical cloaking and micro-particle tracker beams, use photon momentum models to explain various physical phenomena. In the 1950s, Balazs developed a thought experiment which leads to identifying values associated with the kinetic formulation of light. Here, we revisit this thought experiment that using the alternative framework of relativistic electrodynamics to determine the accurate modeling of the kinetics of light. In doing this, we develop the mathematical framework for dealing with moving systems and demonstrate the different interpretations of light within materials. This demonstrates the misconceptions within the field of electrodynamics and illustrates the different interpretations of optical forces inside matter.

Faculty Mentor: Brandon Kemp, Electrical Engineering, bkemp@AState.edu

Southe, Heather – Undergraduate
heather.southe@smail.AState.edu

HIGH ALTITUDE LIGHT INTENSITY MEASUREMENTS WITH BALLOON-BORNE SENSORS

BalloonSAT is an educational outreach and near-space exploration program that uses payload boxes and weather balloons to investigate various issues and conditions within the atmosphere. HOBO data loggers and solar panels within a payload box were utilized to measure light intensity within the atmosphere. Previous studies show light intensity follows a parabolic curve with the apex at the tropopause. In an effort to determine if there is relationship between light intensity and temperature, the atmosphere was stimulated in a closed environment with controlled temperatures and light source. An inverse relationship was found between light intensity and temperature, such that solar voltage increases while temperature decreases with higher altitudes.

Faculty Mentor: Tillman Kennon, Chemistry and Physics, jkennon@AState.edu

Co-Author: Bryant Fong

Sullivan, Jennifer – Undergraduate
jenniferr.sullivan@smail.AState.edu

BALLOONSAT: HIGH-ALTITUDE METHANE MEASUREMENTS

The BalloonSAT program is a high-altitude research and education outreach program. With several balloon launches, Arduino and MQ-6 detectors were sent into the atmosphere at an altitude of 30 km (90,000 feet). Methane is 30 times more potent as a greenhouse gas than carbon dioxide. A calibration curve was made with known concentrations of methane at various temperatures to convert voltage readings into concentrations. Various concentrations were made by changing the ratio of pure methane and compressed air in laboratory controlled conditions. Methane concentration, as measured by the balloon detectors, was found to decrease with altitude, similar to findings from satellite and unmanned aerial vehicle (UAV) detection systems.

Faculty Mentor: Tillman Kennon, Chemistry and Physics, jkennon@AState.edu

Co-Author: Bryant Fong

Thigpen, Chris – Graduate
christopher.thigpen@smail.AState.edu

TOAD (ANURA: BUFONIDAE) LIMB ABNORMALITIES FROM AN AQUATIC SITE IN SCOTT, PULASKI COUNTY, ARKANSAS

We collected and examined 16 Fowler's toads, *Anaxyrus fowleri*, and one dwarf American toad, *Anaxyrus americanus charlesmithi*, in central Arkansas in 2011. Collection was initiated by observation of abnormal toads. Toads were euthanized, measured, photographed and deposited in the Arkansas State University herpetological collection. Several toads were radio-graphed. We found various abnormalities in both forelimbs and hindlimbs, and on both sides of the body. The causes of the abnormalities remain unknown and will require further studies to determine if the environment is imperiled.

Faculty Mentor: Stan Trauth, Biological Sciences, strauth@AState.edu



Watson, Kristiana – Undergraduate
kristian.watson@smail.AState.edu

RESEARCH KINETICS OF CARBONATE AEROSOLS IN CARBOXYLIC ACID ENVIRONMENTS

Aerosols, which are solid or liquid particles suspended in the atmosphere, play a vital role in our changing climate. Our understanding of the behavior of carbonate aerosols interacting with carboxylic acid aerosols is still limited. Gas chromatography with flame ionization detection (GC-FID) and Fourier transform infrared spectroscopy (FTIR) was used to analyze the reaction of sodium and potassium carbonate aerosols with common carboxylic acids including oxalic, malonic and succinic acids. Identified products include carbon dioxide and other gas-phase species. At lower concentrations of carbonate aerosols, more gas product is produced while greater concentrations of carbonates have lower concentrations of gases which suggests a sequestering process.

Faculty Mentor: Hashim Ali, Chemistry and Physics, hali@AState.edu

Wood, Kayla – Undergraduate
kayla.wood@smail.AState.edu

Mughal, Maqsood Ali – Graduate
maqsoodali.mughal@smail.AState.edu

Vangilder, Joshua – Graduate
joshua.vangilder@smail.AState.edu

Newell, Micheal Jason – Graduate
michael.newell@smail.AState.edu

Thapa, Shyam – Graduate
shyam.thapa@smail.AState.edu

STATUS OF PHOTOVOLTAIC MATERIALS RESEARCH AT ARKANSAS STATE UNIVERSITY

This presentation will provide an update on research on photovoltaic materials and other renewable energy-oriented challenges, for example, biofuel pellets, at the Arkansas State University Optoelectronic Materials Research Laboratory. Focus will be on electrodeposition of thin films of cadmium telluride (CdTe), copper indium disulfide (CuInS₂), and indium (III) sulfide (In₂S₃), all promising solar cell materials. Copper indium disulfide and indium sulfide also offer advantages of low hazard/toxicity and low environmental impact. With renewable energy serving as an emerging need and opportunity, such research could pave the way for eventual follow-up businesses and economic stimulation in Arkansas. The research also provides the student participants experience that enhances their overall education and marketability.

Faculty Mentor: Robert Engelken, Electrical Engineering, bdengens@AState.edu

Co-Author: Bruce Johnson

Yang, Tianhong – Graduate
tianhong.yang@smail.AState.edu

HIGH-LEVEL PRODUCTION OF ARACHIDIN-1 AND ARACHIDIN-3 IN HAIRY ROOT CULTURES OF PEANUT CO-TREATED WITH METHYL JASMONATE AND CYCLODEXTRIN

Peanut (*Arachis hypogaea*) produces more than 30 stilbenoids upon abiotic and biotic stress. The majority are prenylated stilbenoids, including arachidin-1 and arachidin-3. These compounds exhibit higher biological activities *in vitro* than their non-prenylated analogs. However, assessment of these bioactivities *in vivo* has been challenging because of their limited availability. In this study, peanut hairy root cultures were shown to be a controlled and sustainable axenic system for high-level production of arachidin-1 and arachidin-3 upon treatment with methyl jasmonate (MeJA) and cyclodextrin (CD). Real-time quantitative PCR results showed MeJA and CD had a synergistic effect on resveratrol synthase gene expression, which could explain the higher yield of stilbenoids when compared to treatment with either MeJA or CD alone. Furthermore, prenylated stilbenoids from the culture medium extracts were purified by high-performance, counter-current chromatography.

Faculty Mentor: Fabricio Medina-Bolivar, Biological Sciences, fmedinabolivar@AState.edu



CHEYENNE SHEPPARD, UNDERGRADUATE PHYSICS STUDENT

"My research has allowed me to study interesting and challenging topics, leading me to a deeper understanding in both academic and research settings. This allows for exponential growth and richer interest in both my field and research topic."

Zhang, Haitao – Graduate
haitao.zhang@smail.AState.edu

PHOSPHORYLATION OF THE CYTOSKELETAL PROTEIN CAP1 CONTROLS ITS ASSOCIATION WITH COFILIN AND ACTIN

Cell signaling can control the dynamic balance between filamentous and monomeric actin by modulating actin-regulatory proteins. One conserved actin-regulatory protein that controls actin dynamics is cyclase-associated protein (CAP). However, cell signals that regulate CAP remain unknown. We mapped phosphorylation sites on mouse CAP1 and found Ser307/Ser309 is a regulatory site. We further identified glycogen synthase kinase 3 (GSK) as a kinase for Ser309. The phosphomimetic mutant S307D/S309D lost binding to its partner cofilin, when expressed in cells, causing an accumulation of actin stress fibers similar to those in cells with reduced CAP expression. In contrast, the unphosphorylatable S307A/S309A mutant had drastically increased cofilin binding, but lost actin binding. These results suggest the phosphorylation may serve to facilitate release of cofilin for a subsequent cycle of actin filament severing. Moreover, our results suggest Ser307 and Ser309 function as tandem sites; neither the alterations in binding cofilin/actin, nor defects in rescuing the phenotype in CAP1 knockdown cells were observed in single-point mutants of either Ser307 or Ser309. In summary, we identify a novel regulatory mechanism of CAP1 through phosphorylation.

Faculty Mentor: Guolei Zhou, Biological Sciences, gzhou@AState.edu

Nursing and Health Professions

Alford, Meghan – Graduate
meghon.alford@smail.AState.edu

Shull, Courtney – Graduate
courtney.dixon@smail.AState.edu

Booth, Tia – Graduate
tia.booth@smail.AState.edu

Mashburn, Madison – Graduate
madison.mashburn@smail.AState.edu

Pickett, Shelby – Graduate
shelby.higgins@smail.AState.edu

ASSOCIATION OF SOUND LEVEL AND UNDESIRABLE BEHAVIOR IN MAINSTREAM STUDENTS WITH AUTISM SPECTRUM DISORDER

Disorders of loudness perception, or hyperacusis, can adversely affect the educational experience of students with autism spectrum disorder (ASD). Whereas most individuals tolerate sounds of 85 db without problem, it is generally held students with ASD and hyperacusis experience a much-lower threshold. Nevertheless, normative data for affected individuals have yet to be firmly established. Recognizing that unmitigated sound hypersensitivity can elicit inappropriate responding to classroom rules and routines, we sought to determine the sound levels associated with inappropriate classroom responding in this mixed method study. Accordingly, we observed three students with ASD in their mainstream classroom environment while recording sound levels (with Audio Tools Real Time Analyzer) along with incidence of undesirable behaviours. In all three students, we noted an increase in undesirable behaviour when sound levels exceeded 60 db. Moreover, we noted sounds of 45-50 db frequently elicited distraction from learning activities. Long-term, these findings will be used to optimize the ambient learning environment of students with ASD.

Faculty Mentor: Christy Phillips, Physical Therapy, cphillips@AState.edu

Bagby, Michelle – Graduate
michelle.bagby@smail.AState.edu

REVIEWING THE INCIDENCE OF UNINTENDED PREGNANCIES IN ADULT WOMEN: LONG-ACTING REVERSIBLE CONTRACEPTION VERSUS PATIENT COUNSELING

A difficult public health challenge of today is unintended pregnancies. Prevention strategies, such as health education and improving accessibility to contraceptives, have been created in an effort to address this issue. However, there is uncertainty regarding the effects of these interventions, resulting in the need to review their evidence-based results. The United States has shown higher rates of unintended pregnancies than other developed countries. Researching contributing factors can assist providers with education and prevention efforts. The purpose of this study is to determine if there is a difference between long-acting reversible contraception versus patient counseling among the rates of unintended pregnancies in women 18 to 40 years old. A non-experimental, retrospective, quantitative research method was conducted. Thirty charts were selected using a convenience sample, and EpiData Entry 3. Incidences of unintended pregnancies in pregnant women 18 to 40 years old that occurred prior to the study were assessed. Data will be analyzed using SPSS version 2.0 (results are pending). We will propose strategies and recommendations for healthcare practitioners.

Faculty Mentor: LaShond Hill, Nursing, lhill@AState.edu



Blalack, Katie – Undergraduate
katie.blalack@smail.AState.edu

REVIEWING THE INCIDENCE OF UNINTENDED PREGNANCIES IN ADULT WOMEN: LONG-ACTING REVERSIBLE CONTRACEPTION VERSUS PATIENT COUNSELING

Billions of dollars are spent annually in the United States on complications of Type-1 diabetes as a result from poor glucose control. Lifestyle changes that accompany the transition to college present a particular challenge to students with Type-1 diabetes, and may be threatening to the health and well-being of these students. The aim of this study was to determine the impact of the transition to college life on blood sugar levels in freshman students with Type-1 diabetes and factors that lead to an alteration in blood glucose regulation. Students who self-identified as having Type-1 diabetes completed an online survey. The survey included questions about lifestyle and alterations in blood glucose regulation upon entering college compared to diabetes management before the freshman year. Data analysis is ongoing and findings will be presented. Knowledge gained from this study may inform the development of educational interventions designed to assist freshmen with Type-1 diabetes in maintaining glucose control, and, thereby preventing complications of the disease.

Faculty Mentor: Susan Snellgrove, Nursing, ksnellgrove@AState.edu

Felts, Corey – Graduate
corey.felts@smail.AState.edu

Metheny, Troy – Graduate
troy.metheny@smail.AState.edu

Reynolds, Zachary – Graduate
zachary.reynolds@smail.AState.edu

Petrus, Haley – Graduate
haley.petrus@smail.AState.edu

QUANTIFICATION OF THE FREQUENCY, MAGNITUDE AND DIRECTION OF IMPACTS INCURRED BY ADOLESCENT FOOTBALL PLAYERS

Subconcussive impacts accrued during sporting participation have been associated with long-term neurological impairment, but variations in the degree of head impacts that occur across playing positions of adolescent football players are not well understood. Recognizing this, the American Medical Society has identified playing position as a key risk factor for concussions in football and called for additional research in this area. Accordingly, we instrumented players' helmets with Shockbox sensors and recorded hits incurred to the helmet during the 2014 football season. ANOVA revealed significant differences between position groups in the number, magnitude and direction of subconcussive hits. Whereas linemen incurred high-frequency, low-magnitude hits, skill players (running backs, linebackers, quarterbacks) incurred low-frequency but high-magnitude hits. This study provides novel findings of positional differences in subconcussive hits incurred by adolescent football players, a finding that suggests different concussion risk among players.

Faculty Mentor: Christy Phillips, Physical Therapy, cphillips@AState.edu

Co-Authors: Aaron Parsely, Dennis Perkey

James, Kimberly – Graduate
kimberly.james@smail.AState.edu

Higgins, Amy – Graduate
amy.higgins@smail.AState.edu

Ridge, Kristi – Graduate
alexandra.hook@smail.AState.edu

Artis, Angela – Graduate
angela.artis@smail.AState.edu

Perez, Fidencia – Undergraduate
fidencia.perez@smail.AState.edu

THE ROLE OF SPIRITUALITY AND RELIGION IN SOCIAL WORK PRACTICE

Since the beginning, spirituality has been considered a crucial component of social work practice. Over time, attitudes moved away from such inclusion, but they have recently returned as part of a more holistic approach. As social work education moves more positively toward spirituality in client assessment and treatment, it is important to investigate whether attitudes toward spirituality and religion in social work practice are also changing. Arkansas State University is conveniently located in the heart of the "Bible Belt," and provides an interesting environment in which to assess attitudes of future social workers about this topic. We assessed the attitudes of 60 students who are currently studying social work at the bachelor's or master's level at Arkansas State University. The Role of Religion and Spirituality in Practice (RRSP) scale was utilized to assess respondents' views. Results are pending data analysis.

Faculty Mentor: Larry Morton, Social Work, lmorton@AState.edu

Macklin, Brooke – Undergraduate
brooke.macklin@smail.AState.edu

ACQUISITION OF HUMOR IN NORMAL LANGUAGE DEVELOPMENT

Many theorists debate on the idea if language is learned or innate. Through these theories, one can see how and why a child normally develops language. But how does a child learn or know how to transpose words into humorous phrase and jokes? Where does a child go from learning or naturally producing and understanding direct language to creating abstract scenarios that we find funny? My research will describe how a child in the process of normal language development cultivates the ability to produce and understand humor on the neurological, psychological and social level. Through this study, I will show the point in development that a child learns, or has the ability to understand, multiple meanings of words, and understand how they can be used in a humorous context. This study will also compare findings to children who do not develop normally and identify the differences.

Faculty Mentor: Richard Neeley, Communication Disorders, rneeley@AState.edu

Peek, Olivia – Undergraduate
olivia.peek@smail.AState.edu

DEAF EDUCATION, CULTURE AND OPPRESSION

In a hearing dominated world, the idea of deafness has always been misunderstood. From the perspective of a deaf individual, the definition of “deaf” includes much more than the physical incapability of hearing. It includes social, cultural and linguistic factors that attribute to being deaf. Within the past few decades, education of the deaf has improved, but many may argue deaf children continue to lack the knowledge and skills presented to other children in mainstream schools. The dilemma stands: to mainstream one’s deaf child knowing they would be at a linguistic disadvantage, or to enroll them in a deaf school knowing the education may not be as beneficial. The deaf culture and community are extremely important to a deaf individual. Technology and workplace accommodations go hand-in-hand to ensure no oppression ensues. Religion barriers and negative depictions of the deaf in children’s books are examples of the oppression that still exists today. The implications of the professional are to make ourselves aware of deaf culture, education and oppression that surround our potential clients so we may be as effective, efficient, knowledgeable and respectful as possible.

Faculty Mentor: Nelvia Agnew, Communication Disorders, nagnew@AState.edu

Simon, Jade – Graduate
jade.simon@smail.AState.edu

PREFERRED TREATMENT OPTIONS IN WOMEN AGES 19 TO 65 WHO HAVE BEEN PREVIOUSLY DIAGNOSED WITH VULVOVAGINAL CANDIDIASIS

Vulvovaginal candidiasis (VVC) is the most common form of vaginitis. VCC is not a sexually transmitted disease due to the pathogenicity of the organism, but is an upset in the homeostatic balance in the vagina that leads to an overgrowth of the organism *Candida albicans*. An estimated 75 percent of women will have at least one episode of VVC, and 40 to 45 percent will have two or more episodes within their lifetime. The purpose of this study is to determine which treatment options females prefer. A sample survey was administered to 30 women ages 19 to 65 years old. The survey assessed if there was a diagnosis of VVC, as well as the treatment options preferred by the participant. Because of ongoing data analysis, the results of the study are still pending.

Faculty Mentor: Karen Olson, Nursing, kolson@AState.edu



BELINA SANTOS, UNDERGRADUATE MATHEMATICS STUDENT

“Through my research, I have been presented with opportunities that have motivated and challenged me in more ways than just academically. It opened a door to mathematics and statistics I never knew existed. This lead to my desire to continue expanding my knowledge and success through the Master of Sience in Mathematics program at Arkansas State University.”



Whitaker, Erica – Graduate
 erica.whitaker@smail.AState.edu

TELEPRACTICE IN THE ARKANSAS STATE UNIVERSITY SPEECH AND HEARING CENTER

The purpose of this study was to explore the telepractice service delivery model at the Arkansas State University Speech and Hearing Center (ASUSHC). The participant was a 70-year-old female diagnosed with mild non-fluent aphasia. She exhibited deficits in word retrieval and had mild articulation errors in her speech. She was highly motivated to improve her expressive communication skills. Telepractice was chosen as a viable option for her therapy after she became unable to travel to Jonesboro for treatment. Cisco WebEx, an online web conferencing system, was downloaded onto iPads. This program provided real-time online collaboration, online meetings and videoconferences. The client was trained by the clinician to operate the web conferencing system. The telepractice service delivery model was conducted for two semesters, during which the client continued to have biweekly, one-hour sessions. The sessions were supervised by a licensed speech-language pathologist. The client continued to make good progress with her therapy objectives via telepractice. This study showed telepractice is a viable service delivery model for the ASUSHC, and it may provide new therapy opportunities for future clients and clinicians.

Faculty Mentor: Amy Shollenbarger, Communication Disorders, ashollenbarger@AState.edu

Co-Author: Arianna Pait

Wilkins, Rachel – Graduate
 rachel.flemon@smail.AState.edu

THE RELATIONSHIP BETWEEN FOOT SENSATION AND BALANCE STRATEGIES IN PATIENTS WITH DIABETES

Our research is designed to find out if persons with diabetes rely more on somatosensory, vestibular or visual input to maintain balance when they have neuropathy. Different people use different sensory strategies to maintain their balance (somatosensation, visual or vestibular). A frequently used neuromuscular textbook, Motor Control (Shumway-Cook and Woollacott, 2011), states the visual sense is more heavily relied upon when one has diminishing somatosensation. This textbook does not site a reference to support this claim. However, as people with diabetes lose somatosensation, they are often losing vision as well (neuropathy and retinopathy). Our research shows somatosensation is the more-dominant sense used for balance in people with diabetes, no matter how much sensation loss they have suffered. Our research will allow physical therapists to develop better treatment plans to help patients with diabetes deal with their neuropathy and balance deficits.

Faculty Mentor: Susan Motts, Physical Therapy, smotts@AState.edu

Co-Author: Matthew Martin

Yankaway, Sherrita – Graduate
 sherrita.yankaway@smail.AState.edu

DO PATIENTS ACKNOWLEDGE A BODY MASS INDEX OF 25 OR GREATER PUTS THEM AT RISK FOR PREDIABETES?

In 2010, Tennessee adults presented as the eighth-highest incidence of obesity in the United States, at a striking 31.7 percent. More than two-thirds of adults in Tennessee, 68 percent of the state's population, are classified as overweight or obese. As of 2011, 34.7 percent of Shelby County residents are obese and 12.2 percent are reported as diagnosed with diabetes. The purpose of this study is to determine if adult patients with a body mass index (BMI) of greater than or equal to 25, who do not have a diagnosis of Type 2 diabetes mellitus, acknowledge overweight as being a risk factor for pre-diabetes. Data will be collected using a questionnaire administered to a convenience sample of patients in a small private practice in the suburbs of Western Tennessee. Results and conclusions are pending completion of the study. The expected result of this study is to provide education to patients who are unaware that a BMI greater than or equal to 25 is a risk factor for prediabetes.

Faculty Mentor: Karen Olson, Nursing, kolson@AState.edu

Psychology, Education and Other Analytic Studies

Almalki, Abdullah – Graduate
abdullah.almalki@smail.AState.edu

THE ROLE OF SOCIAL MEDIA IN HIGHER EDUCATION

This study focuses on using social media in higher education. What distinguishes social media in the educational field from traditional classrooms is interaction and collaboration. This study evaluates different types of social media that have been used in classrooms, and how instructors and students use social media to develop educational processes. Specifically, this study will examine these forms of social media in the classroom: wikis, blogs and YouTube. Keywords: higher education, social media, blog, YouTube, wikis. Social media creates a new concept of knowledge construction, interactive learning and collaboration that is more beyond traditional classrooms.

Faculty Mentor: Holly Hall, Strategic Communications, hollyhall@AState.edu

Blair, Amanda – Graduate
amanda.blair@smail.AState.edu

ENHANCING APPROPRIATE STUDENT VERBALIZATIONS IN THE CLASSROOM: AN EVALUATION OF A MULTI-COMPONENT BEHAVIORAL INTERVENTION

Inappropriate student verbalizations in the classroom setting constitute a common behavioral referral for school psychologists. This behavior negatively affects the referred student, their peers and the overall learning environment. The purpose of this study was to examine the effectiveness of a multi-component behavioral intervention with a first-grade student referred for this behavior, with the goal of enhancing their frequency of appropriate words while decreasing those that are inappropriate. The intervention was implemented through consultation with the teacher, and it consisted of visual prompting and a token economy with positive reinforcement and response cost. The results of the intervention revealed the student's mean number of appropriate words during baseline was zero but increased to approximately three during intervention. The percent of nonoverlapping data was 90 percent. Treatment integrity was acceptable. Goal attainment scaling completed by the teacher revealed the goal of the intervention was attained. Furthermore, the consultant reported they were very satisfied with the effectiveness of the multi-component program. Advantages of the intervention and limitations of the study are addressed.

Faculty Mentor: John Hall, Psychology and Counseling, jhall@AState.edu

Blevins, Sherry – Graduate
sherry.griffin@smail.AState.edu

COMPARISON OF TEACHING METHODS AND HOW THEY AFFECT COMPREHENSION

This case study research project will compare teaching methods for reading comprehension using small and whole-class groups. The small groups will include students from a similar reading level based on Student Teacher Assessment Response scores already recorded by the school literacy specialist. Three groups will rotate during the reading period. One group will be at the table with the teacher reading and discussing the chapter aloud. The two other groups will be at their seats reading silently. The groups will rotate until every group has had equal time at the back table with the teacher. The next week the class will read and discuss the next chapter using the whole group method. The class will read and discuss the chapter as a whole class, which includes all achievement level students ranging from third to 11th grade. Both weeks will conclude with a test on Friday with the same basic questions each time. Data analysis will involve comparing the grades on the two tests to see if there is a noticeable difference in the scores. Ultimately, this study hopes to better understand the differences in how students learn with small groups of like learners, or in a classroom setting of multiple achievement levels.

Faculty Mentor: Ryan Kelly, Teacher Education, rkelly@AState.edu



Campbell, Margaret – Graduate

margaret.campbell@smail.AState.edu

FLUENCY: FACT VS. FICTION

The objective of this study is to further understand the nature and context of introducing fiction texts and non-fiction texts to students, and evaluating which one has more of an impact on reading fluency. Fluency is defined as reading a text with speed, accuracy and expression. As years have passed, they have included comprehending the text to the definition. Classroom teachers need to implement fluency practice within their weekly lessons whether they see a need or not. When the students are in earlier grades, speed, accuracy and expression are a main focus. As the students grow older, there is a higher focus on comprehension. If this type of fluency is not practiced then the student(s) will fall behind. This study aims to understand the nature of using two different types of texts for distinct, short periods of time, in order to gauge whether fiction or non-fiction texts have a positive impact and increase their reading fluency. To what extent do fiction and non-fiction texts play a role in reading fluency? Will one or both texts cause an increase or decrease in fluency? Will frequent exposure to fiction or non-fiction texts allow students' fluency scores to continually rise or fall? Using a case study approach, this study will examine student Dynamic Indicators of Basic Early Literacy Skills test scores, as well as weekly running records on student fluency, and ultimately explore the link between the type of text selected for students and their resulting fluency.

Faculty Mentor: Ryan Kelly, Teacher Education, rkelly@AState.edu

Cortes, Melissa – Graduate

melissa.cortes@smail.AState.edu

A STUDY ON THE DIFFERENT METHODS OF TEACHING VOCABULARY

The objective of this study is to better understand effective methods of vocabulary instruction. In education, vocabulary instruction is a critical piece of a child's knowledge base. This knowledge base is used to find deeper meaning within a text. When vocabulary instruction falls behind, children may struggle to comprehend a text or find the deeper meaning intended by the author. In education, effective vocabulary instruction generally focuses on deeper meaning within words as they relate to the text as a whole, as well as strategies that help students to take on new words. This study will involve the use-teaching method of whole group delivery where the students will all be delivered the same information in the same way, and method of small group instruction where the students will receive the same information, but in a more differentiated manner. This study therefore seeks to answer the following questions: In what ways do students respond to these two methods of teaching delivery? In what ways do these two methods of delivery support retention of the information presented? Using a case study approach, this study will look closely at student vocabulary data from both Dynamic Indicators of Basic Early Literacy Skills and Developmental Spelling Assessment testing, as well as an in-classroom vocabulary assessment with word patterns, to ultimately better understand the link between a teacher's classroom methods and vocabulary learning.

Faculty Mentor: Ryan Kelly, Teacher Education, rkelly@AState.edu

Diles, Heather – Graduate

heather.diles@smail.AState.edu

THE FLUENT READER: A STUDY OF THE EFFECTS OF DIFFERENT TEACHING METHODS

The objective of this study is to further understand the effects that different teaching methods have on students and the improvement of their reading fluency. Reading fluency is defined as reading with accuracy and automaticity, with expression and proper speed and intonation. Children will not be able to comprehend text if they do not become fluent readers. This study aims to better understand the link between student fluency and text difficulty. This will give insight to other teachers on the best practices to support fluency and enhance comprehension, which could prevent students from falling further behind in other academic subjects. This study therefore aims to answer the following: What will be the impact on reading fluency given the presence of reading material of varying difficulty, and in what ways are best practices of fluency instruction of benefit to further comprehension instruction? Using a case study approach, I will examine measured progress on lower-level fluency with a greater quantity of material, and at a higher level of fluency with less material.

Faculty Mentor: Ryan Kelly, Teacher Education, rkelly@AState.edu

Flemon, Jessica – Graduate
jessica.pope@smail.AState.edu

THE BASE OF READING: A CASE STUDY OF PHONEMIC AWARENESS

Utilizing classroom Dynamic Indicators of Basic Early Literacy Skills and Developmental Reading Assessment data, as well as progress monitoring during the intervention, this case study ultimately seeks to explore the success of this reading intervention with findings applicable to future classroom intervention settings. The study utilized assessments that are required by the school, given periodically during the school year. To determine the participant and focus of this case study, I analyzed the scores for my class and a co-teacher's class. There was a prevalence of low benchmark scores and skill sets in the areas that relate to phonemic awareness. Without solid a phonemic awareness skill-set, students will have trouble connecting the sounds heard in words (phonemes) to the letters that represent the sounds (graphemes) because they do not have a strong base-knowledge of sounds. A particular student was identified as being at risk of falling behind if intervention was not conducted. A series of interventions was piloted to address the aforementioned areas. Ultimately, this study sought to address the following questions: how will the student respond to intervention in these areas, and will the student demonstrate gains in these areas of assessment after interventions?

Faculty Mentor: Ryan Kelly, Teacher Education, rkelly@AState.edu

Johnson, Sky – Undergraduate
sky.johnson@smail.AState.edu

Shepard, Garrett – Undergraduate
garrett.shepard@smail.AState.edu

Bearden, Erica – Undergraduate
erica.bearden@smail.AState.edu

TOO CUTE? COURTHOUSE DOG'S EFFECT ON JURY DECISION MAKING

Testifying in court can be a traumatic event for a child. To reduce this stress, courthouse dogs are utilized in some jurisdictions; however, defense attorneys have made objections claiming the dog's cuteness will increase the witness's believability resulting in a biased trial against their client. The current research examined these claims by presenting participants with a mock trial in which a child witness was either holding a dog, teddy bear or nothing. The participants were asked to complete a questionnaire asking for their verdict, believability of the witness and confidence of the witness. Participants Need for Cognition (NFC) and Need for Affect (NFA) levels will be determined by two surveys. NFC refers to an individual's motivation to think through issues and find more enjoyment from thinking, while NFA refers to an individual's desire to approach emotion-inducing situations and to seek out emotions. It is hypothesized the presence of the dog will not have an effect on participants high in NFC, but it will affect others high in NFA. If the hypothesis is supported, it suggests objections from defense attorneys may be unwarranted if jury members score higher in NFC.

Faculty Mentor: Christopher Peters, Psychology and Counseling, cpeters@AState.edu

Co-Authors: Hali Weeks, Felicia Houston

Keith, Jessica – Undergraduate
jessica.keith@smail.AState.edu

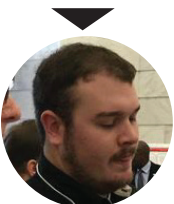
Godwin, Hannah – Undergraduate
hannah.godwin@smail.AState.edu

Dollars, Priscilla – Undergraduate
priscilla.spillman@smail.AState.edu

JOB TRENDS IN SPORTS CAREERS FOR WOMEN OVER THE LAST 20 YEARS

Previous research has shown there are more male figures in the sports industry workforce than females. However, the demand for women in sports industry jobs is steadily growing. This study examines the trend of female figures in the sports industry workforce over the last 20 years in America. We will conduct trend analysis utilizing data available through the NCAA Race and Gender Demographics Database. We will also conduct interviews of women regarding their experiences and trends they have observed in the sports workforce. Results are pending data analysis.

Faculty Mentor: Joyce Olushola, Sports Management, jolushola@AState.edu



ROBERT DARRINGTON, UNDERGRADUATE ENGINEERING STUDENT

"By conducting this research, I have been able to apply some of the ideas I learn in the classroom to real-world scenarios. I have been able to understand better and learn different concepts of transportation engineering."



Marks, Austin – Undergraduate
austin.marks@smail.AState.edu

Clover, Miles – Undergraduate
miles.clover@smail.AState.edu

McKinney, Cameron – Undergraduate
cameron.mckinney@smail.AState.edu

Wilson, Parisha – Undergraduate
parisha.wilson@smail.AState.edu

THE CORRELATION BETWEEN HIGH SCHOOL STAR RANKINGS AND SUCCESS IN PROFESSIONAL ATHLETICS

Recruiting services have been using the concept of “star ranking” for many years. The value of a prospect is often judged by these rankings, although the fairness of this metric as a true indicator of the player’s ability has not been thoroughly examined. The purpose of this study is to reveal whether highly ranked prospects have successful college sports careers and are recruited by professional teams. We will take the top 10 draft selections from the previous five drafts for both the NFL and NBA. Using the Rivals.com Prospect Database for the prospects star rankings, we will evaluate the relationship between rankings and draft outcomes. Results are pending data analysis. We predict the lower ranked prospects will more often be seen as first-round selections in their draft. This study has the potential to reveal whether coaches and scouts should place emphasis on these rankings when evaluating a prospect.

Faculty Mentor: Joyce Olushola, Sports Management, jolushola@AState.edu

McKnight, Samuel Tanner – Undergraduate
samuel.mcknight@smail.AState.edu

AN ANALYSIS OF THE BP DEEPWATER HORIZON OIL SPILL AND ITS EFFECTS ON THE ALABAMA GULF COAST ECONOMY

The purpose of this study is to analyze the BP Deepwater Horizon oil spill and its effects on the Alabama Gulf Coast economy. Since the Alabama Gulf Coast economy is primarily made up of (and dependent upon) tourism to generate revenue, the dominant focus of this research is based on determining what aspects of this industry were affected during the time of the oil spill, and by how severely they were impacted. To do this more efficiently, the area studied has been narrowed down to a small sample with demographics similar to much of the collective market: Baldwin County, Ala. By centralizing the focus on one particular area of the economy that makes up a significant piece of the market-whole, it will be easier to study and conclude how strongly the oil spill affected the economy of the Alabama Gulf Coast. Economic data collected by the Gulf Shores and Orange Beach Visitor’s Bureau during 2006 – 2014 was analyzed using correlation and logistic regression analyses. Results are pending further data analysis. In addition to investigating the effects of the spill on the economy, an examination of the legalities surrounding the oil spill will also be reviewed.

Faculty Mentor: David Kern, Business - Finance, dkern@AState.edu

O’Neal, Tabitha – Undergraduate
tabitha.oneal@smail.AState.edu

RIGGING THE JURY: PRIMING CRIME CONTROL VERSUS DUE PROCESS ORIENTATION

Sometimes inadmissible evidence is introduced into the courtroom and jurors are advised to disregard such evidence when determining their verdict. Inadmissible evidence refers to evidence that should not be introduced in court because it is considered to be unlawfully obtained, unreliable or irrelevant to the case. When inadmissible evidence is introduced, jurors often fail to disregard the evidence and their verdicts are affected. The goal of this study is to examine how experimentally manipulated motivations affect an individual’s regard of inadmissible evidence. Crime-control and due-process orientations are expected as possible motivations that affect how individuals regard inadmissible evidence. A person with a crime-control orientation will tend to focus on locking up potential threats in order to keep society as a whole safe, whereas a person with a due-process orientation will tend to focus on protecting the rights of the accused individual. Participants will be primed with one of the two motivations using a supraliminal priming technique and their verdict to a trial summary, either with or without inadmissible evidence, will be recorded. By experimentally manipulating these motivations, we hope to improve internal validity and, in turn, better draw causal relationships. Data collection is ongoing for this project.

Faculty Mentor: Christopher Peters, Psychology and Counseling, cpeters@AState.edu

Co-Authors: Andrew Atkins, Kasyah Barrett

Rancifer, Darnell – Graduate
darnell.rancifer@smail.AState.edu

YOUNG STUDENTS ANALYZING CLASSICAL TEXTS

The purpose of this study is to better understand the method of teaching students to analyze a classical piece of literature for abstract ideas. In standardized testing, students are required to perform more advanced skills in core subjects to remain competitive with the global market. In the English portion, students are expected to read a passage and analyze it for abstract ideas and concepts. In the field of education, children are typically not considered mature enough to develop these skills. The major methods are direct instruction and modeling instruction. Curriculum directors recommend classical literature in public schools to help students better analyze and understand the abstract ideas in these texts. This study seeks to answer the following: how do young students learn to analyze classical literature for figurative language, theme and character development; how effective will the different methods be in the classroom; and how might the exposure to classical literature enable students to be successful in others? This case study will utilize classroom pre- and post-test results on an applicable scene from *Romeo and Juliet*, as well as classroom observational data, to ultimately determine the effectiveness of this type of teaching method with this type of literature.

Faculty Mentor: Ryan Kelly, Teacher Education, rkelly@AState.edu

Rudelis, Jordan – Undergraduate
jordan.rudelis@smail.AState.edu

BIOFEEDBACK AND MINDFULNESS: THE EFFECTS OF HUMOR VERSUS BODY RELAXATION

With the popularization of mindfulness-based stress reduction techniques, mindfulness was introduced into mainstream psychology; yet the general population may only know of it as an abstract idea rather than practice it on a regular basis. Mindfulness practices, or the ability to pay attention to thoughts of all types in a non-judgmental manner, have been linked to decreased anxiety, stress, negative thinking and chronic pain. Even though laughter actually causes physiological responses synonymous with a stress response, studies show the body's natural response to laughter is another method of connection between the psychological state and the immune system; therefore, it can also be used to enter the body into the relaxation state (Kinser, 1999). This study aims to investigate the effects of humor on body relaxation meditation and mindfulness practices by means of the emWave® biofeedback device designed by HeartMath. The emWave® software displayed a measurement of heart rate variability as the user's physiological state; additional data was collected by the pre- and post-survey using the Five Facet Mindfulness Questionnaire (Baer et al., 2006). Based on preliminary data from 19 participants, we conclude our sessions resulted in higher mindfulness and led to other positive psychological outcomes.

Faculty Mentor: Irina Khramtsova, Psychology and Counseling, ikhramtsova@AState.edu

Co-Authors: Ariel Nathions, Ethan Reed, Marwan Grera, Alex Swenson

Sloas, Kelsey – Undergraduate
kelsey.sloas@smail.AState.edu

Crawford, Samantha – Undergraduate
samantha.johnson@smail.AState.edu

USING A FORK AS A HAIRBRUSH: IMPROVING PROBLEM SOLVING ABILITIES WITH TRAINING AND EYE CLOSURE

Functional fixedness hinders critical thinking by limiting a person to only consider traditional uses of common objects. When faced with problems that require untraditional solutions, the Obscure Features Hypothesis predicts that identifying missed or new features of an object can help people overcome this obstacle. The Generic Parts Technique (GPT) applies the Obscure Features Hypothesis by training participants to use everyday objects in creative ways after breaking down the objects into basic parts defined by the physical properties instead of the function. Imaging physical properties represents a complex visual task, which research shows can be aided by eye closure. Therefore, we investigated whether the GPT and eye closure jointly improve the ability to visualize breaking down objects into smaller parts that allow novel uses. In our fully between-participants design, participants either learned the GPT or completed a word association (control) task. After completing one of the two tasks, participants attempted to solve five problems with untraditional solutions. Participants either closed their eyes while imagining solutions or did not. We predict the GPT and eye closure will both increase accuracy and decrease response latency. Further, we predict these strategies will be most effective in combination.

Faculty Mentor: Dawn Weatherford, Psychology and Counseling, dweatherford@AState.edu

Co-Authors: Laura Tedder, Joylyn Gregory, Paige Hawkins



Tarver, Magan – Graduate
magan.duffel@smail.AState.edu

PARALLEL TEACHING PRACTICES IN POETRY

The objective of this study is to further understand differences in direct instruction, a teacher-centered method and inquiry-based learning, a student-centered method of instruction, via case-study research on the teaching of poetry. There are numerous teaching methods and styles that have successes in the classroom. Some methods are more centered on the teacher, where the teacher, who holds the knowledge, imparts this knowledge onto the students. However, some methods are more student-centered and have the students playing an active role in their learning. Increasingly, educators favor student-centered methods of teaching as being more appropriate for teaching today's students. This study aims to understand the nature of both teaching practices that I will be using in my classroom with poetry. As an educator, I want to know, is one teaching practice better for my students versus the other? Does one type of teaching lead to better scores and understanding? Using a case-study approach, this study will examine both pre- and post-test data on poetry terminology. Ultimately, this study hopes to better understand which approach best supports the teaching of poetry.

Faculty Mentor: Ryan Kelly, Teacher Education, rkelly@AState.edu

Thomas, Meagan – Undergraduate
meagan.thomas@smail.AState.edu

Voss, Kelli – Undergraduate
kelli.voss@smail.AState.edu

WITNESS INFLUENCE ON CRIME CONTROL AND DUE-PROCESS ORIENTATIONS

In the criminal justice system, an individual's crime control versus due-process orientation (CCDPO) can often be used to predict how jurors will vote in an actual trial. The goal of a person with a crime-control orientation is to protect society at all costs, even if that means potentially incarcerating an innocent individual. The goal of a person with a due-process orientation is to respect the suspect's rights as an American citizen, even if they are guilty. This study examines how influential the number of witnesses can be when the jury members declare a verdict, based on their CCDPO. The participants will be given a mock trial in which no physical evidence is presented and the number of witnesses will vary. They will then be asked a series of questions that will determine how important witnesses are to an individual based on their CCDPO. We expect the results to show the number of witnesses required for a juror to convict the suspect will be mediated by their CCDPO. Data collection is currently ongoing for this project.

Faculty Mentor: Christopher Peters, Psychology and Counseling, cpeters@AState.edu

Williams, Christopher – Undergraduate
christopherr.williams@smail.AState.edu

Partlow, Mary – Undergraduate
mary.partlow@smail.AState.edu

Harikrishnan, Prathik – Undergraduate
prathik.harikrishnan@smail.AState.edu

INFLUENCE OF ENCODING FACTORS ON CONFIDENCE-ACCURACY IN FACIAL RECOGNITION

Although people might believe otherwise, confidently held memories are not always accurate. Research supports this distinction by showing some factors influence confidence, but not accuracy; whereas others influence accuracy, but not confidence. Theoretical recognition memory models predict both familiarity-based and feature-based encoding strengthens memory, which increases accuracy. However, feature-based encoding more-strongly influences confidence. Subsequently, trait descriptions (e.g., personality type, honesty and attractiveness) and featural descriptions (e.g., eyes, nose and mouth) should both enhance memory. Additionally, the contents of the description (i.e., number and type of descriptions) may differentially influence confidence and accuracy. The current experiment aims to investigate how encoding differences driven by task (i.e., description) and stimulus (i.e., study duration) affect accuracy and confidence in a facial recognition paradigm. Participants were randomly assigned to a featural description, trait description or counting (control) group. Participants studied several faces for either 2s or 6s, each followed by their assigned task. In a subsequent test, participants provided yes/no judgments and confidence ratings for previously studied faces intermixed with new faces. We predict featural descriptors should increase confidence, after controlling for accuracy. Meanwhile, trait descriptors and duration should increase accuracy after controlling for confidence.

Faculty Mentor: Dawn Weatherford, Psychology and Counseling, dweatherford@AState.edu

Oral Presentations

Abstracts Listed in Alphabetic Order by Lead Presenter

create





Science, Technology, Engineering and Mathematics

Ballard, John – Undergraduate
johnt.ballard@smail.AState.edu

COMPUTER VISION SYSTEM FOR REAL-TIME KINEMATICS MODELING AND ANALYSIS

Using an embedded Linux system with open-source computer vision algorithms, this project focuses on the capture and analysis of object motion from a webcam suitable for introductory physics laboratories. Combining object recognition and reference marks, we seek to track the motion of assorted objects and create an automated system for displaying measured and theoretical kinematic properties relevant to a given laboratory exercise. Parts of this concept exist in a few different open-source software packages, the focus here being the combination of these features with particular emphasis on automated error analysis and data visualization. Because the size and low cost of the embedded Linux system, in our case the BeagleBone Black, we can take our project outside of the typical laboratory to study motion in the real world. Ultimately, this project will be a low-cost way to automate object recognition and motion tracking so students in an introductory physics lab can focus on examining the fundamental science with fewer instrumentation barriers.

Faculty Mentor: Ross Carroll, Chemistry and Physics, bcarroll@AState.edu

Benson, Ray – Graduate
nelson.benson@smail.AState.edu

EVALUATION OF SEEDING DENSITIES AND SOIL TEXTURE ON YIELD AND PROFIT OF COTTON GROWN IN NORTHEAST ARKANSAS

Development of guidelines for delineation of management zones based on yield and profit potential will help improve production efficiency for Northeast Arkansas cotton producers. General trends observed from multiple-years-yield map data have indicated areas of coarse sand have a lower yield potential than field areas classified as sandy loam. Reduced seeding rates in these areas may provide a cost-of-production savings for cotton producers. An on-farm study to evaluate seeding rate and soil-type effects on cotton development and yield was initiated during the 2014 production season. Historical data from yield maps, soil electrical conductivity (ECa) measurements and soil texture classifications were used to sub-divide the field into three soil classifications: coarse sand, sandy loam and clay. Treatments within each soil type included seeding rates of 1.5, 3.0 and 4.5 seeds per foot, and represented per-acre seeding costs of \$41.22, \$82.44 and \$123.66 respectively. Average yield and fiber quality assessments were not statistically different among seeding rate treatments in this study. Significant differences in yields were observed among soil EC classes. Yield from plants grown in sandy loam areas was significantly higher than for plants grown in sand blow or clay soils.

Faculty Mentor: Tina Teague, Plant and Soil Science, tteague@AState.edu

Co-Authors: Keith Morris, Earl Vories

Caparas, Alyssa – Undergraduate
alyssa.caparas@smail.AState.edu

INTEGRATING A PLANT-SPECIFIC DESIGNER SUGAR POLYMER TECHNOLOGY FOR ENHANCING THE EXPRESSION AND STABILITY OF RECOMBINANT FISH INTERLEUKIN-22

Globally, the aquaculture industry is a rapidly growing industry that provides about half of the world's food fish. In response to increasing global demands for high-value protein diets, farmed fish are raised at high density, which can lead to increased incidence and spread of diseases. To remain competitive, there is need for innovative tools in fish health management. The protein interleukin-22 (IL-22), which stimulates the innate immune system of animals, may provide a new protein-based therapeutic approach that is a safer alternative to antibiotics used in controlling fish disease outbreaks. However a major challenge with protein-based therapeutics in harsh settings such as aquaculture is proteins by their nature are unstable and subject to lose functional properties. To overcome this challenge, we leveraged both plant biotechnology to produce recombinant IL-22, and a recently identified *Hyp-O-Glyco* technology unique to proteins expressed in plants. This latter technology takes advantage of a plant-specific O-glycosylation process that instructs the plant to attach protective sugars onto signature amino acid sequences of newly synthesized proteins. If successful, this technology may increase the stability and yield of functional protein therapeutics like IL-22 in the aquaculture setting, as well as offer a protein-based therapeutic for promoting fish health.

Faculty Mentor: Maureen C. Dolan, Biological Sciences, mdolan@AState.edu

Co-authors: Zachary Marsh, Jianfeng Xu

Chappell, Shelby – Undergraduate
shelby.chappell@smail.AState.edu

EFFECTS OF NATURAL SOURCES ON NUTRIENT LEVELS IN CHANNELIZED AND NATURAL STREAMS

The Arkansas Cache River Watershed is listed as a focus watershed for the Mississippi River Basin Healthy Watersheds Initiative, indicating its potential as a source for nutrients contributing to the hypoxic zone in the Gulf of Mexico. Although this watershed has been highly altered to maximize agriculturally productive land, some unaltered areas still remain. Nutrient inputs were expected to be higher in altered areas of the watershed because of channel and riparian changes and surrounding agricultural land usage. However, preliminary sampling (2013) indicated nitrate concentrations at unaltered sites exceeded those at altered sites for at least part of the sampling season. This sampling examined only two altered and two unaltered sites in a single sub-watershed of the Cache River. The present study expanded sampling to include an additional six unaltered sites in five sub-watersheds over a second growing season (2014). Similar results were noted to the previous study, with nitrate concentrations at unaltered sites exceeding those at natural sites during the latter portion of the growing season. We suggest leaf litter associated with senescence (drought or seasonally-induced) could account for the increased nitrate concentrations at these sites.

Faculty Mentor: Jennifer Bouldin, Biological Sciences, jbouldin@AState.edu

Chiu, Yin-Lin – Graduate
yinlin.chiu@smail.AState.edu

DEVELOPMENT OF A WIRELESS SENSOR NETWORK FOR MONITORING AND MANAGING WETTING FRONT ADVANCE DURING IRRIGATION EVENTS

The inclusion of automation in irrigation and field data measurements may improve management by providing consolidated and meaningful information regarding individual field requirements that would help a producer make better-informed management decisions. Providing information, such as wetting front advance in a furrow-irrigated cotton field, remotely to a producer can help them manage water resources, as well as related logistics and labor, more effectively. The objective of this study was to develop a Wetting Front Advance Detection (WFAD) system, a rugged low cost wireless sensor network and infrastructure to retrieve remote sensor data within a production field to an offsite computer server, and to process and provide information to a producer via mobile device. By knowing the location and travel time of the wetting front, one could use the information to improve existing irrigation planning tools. The WFAD system was installed prior to the irrigation event and remained in the field until the conclusion of the irrigation event. The WFAD system recorded and transmitted irrigation water progress information from the production field, and alerted conditions via mobile devices. Future work will attempt to quantify the benefits and costs of using these systems.

Faculty Mentor: Michele Reba, USDA Agricultural Research Service, Michele.Reba@ars.usda.gov

Chlapecka, Justin – Undergraduate
justin.chlapecka@smail.AState.edu

SOYBEAN IRRIGATION TIMING USING EVAPOTRANSPIRATION CUES

Expanded use of irrigation management tools are needed to improve irrigation and water use efficiency in eastern Arkansas soybean production. In 2014, we examined irrigation-initiation timing on a sandy loam soil in a furrow-irrigated commercial field in Mississippi County. A major research objective was to validate and expand use of irrigation-timing cues using technological measurements. We based cues for irrigation-initiation timing on plant maturity measures and evapotranspiration. Four treatments were evaluated: initiation occurred when deficits reached 1.2 in (early start), 2 in (standard), 3 in (late start) and rain fed. Although the predominant soil type was a sandy loam, the field was variable with multiple areas of coarse sand present at random locations. The experimental design was a randomized complete block with four replications and comprised approximately 16 hectares. Meteorological data was obtained from an on-farm weather station. We also monitored crop and pest response to irrigation timing. In the high rainfall 2014 season, results from the study showed little variation of soybean yield between irrigation-timing treatments. Analysis of yield monitor data indicated yield penalties for irrigation treatments only within rain fed strips in areas of the field characterized as sand blows.

Faculty Mentor: Tina Teague, Plant and Soil Science, tteague@AState.edu

Co-Authors: Ray Benson, Amanda Mann, Keith Morris, Michele Reba



Clark, Cecilia – Undergraduate
cecilia.clark@smail.AState.edu

RESEARCH AND DEVELOPMENT OF IMPROVED FOOTBALL HELMETS TO AID IN CONCUSSION STUDIES

Recent Studies have determined that modern football helmets inadequately provide satisfactory protection against hits that can lead to serious brain injury. In order to provide early detection, one must consider a helmet incorporated with the appropriate sensors, in order to detect/notify the necessary personnel when a player has experienced sufficient, severe blows to the head before serious injury has occurred. This experiment focuses on testing such helmets by designing and fabricating an impact testing system. After extensive research of existing testing methods and examination of multiple options, the final design has been fabricated, which consists of a steel-frame base equipped with a pneumatic impactor, a head-mounting system (for the helmet), and a horizontal steel plate to mimic an impact of the head to the ground. With the newly designed impactor, the proposed testing methods focus on measuring strain and acceleration to determine if the impactor can accurately mimic an actual impact to the helmet within certain thresholds, for linear and angular acceleration. Studies will include signal processing/analyses, correlation and statistical computations on the raw data. Testing will also provide some guidance on whether linear or rotational impacts cause more strain, and thus injury, to the athlete's brain.

Faculty Mentor: Shivan Haran, Mechanical Engineering, sharan@AState.edu

Co-Authors: Isaac Bradley, Clayton Davis, Luke Lindsley

Cowgill, Samuel – Undergraduate
samuel.cowgill@smail.AState.edu

BAYESIAN APPROACH TO LINEAR REGRESSION ANALYSIS

Ordinary Least Square (OLS) estimation is the simplest way to estimate parameters in linear regression analysis. However, if there is any missing data, OLS estimation may not always work as expected. In this case, the Generalized Least Square (GLS) estimation could be used. In addition, both of these methods require independence amongst observations, which is hard to achieve in real-world practices. In this presentation, we will introduce the Bayesian approach to linear regression as an alternative. It will show the Bayesian approach is as efficient as the least squares methods, and the approach can be used for even data that has any dependencies such as seen in spatial data. Comparisons among OLS, GLS, and the Bayesian statistical approach will be provided through two examples.

Faculty Mentor: Seo-eun Choi, Mathematics and Statistics, seo-eun.choi@mathstat.AState.edu

Eckerson, Benjamin – Undergraduate
benjamin.eckerson@smail.AState.edu

Nolen, Cameron – Undergraduate
cameron.nolen@smail.AState.edu

SYNTHESIS OF VANADIUM ELECTROLYTE FOR USE IN VANADIUM REDOX FLOW BATTERIES

The objective of this research is to create an efficient vanadium electrolyte for use in a vanadium redox flow battery (VRFB) with the goal of renewable power stabilization. The VRFB is an electrochemical battery utilizing two vanadium ion solutions having a potential difference between them. An electric circuit connected to the battery harnesses the potential difference to store or extract power as needed. Three synthesis procedures will be conducted and studied using engineering analysis. A batch of vanadium(IV) and vanadium(III) will be synthesized and tested using a lab scale test bed. The result will be analyzed and used to modify the synthesis procedure. The second synthesis will correct errors from the initial synthesis and investigate different reduction methods including the charging of vanadium(IV) to vanadium(V) and vanadium(III). The third synthesis will modify the procedure based on previous results and test the use of oxalic acid for reduction of vanadium(V) to vanadium(IV). Oxalic acid will be deemed to have a high potential as a reduction agent for reducing vanadium(V) to vanadium(IV). Oxalic acid does not contaminate the electrolyte with unpaired zinc ions, and result in higher energy densities because of off-gassing of its only byproduct, carbon dioxide.

Faculty Mentor: Kwangkook Jeong, Mechanical Engineering, kjeong@AState.edu

Co-Author: Rabiul Islam

Egan, Hunter – Undergraduate
hunter.egan@smail.AState.edu

ARKANSAS DROUGHT VARIABILITY

Although Arkansas has a long history of drought, the state has suffered from severe droughts as recently as 2012. The Palmer Drought Severity Index (PDSI) uses a water-balance equation to relate precipitation, soil moisture, evapotranspiration and temperature to categorize abnormally wet or dry conditions. The PDSI was the first comprehensive method of drought indexing, thus it has limitations because of the assumptions and simplifications of soil layers, actual evapotranspiration and runoff levels that assume soil capacity to be full. However, these limitations do not outweigh the benefits of the index (length of time, built-in adjustable time scale). This study examines data from the National Oceanic and Atmospheric Administration's National Climatic Data Center dating back to 1895. Graphical representations of this data will support analysis of climatic variability in Arkansas as a state, as well as divisionally in nine regions. This analysis will set a basis for future research and the development of drought forecasting models.

Faculty Mentor: Yeonsang Hwang, Civil Engineering, yhwang@AState.edu

Hori, Masakazu – Undergraduate
masakazu.hori@smail.AState.edu

LASER CONTROL WITH A SPATIAL LIGHT MODULATOR

In this project, I will demonstrate the construction and use of a spatial light modulator (SLM) using a liquid crystal display in a projector. The project requires the interface of a computer to control the liquid crystal display. The SLM will be used to remove hot spots in a laser to develop a uniform beam. For this application, the intensity of the laser must be known at each pixel in the liquid crystal display so the correct amount of light can be eliminated everywhere within the beam. The SLM will also be tested by filtering in the Fourier-transform plane using a 4-f configuration. A final test will be the creation of optical vortices.

Faculty Mentor: Bruce Johnson, Chemistry and Physics, bjohnson@AState.edu

Hubbard, Emily – Undergraduate
emily.hubbard@smail.AState.edu

LOGISTIC REGRESSION ANALYSIS ON EFFECTS OF COLLEGE ALGEBRA COURSE ON COLLEGE STUDENTS

There are many variables that may affect students while they are taking College Algebra courses. This study will examine the relationships of these variables. First, multivariate random sampling technique will be used to choose a random sample from universities in Arkansas, followed by online/paper surveys. Then, the relationship between explanatory variables and students' academic performance will be analyzed using logistic regression. Findings will be utilized by the Department of Mathematics and Statistics to enhance College Algebra courses, and will also be presented to the Arkansas Department of Education.

Faculty Mentor: Dr. Seo-eun Choi, Mathematics and Statistics, seo-eun.choi@mathstat.AState.edu

Islam, Rabiul – Graduate
rabiul.islam@smail.AState.edu

Eckerson, Benjamin – Undergraduate
benjamin.eckerson@smail.AState.edu

Nolen, Cameron – Undergraduate
cameron.nolen@smail.AState.edu

TEST-BED PREPARATION AND PERFORMANCE ANALYSIS OF A SINGLE-CELL, ADVANCED VANADIUM REDOX-FLOW BATTERY

A lab-scale experimental setup has been designed and built based on better geometry of mechanical components and reduced power consumption in terms of thermo-fluids to optimize the energy efficiency of vanadium redox-flow battery (VRFB). Tests will be conducted with variations of parameters and boundary conditions (e.g., flowrate ranges from 0.125L/min to 0.300L/min), concentration of electrolytes ranges from 0.949M to 2.0M, current density ranges from 80mA/cm² to 200mA/cm², charging and discharging voltage ranges from 1.6V to 4V, and electrolytes temperature ranges from minus 5 C to 50 C. The test bed has been constructed with two mold-type half cells and attached together by an ion exchange membrane held in between them. This permeable membrane will separate the electrolytes and facilitate ion transfer between two electrolytes through its 20Å diameter pores. An analytical modeling has also been performed to predict the electric circuits and electrochemistry, and to compare it with our experimental results. This research aims to better understand and demonstrate the transient characteristics of VRFB in order to refine the system in hopes of improving efficiency. The VRFB project is in collaboration with the University of Arkansas at Fayetteville (UAF) to integrate VRFB with micro-grid at UAF.

Faculty Mentor: David Jeong, Mechanical Engineering, kjeong@AState.edu



Kardas, Clayton – Undergraduate
clayton.kardas@smail.AState.edu

USING A CHARGE-COUPLED DEVICE FOR BEAM-SHAPING FEEDBACK TO A SPATIAL LIGHT MODULATOR

My project will use a charge-coupled device (CCD) to analyze a laser beam's spatial intensity profile and return adjustments to a liquid crystal display (LCD) spatial light modulator in order to shape the beam to a desired profile. This method will be implemented by reading the profile pixel-by-pixel, and feeding back information to rotate the polarity of each liquid crystal as needed. This will manipulate the beam shape using an algorithm developed with *LabVIEW*. Most other devices that aim to homogenize beams cost upwards of thousands of dollars, whereas our device will be at a much lower cost and provide more options for beam manipulation compared to the higher-priced devices. The inspired purpose of this device is to provide more efficient methods for the laser annealing of solar cells, which will provide for maximizing crystal growth and electron mobility.

Faculty Mentor: Bruce Johnson, Chemistry and Physics, bjohnson@AState.edu

Kardas, Clayton – Undergraduate
clayton.kardas@smail.AState.edu

DEVELOPMENT OF AN 8-BIT AVR-BASED AUDIO SIGNAL PROCESSING APPARATUS

One of the problems of creating music is transposing conscious musical thoughts into hard copy or into music itself. Professional musicians with in-depth knowledge of musical theory and talent are often able to translate their knowledge to acoustic forms such as instruments or singing. In order to reduce the learning curve for musical translation, a device was developed that mimics the musical notes of the inputted human voice allowing users to store and play the mimicked notes on one of the various play buttons and be able to play the established musical notes repeatedly or reset them to new notes. The device uses analog-to-digital signal processing, the Fast Hartley Transform algorithm and an Arduino microprocessor to determine the dominant frequency from the inputted sound wave.

Faculty Mentor: Ross Carroll, Chemistry and Physics, bcarroll@AState.edu

Katari, Chaitanya Prakash – Graduate
chaitany.katari@smail.AState.edu

BIOLOGICALLY SUPPORTED NEW STOCHASTIC MODELS OF SKIN CANCER

Skin cancer is one of most lethal human cancers in the United States. For efficient control and prevention of skin cancer, it is necessary to develop biologically supported stochastic models and identify critical events in the process of carcinogenesis. In this study we use a stochastic system to model the critical events of biological processes of skin cancer. Furthermore, a computer program will be developed to mimic the biological mechanism.

Faculty Mentor: Hong Zhou, Mathematics and Statistics, hzhou@AState.edu

Kennon, Molly – Graduate
molly.kennon@smail.AState.edu

ANALYSIS OF CACHE RIVER WATERSHED: POSSIBLE SOURCES OF THE DISSOLVED LEAD, COPPER AND TOTAL DISSOLVED SOLIDS IMPAIRMENTS

The United States Environmental Protection Agency, based on the Federal Clean Water Act (CWA), has derived criteria for each state to determine the status of a particular waterbody to maintain its designated use. The Arkansas Department of Environmental Quality (ADEQ) works diligently toward maintaining its waterbodies through developing lists under the CWA §303(d) of impaired waterbodies and total daily maximum loads. The Cache River Watershed in Arkansas is listed for several impairments including: dissolved lead (Pb) and copper (Cu), total dissolved solids (TDS), turbidity and dissolved oxygen (DO). This study focuses on eight sites along the Cache River Watershed (four main channel sites and four tributary sites) that are regularly sampled by ADEQ. Monthly samples were collected and water quality monitoring has been conducted to measure the following parameters: pH, conductivity, DO, temperature and flow. Total suspended solids, total dissolved solids, turbidity, hardness, dissolved and total nutrients, and metals (Pb and Cu) were also performed. This project serves as additional data for ADEQ for the above mentioned sites, as well as to determine possible source(s) of impairments. To date, sampling of these sites has shown several detections for the above impairments comparable to ADEQ's results.

Faculty Mentor: Jennifer Bouldin, Biological Sciences, jbouldin@AState.edu

Kirby, Paige – Undergraduate
paige.kirby@smail.AState.edu

PALLADIUM CATALYZED SYNTHESIS OF STILBENES

Alkenes are a class of hydrocarbons containing only carbon and hydrogen. The compounds are extremely useful in industrial applications and may also affect human health. In particular, stilbenoids, derivatives of stilbene that can be isolated from common plants such as peanut and muscadine grape, exhibit anticancer, antioxidant, anti-inflammatory and cardioprotective activity. Stilbenoid compounds and derivatives, such as combrestatin A4 and resveratrol, are important and beneficial to human health. Current methods used to synthesize stilbenes can be harmful to the environment and generate large amounts of hazardous halogenated waste. By using a palladium-catalyzed reaction, alkenes such as stilbene can be selectively formed under mild conditions using boron and silicon, while generating less harmful waste and leaving a smaller environmental footprint. By exploring different reagents and methods in this reaction, the yield of stilbene can be optimized. The purpose of this study is to discover successful reaction conditions to create optimal yields of stilbenoids while reducing harmful environmental effects.

Faculty Mentor: John Hershberger, Chemistry and Physics, jhershberger@AState.edu

Kilmer, Mary – Graduate
mary.kilmer@smail.AState.edu

LOOKING FOR LEAD IN ALL THE WRONG PLACES?

The Cache River has been on the Clean Water Act § 303(d) list according to the Arkansas Department of Environmental Quality (ADEQ) for more than a decade because of lead (Pb) impairments. While the cause is commonly thought to be agricultural land usage in combination with precipitation-induced runoff, no comprehensive sampling has been performed to support this hypothesis. Previous data used to determine the impaired status was limited in scope, with only five main channel sites sampled and 100 samples analyzed over a period of 15 years. In this study, both headwater sub-watersheds and main channel sites were sampled to determine frequency and intensity of lead detection. Water and sediment samples were collected, with water samples collected monthly for analysis of dissolved and total lead, and sediment samples collected quarterly for analysis of sediment-bound lead. Results were mapped and compared to land usage in the watershed. Preliminary results indicate lead is present in all matrices (water, suspended sediment, sediment), though detections above the impairment limit of 2 ppb (dissolved lead) were rare. Levels in suspended sediment (total Pb) and sediment-bound Pb were consistent with other Midwestern river basins. No consistent geographic or land-usage pattern is yet obvious for lead detections.

Faculty Mentor: Jennifer Bouldin, Biological Sciences, jbouldin@AState.edu

Knapp, Tyler – Undergraduate
tyler.knapp@smail.AState.edu

STILBENOID PRODUCTION IN HAIRY ROOT CULTURES OF MUSCADINE GRAPE: EFFECTS OF METHYL JASMONATE AND CYCLODEXTRIN

Muscadine grapes (*Vitis rotundifolia*) have been experimentally proven to be high producers of phenolic compounds called stilbenoids. These compounds are important because of their antioxidant, anti-inflammatory, and potential anti-cancer effects in human health. In order to develop a sustainable bioproduction system for stilbenoids, hairy root cultures of muscadine grape cultivars Noble and Fry were established. Elicitation was used as a strategy to increase the levels of these compounds. To this end, the cultures were treated with the elicitor methyl jasmonate in combination with cyclodextrin for 24, 48, 72 and 96 hours. The stilbenoids were extracted from the root tissue and culture medium with ethyl acetate and analyzed by high performance liquid chromatography. Our results show the combined methyl jasmonate and cyclodextrin treatment led to high levels of selected stilbenoids in these hairy root cultures.

Faculty Mentor: Fabricio Medina-Bolivar, Biological Sciences, fmedinabolivar@AState.edu

Co-Authors: Luis Nopo-Olazabal, Cesar Nopo-Olazabal



Leonard, Ethan – Graduate
ethan.leonard@smail.AState.edu

WATER QUALITY CHARACTERIZATION OF A TAILWATER RECOVERY SYSTEM ASSOCIATED WITH AGRICULTURAL PRODUCTION

Water levels of the Mississippi Alluvial Aquifer in the Lower Mississippi River Basin are declining at a greater rate than what can be recharged because of increases in groundwater withdrawal. Since conventional crop production practices rely exclusively on groundwater aquifers and rainfall for irrigation, sustainable agriculture in Arkansas will require substantive investment in water storage and a diverse array of irrigation techniques. Sustaining groundwater supplies also involves consideration for potential water quality changes that can occur within and downstream of production sites. Previous characterizations based on measured phosphate concentrations have shown significant differences ($p < 0.01$; $p < 0.01$) between ditches and reservoirs at Gibson Switch (GS)-1 and GS-3, respectively. Similarly, nitrite concentrations were significantly different ($p < 0.01$) between ditches and the reservoir at GS-3. Differences in turbidity have been found spatially at GS-1 ($p < 0.01$) and temporally at GS-2 ($p < 0.01$). Ongoing characterizations will support more thorough comparisons of water quality among production sites, given their varying landscape characteristics as they impact post-irrigation water storage and reuse.

Faculty Mentor: Jerry Farris, Biological Sciences, jlfarris@AState.edu

Co-Author: Michele Reba

Lewis, Austin – Graduate
austin.lewis@smail.AState.edu

WATER QUALITY CHARACTERIZATION OF A TAILWATER RECOVERY SYSTEM ASSOCIATED WITH AGRICULTURAL PRODUCTION

Arkansas ranks third (following California and Nebraska) in irrigated acreage and applied water among states in the U.S. Arkansas currently irrigates more acres than any other state in the Mid-South. A high demand for irrigation in the Mid-South has resulted in a declining Mississippi River Valley Alluvial Aquifer. Needless to say, improving water management will play a key role in improving sustainability in agriculture in the Mid-South. *Pipe Planner*, a Web-based application for irrigation system design, and polyacrylamide (PAM), a soil stabilizer, are tools that have been tested to understand their impact on water conservation. Research was conducted on selected cotton fields to analyze what impact *Pipe Planner* use, with and without PAM application, would have on furrow irrigation advance times. Data was collected using soil moisture sensors that monitored the advancement of water in the furrows.

Faculty Mentor: Michele Reba, USDA Agricultural Research Service, michele.reba@ars.usda.gov

Co-Author: Tina Teague

Mahmud, Istiaque – Graduate
istiaque.mahmud@smail.AState.edu

EFFECTS OF POLYPHOSPHORIC ACID (PPA) MODIFICATIONS OF ASPHALTS

The Arkansas State Highway and Transportation Department (AHTD) has approved three types of polymer (styrene-butadiene, styrene-butadiene-styrene and styrene-butadiene-rubber) for asphalt suppliers to improve the quality of asphalts. Although the AHTD does not allow polyphosphoric acid (PPA) as an asphalt modifier, some suppliers in Arkansas are believed to be including PPA in their asphalt modifications. The objective of this project is to evaluate PPA-modified asphalts and determine the adverse effects, if any, of PPA on the performance of asphalts. A comprehensive test plan is being developed based on literature review and outcomes of two surveys. The surveys are being conducted within neighboring states' highway departments and certified asphalt binder suppliers in Arkansas. The rheological and mechanistic properties of different mixtures of PPA and asphalt binders are being evaluated in order to analyze possible issues of PPA-modified asphalt and propose recommendations to the AHTD for possible inclusions and/or revision of their current specifications. Moreover, a comprehensive database containing performance of PPA-modified asphalts will be delivered to the AHTD. The findings of the research are expected to be useful as guidelines for AHTD to determine the optimum level of PPA in asphalt while enhancing the performance of asphalt pavement in Arkansas.

Faculty Mentor: Zahid Hossain, Civil Engineering, mhossain@AState.edu

Mann, Amanda – Graduate
amanda.mann@smail.AState.edu

USE OF SOIL ELECTRICAL CONDUCTIVITY TO CHARACTERIZE HETEROGENEOUS SOILS ON THE JUDD HILL FOUNDATION FARM

Agricultural producers are working to implement sustainable farming practices by using precision-agriculture technology. This includes use of site-specific management in fields with heterogeneous soils. A better understanding of soil variability can aid in data interpretation, soil sampling and prescriptions for precision applications of fertilizer, pesticide and seeds. The purpose of the research was to use soil electrical conductivity (EC) measurements to make soil EC variation maps. Soil EC is the ability of the soil to conduct an electrical current. A number of soil physical and chemical properties relate well to the soil EC measurements. The study area is located on the Judd Hill Foundation Farm. Soil EC measurements were made in 2010, 2012 and 2014 using a contact sensor, Veris® 3150. Soil electrical-conductivity measurements were analyzed using the geographic information system, ArcGIS 10.1©, a spatial analyst tool interpolation. EC maps for each sample period were prepared and in-field variability of soil was compared. This information may support development of practical guidelines for precision management which can have economic, agronomic and environmental benefits in Mid-South row-crop agriculture.

Faculty Mentor: Tina Gray Teague, Plant and Soil Science, tteague@AState.edu

Co-Authors: Keith Morris, Jami Nash

McCauley, Jacob – Graduate
jacob.mccauley@smail.AState.edu

BIOACCUMULATION OF CADMIUM IN INVERTEBRATES ALONG THE BUFFALO NATIONAL RIVER DUE TO HISTORIC LEAD AND ZINC MINING OPERATIONS

Buffalo National River in North Central Arkansas is a 246 km-long, free-flowing river that is considered to be untouched by many anthropogenic means of pollution. Collections over the past decade, however, have shown a decline in population and diversity of many aquatic invertebrates, most notably with the freshwater mussel populations. While no single reason for the decline has been established, one factor largely overlooked is the Buffalo River's history of lead and zinc mining operations along its banks and a particular concentration in the mid-river town of Rush. The tails and spoils of these operations release heavy amounts of raw ore into streams. One element commonly found in the earth's crust that becomes a minor constituent of the tails and spoils is cadmium. Cadmium is a non-essential metal in higher functioning organisms and is extremely toxic when input exceeds the rate at which an organism may depurate pollutants. This research will assess the bioaccumulation of cadmium within several invertebrate species and relevant water quality variables that affect the metal's toxicity to further understand the role of cadmium in the Buffalo River.

Faculty Mentor: Jennifer Bouldin, Biological Sciences, jbouldin@AState.edu

Moore, Patrick – Graduate
patrickr.moore@smail.AState.edu

HOME RANGE AND HABITAT USE OF FORAGING GRAY BATS (*MYOTIS GRISESCENS*) FROM FIVE MATERNITY SITES IN NORTHERN ARKANSAS

The U.S. Fish and Wildlife Service *Gray Bat Recovery Plan* recommends further study on gray bat foraging habits and home range. Gray bats (*Myotis grisescens*), listed as endangered in 1976, have large home ranges, making ground-based tracking methods problematic. This study assessed gray bats' foraging habits using aerial telemetry. In 2014, two maternity sites (near Newark and Batesville, Ark.) were harp-trapped, and 50 adult lactating gray bats were radio-tracked from a Cessna 182 Sky-lane to gather 563 locations from June 15 to July 15. Fixed-kernel (FK) density with least square cross validation was used to determine home ranges (95 percent of locations) and core foraging areas (50 percent of locations) of 14 individuals, all of which had 15 independent locations. Minimum Convex Polygon (MCP) was also used for comparative purposes with past published studies. Mean 95 percent FK home range was 362.2 ± 24.9 km, 50 percent core foraging area was 83.2 ± 6.7 km², average MCP was 171.6 ± 8.8 km². Bats were often located over water. With such large home ranges, management strategies for gray bats should go beyond protecting roost sites to include waterways and riparian areas for travel and foraging on sensitive aquatic insect species.

Faculty Mentor: Virginie Rolland, Biological Sciences, vrolland@AState.edu

Co-Authors: Thomas Risch, Keith Morris



Phelps, Greg – Undergraduate
gregory.phelps@smail.AState.edu

DNA BARCODING TO IDENTIFY ARKANSAS NATIVE PLANTS WITH POTENTIAL ANTI-LEUKEMIA ACTIVITY

Our overall goal is to investigate Arkansas' native flora as a source of new therapeutic leads for the treatment of drug-resistant pediatric leukemia. More than 200 plant species were collected at the two Arkansas State University Environmental Field Stations (Bearitage in Cross County and Harp in Marion County) in spring 2014. Collected specimens were identified using morphology-based identification. Genomic DNA was isolated from leaves, and polymerase chain reaction was used to amplify fragments of the *rbcL* and *matK* genes, the universal DNA barcodes for land plants. Resulting consensus sequences are compared to GenBank using the BLAST algorithm for plant identification. Preliminary results show some morphologically identified species have exact matches for these barcode regions in the database, but the far-more-common result is species collected in Arkansas are not yet represented for these barcode sequences in GenBank. As a result, we will be adding new sequences to this globally available, genetic-data resource. Moreover, these sequences could unveil potential evolutionary relationships of the collected specimens through community phylogenetics. Four species have already shown promising biological activity when secondary chemicals were screened against drug-resistant leukemia cells. Further studies will include structure elucidation of the active natural products.

Faculty Mentor: Argelia Lorence, Chemistry and Physics, alorence@AState.edu

Co-Authors: Siddique Aboobucker, Jessica Yactayo-Chang, Fatima Rivas, Travis Marsico

Rashid, A.M. Feroze – Graduate
amferoze.rashid@smail.AState.edu

INVESTIGATION OF LOW TEMPERATURE CRACKING AND FATIGUE RESISTANCE OF ASPHALT CONCRETES WITH RECLAIMED ASPHALT PAVEMENT (RAP)

The use of reclaimed asphalt pavement (RAP) introduces sustainable construction in pavement technology. In 2010, the U.S. used about 60 million tons of RAP in asphalt concrete production, and this amount is growing over time. These RAP mixes are extremely susceptible to fatigue and low-temperature cracking. Extreme diurnal changes in temperature in the region might also affect asphalt pavement performances and cause premature pavement failures. This study is aimed to explore fatigue and low-temperature performances of mixed asphalt mixes with high RAP content. Different percentages of multiple RAPs around the region are being blended with virgin materials, and their performance properties are being evaluated in the laboratory. Additionally, the field performance of selected pavement sections is being evaluated for comparison purposes. The findings of this study are expected to be beneficial in using high RAP contents in preparing new asphalt mixes and, thereby, save taxpayers money in building longer-lasting roads and highways.

Faculty Mentor: Zahid Hossain, Civil Engineering, mhossain@AState.edu

Santos, Belina – Undergraduate
belina.santos@smail.AState.edu

NON-REGULAR, ROBUST PARAMETER DESIGNS AND APPLICATIONS TO ENGINEERING AND QUALITY IMPROVEMENT PROCESSES

Robust parameter design (RPD) is an engineering methodology for quality improvement and control of products and processes. RPD allows engineers to optimize the settings in a manufacturing process so the effects of uncontrollable variables, called noise variables, are minimized. Consider the example of a product developer who is improving the quality of a cake mix. Controllable factors during manufacturing, such as the flavoring and the amount of each ingredient, should be set at levels that bring the quality of the cake to target. However, there are also uncontrollable noise variables because of the consumer that affect the quality of the cake. These noise variables include the quality of home ingredients, oven temperature and cooking time. Fluctuations in these variables are expected, but they cannot be controlled by the manufacturer. RPD provides investigators with experimental plans to discover the settings of the controllable factors that will minimize the effects of these noise variables. Using these settings during the manufacturing process will make the quality of the cake robust to uncontrollable variability in oven temperature, cooking time, etc.

Faculty Mentor: Debra Ingram, Mathematics and Statistics, dingram@AState.edu

Sheppard, Cheyenne – Undergraduate
 cheyenne.sheppard@smail.AState.edu

THE KINETIC SUBSYSTEM OF LIGHT: A LAGRANGIAN APPROACH

Since the early 1900s, the enigma of photon momentum within media has left researchers puzzled. However, recent advancements have drawn conclusions, defining two mathematical exact-momentum models: the kinetic momentum and the canonical momentum. Within this framework, each momentum model can be used to describe the interactions of light and matter, allowing researchers to model and explain modern and growing applications and experiments. The recent applications include optical cloaking, micro-particle tractor-beams, optical stretching and binding of particles. Using the kinetic momentum model, researchers have multiple interpretations to choose from in describing the kinetic photon momentum, which leads to different concepts and ideologies. In light of this, we present a rigorous energy approach via the Lagrangian methods to describe the physics of light inside materials. In doing this, we render the results in terms of macroscopic electromagnetic quantities. This allows for the accurate modeling of the kinetics of light within materials, rendering the kinetic system of light.

Faculty Mentor: Brandon Kemp, Electrical Engineering, bkemp@AState.edu

Steckling, Benjamin – Graduate
 benjamin.steckling@smail.AState.edu

HYDROGEN BONDING IN INTERPOLYMER INTERACTIONS: CASE STUDY OF FIBROIN

The primary focus of this work is to investigate the hydrogen bonding interactions that occur in fibroin, an organic/biological polymer found in the *Bombyx mori* silkworm. In its natural form, the protein is considered to be silk and consists of layered beta sheets in anti-parallel arrangement. The frequent amino acid sequence made up of (Gly-Ser-Gly-Ala-Gly-Ala)_n is the primary structure of the protein. The interpolymer interactions will be calculated using density functional theory to obtain the computational values of tensile strength and stiffness. This value will be compared to bulk-phase properties. In order to obtain reasonable data, the polymer chain must be repeated in order to reduce the strain along the x-axis. The orientation maximizes the interpolymer hydrogen bonding interactions. Therefore, slight offsets must be introduced to the neighboring polymer chain in the y-direction. Finally, sheet-sheet interactions are introduced along the z-axis, which requires at least two sheets. Geometry of polymer is optimized to maximize the interpolymer interactions. Periodic boundary conditions (PBC) will be implemented in one dimension and the geometry optimized. Upon completion, the optimized polymer will be tested using PBC in the second and third dimensions. Several calculations are then repeated at increased/decreased interpolymer distances.

Faculty Mentor: Hideya Koizumi, Chemistry and Physics, hkoizumi@AState.edu

Straitt, Nadine – Graduate
 nadine.straitt@smail.AState.edu

IMPACT OF COVER CROPS ON MEASURED EDGE-OF-FIELD SEDIMENT AND NUTRIENT LOADING FROM PRODUCTION-SIZED COTTON FIELDS IN MISSISSIPPI AND CRAIGHEAD COUNTIES, ARK.

Two production-sized, edge-of-field cotton project sites located in the Lower Saint Francis and Little River Ditches watersheds were part of a focus area for the improvement of water quality and quantity, reducing sediment and nutrient loading. Utilizing a paired field arrangement, each location had one field using conventional farming practices while the other used cover crops. Each pair set had similar-sized fields, soil types, fertilizers and treatments. Water samples were taken year-round for both irrigation and precipitation events. During the winter months when the ground might be frozen, and, in combination with snow/ice melt, heavy precipitation events could cause more sediment loss, but was reduced on fields with cover crops. Precipitation events can affect nutrient loss when fertilizer application dates coincide closely to the precipitation event. The fields with cover crops had less nutrient loss on average than did the conventional fields.

Faculty Mentor: Michele Reba, USDA Agricultural Research Service, michele.reba@ars.usda.gov

Co-Authors: Seth Dabney, Tina Gray Teague, Jennifer Bouldin



AUSTIN LEWIS, GRADUATE AGRICULTURE STUDENT

"I'm hopeful the impact of my research will allow others to see the importance of water conservation and to evaluate their current water management practices."



Sullivan, Jennifer – Undergraduate
jenniferr.sullivan@smail.AState.edu

Mayfield, Jay – Undergraduate
jay.mayfield@smail.AState.edu

LOW-COST, 3D PRINTED ENTRY-LEVEL PHOTOSPECTROMETER

In this study, we present data obtained from a photospectrometer that was assembled using mostly 3D printed materials. Spectroscopy is a chemical tool used to examine a wide range of materials with far-reaching applications (e.g., medicine, electronics and agriculture). Light from a point source is routed through a system of custom off-axis parabolic reflectors in the Heath geometry. We use a diffraction grating to disperse the light into its component wavelengths. Through photometric detection, we achieve increased sensitivity by using the entire photodetector, as opposed to dispersive detection, which only uses a portion. The spectrometer was constructed using mostly 3D printed materials in order to lower production costs. Our intentions are to provide an accessible and inexpensive solution for professors and entry-level physics students to teach/learn about spectroscopy in a contemporary fashion.

Faculty Mentor: Ross Carroll, Chemistry and Physics, bcarroll@AState.edu

Tovar, Jose – Graduate
jose.tovar@smail.AState.edu

BASIS FOR ENGINEERING THE THERMALLY TOLERANT PECTIN METHYLESTERASE (TT-PME) IN SUGAR BEETS FOR AN IMPROVED PROCESSING TRAIT

We are developing a novel application for a thermally tolerant pectin methylesterase (TT-PME) to improve energy efficiency in sugar beet processing. The United States annually produces millions of tons of sugar beet pulp, the plant residue after sucrose diffusion from beet roots. Sucrose diffusion occurs in 70 C water, which denatures most enzymes but is optimal for TT-PME activity. Drying pulp is necessary for storage and transport, but costly, consuming 30 percent of a processing plant's energy. Beet pulp's hydrophilicity is a result of its high content of pectin, a cell wall polysaccharide that entraps water. We hypothesize TT-PME can modify beet pulp pectin to reduce water binding, by promoting calcium-mediated pectin crosslinking. We developed a novel assay to quantify water binding in pulp after treatment with PME and calcium. We found PME action in the presence of calcium reduced water binding in beet pulp by 27 percent, three-fold the effect of calcium alone. This drives our goal to develop transgenic beets expressing TT-PME for an improved output trait. For this, we developed monospecific antibodies to detect recombinant TT-PME in transgenic plants. Now, we are assessing the role of TT-PME's pro-peptide in expressing active recombinant enzyme, using the well-established *Nicotiana benthamiana* transient expression system.

Faculty Mentor: Brett Savary, Agriculture and Technology, bsavary@AState.edu

Co-Authors: Megan Cease, Jianfeng Xu

Tripod, Nathan – Undergraduate
nathan.tripod@smail.AState.edu

HIGH THROUGHOUT PHENOTYPING OF RICE LINES TO DETERMINE SALINITY TOLERANCE

Rice is one of the most-significant crops for global food security. A significant portion of rice is grown in coastal areas that are prone to floating. In order to keep meeting rice demand, there is a need to develop new rice varieties that can thrive under saline conditions. This work is a collaborative effort between the Walia Laboratory at the University of Nebraska Lincoln and the Lorence Group at Arkansas State University. The Walia team has been studying the salt tolerance of a rice diversity panel at two developmental stages that are particularly susceptible to this stress in greenhouse experiments. Based on their results, a selected group of rice lines including salt-tolerant and salt-sensitive types, as well as positive and negative controls, was sent to the Lorence team to study their response to salt stress at the early vegetative growth stage using a Scanalyzer HTS. We have used the visible and fluorescence cameras of this powerful high throughput phenotyping system to quantify the tolerance to salt of more than 70 rice accessions grown in hydroponic conditions. In this work we will present our progress on the identification and characterization of salt-tolerant rice lines.

Faculty Mentor: Argelia Lorence, Chemistry and Physics, alorence@AState.edu

Judith Lima, Zana Robinson, Patrick Dietz, Malachi Campbell, Harkamal Walia

Tyler, Hannah – Undergraduate
hannah.tyler@smail.AState.edu

Land, Megan – Undergraduate
megan.land@smail.AState.edu

ARKANSAS CLIMATE: WITH OR WITHOUT UNIFORM?

Arkansas' climate is usually perceived as sporadic, or without pattern, because of its ever-changing temperature and precipitation. However, analyzing the National Oceanic and Atmospheric Administration monthly climatic data graphically for Arkansas' nine divisions, a pattern can be seen regarding each dataset analyzed. The datasets of interest include monthly precipitation, minimum and maximum monthly temperatures, and the monthly Palmer Drought Severity Index (PDSI). Separate datasets are analyzed for each of the nine climatic divisions, dated back to January 1895. When analyzing the data on a statewide scale, the nine divisions demonstrated graphical similarities. However, when the divisions were examined separately, on a localized scale, climatic diversity increased because of spatial variations, such as altitude, terrain, humidity and pressure. Another resource that will be used in this study is the Community Collaborative Rain, Hail and Snow Network. The existing precipitation measurements, logged by network volunteers, will be analyzed to provide a more-precise reasoning for the diversity between statewide and localized climate within Arkansas.

Faculty Mentor: Yeonsang Hwang, Civil Engineering, yhwang@AState.edu

Co-Author: Leah Walker

Vogt, Sarah – Graduate
sarah.vogt@smail.AState.edu

DETERMINING EFFECTIVENESS OF CONSERVATION PRACTICES BASED UPON WATER QUALITY PARAMETERS AND THE BMP TOOL IN THE OUTLET LARKIN CREEK WATERSHED

Conservation practices were used by managers in an effort to control nonpoint source pollution. Time, effort and money have gone into the planning and implementation of conservation practices. The question remains as to whether conservation practices result in improved water quality. In an effort to answer this question, a field study of Outlet Larkin Creek Watershed was used to determine the effectiveness of agricultural conservation practices to water quality, and to compare the percent reduction by the BMP tool (Merriman et al. 2009). The watershed was located in northeastern Arkansas as a sub-watershed to the L'Angeuille River Watershed. Weekly water samples were taken for water quality analysis prior to (2010) and after (2012-2014) conservation practices were implemented. Analysis was conducted on water quality parameters: turbidity, total suspended solids (TSS), orthophosphate, nitrate and *E. coli* coliforms for various time periods. Prior and post implementation, for example, at the Middle Site revealed decreases in TSS. The BMP tool revealed similarities between the calculated (76 percent TSS at the Middle Site) and reported (77 percent TSS for a sedimentation pond). Therefore, the results of this study show improvements to water quality over time. However, a longer-term study is needed at this watershed to determine conservation practice effectiveness.

Faculty Mentor: Jennifer Bouldin, Biological Sciences, jbouldin@AState.edu

Co-Author: Tracy Woodruff

Welicky, Rachel – Graduate
rachel.welicky@smail.AState.edu

DECREASED MOVEMENT RELATED TO PARASITE INFECTION IN A DIEL- MIGRATORY CORAL REEF FISH

Risk of infection by parasites may be an important contributing cause or consequence of animal movement patterns. The movement patterns of French grunt, a common Caribbean coral reef fish, are well documented and known to connect reef and seagrass systems. In the northeastern Caribbean, French grunt are known to be infected by *Anilocra haemuli*, one of the largest and most conspicuous ectoparasitic isopods. Studies on *Anilocra* infection have demonstrated infection reduces host swimming performance and condition. We hypothesized *A. haemuli* infection influences French grunt movement patterns and tested whether short-distance daytime movements and/or reef-seagrass migration was associated with infection by conducting focal observations on infected and uninfected fish's daytime movement and dusk migration activity in St. John, USVI. We also conducted daytime and nocturnal reef surveys on prevalence of infection. We found infected fish move significantly less than uninfected conspecifics during the day, and observed 100 percent of uninfected and 37.5 percent of infected fish depart the reef during dusk. Prevalence of infection was significantly greater at night compared to daytime. Given we found effects during day and night, we suggest *A. haemuli* infection alters host movement patterns and parasitism may indirectly influence trophic connectivity between reef and sea grass ecosystems.

Faculty Mentor: Paul Sikkell, Biological Sciences, psikkell@AState.edu



Zhang, Ningning – Graduate
ningning.zhang@smail.AState.edu

EXPRESSION OF THERMOSTABLE ENDO-ARABINASE FOR GENERATING FUNCTIONAL OLIGOSACCHARIDES FROM PLANT CELL WALL FOR COLON-SPECIFIC HEALTH BENEFITS

Lignin-deficient plant fibers, e.g., sugar beet pulp and rice bran, are rich sources of functional cell wall polysaccharides. Used primarily as low-value animal feed, these established feedstocks can be capitalized on for generation of value-added bioproducts. We aim to develop an efficient enzymatic platform for generating functional oligosaccharides, specifically feruloylated arabino-oligosaccharides (FAOs), from these plant fibers. FAOs may promote healthful colon functioning through prebiotic, anti-inflammatory and mucosal immuno-modulatory activities. FAOs of defined structure can be released from plant fibers through selectively cleaving the arabinan chain of cell wall polysaccharides by a key glycohydrolase - *arabinase* (ABN). In this study, a thermostable endo-1,5- α -L-ABN from *Bacillus thermodenitrificans* was expressed in yeast (*Pichia pastoris*) in order to produce enzyme in quantities sufficient for testing its activity of releasing FAOs from plant fibers. Recombinant enzyme was secreted into culture media at a yield of approximately 70 mg/L and showed a specific enzymatic activity of 350 units/mg. The highest enzyme activity was detected at 77 C and pH 7. Colonic T84 epithelial cell culture was established to assay the anti-inflammatory activities of FAOs. Preliminary study indicated FAOs isolated from rice bran significantly enhanced the expression of occludin, a biomarker of colonic epithelial cells' immune response.

Faculty Mentor: Jianfeng Xu, Agriculture and Technology, jxu@AState.edu

Co-Author: Brett Savary

Humanities, Social Sciences and Other Analytical Studies

al-Momani, Hazim – Graduate
hazim.almomani@smail.AState.edu

DEALING WITH DAESH (ISIL), AL-QAEDA'S STRATEGY IN THE MIDDLE EAST AND A NEW GLOBAL SECURITY THREAT

This study aims to estimate the sociopolitical impact of the current Syrian crisis on global peace. The study analyzes the future implications of this domestic conflict, which is likely to impair regional stability. A questionnaire was administered to approximately 1,500 students of Yarmouk University in Jordan in 2013. The survey assessed public sympathy toward the militant groups that enroll in the Syrian Civil War against Al Assad's army. Results are pending data analysis. This paper will consider the role of the global Islamist militant groups in compromising the security of the entire region. Since the beginning of the Syrian Civil War on March 15, 2011, one of the main arguments held by the international community for not launching an U.N. humanitarian intervention was the consideration of its mere domestic nature. Although it sounds like a matter of Syrian domestic policy, no one can deny the international peace and security threats caused by this conflict, as well as its humanitarian consequences and human rights violations on the Syrian civilians.

Faculty Mentor: David Harding, Public Administration, drharding@AState.edu

Basinger, Gunner – Undergraduate
gunner.basinger@smail.AState.edu

THE OUTER LIMITS OF INSTRUMENTAL TECHNIQUE

The study of composition calls for constant research in the areas of performance practice and instrumental mechanics. An especially exciting branch of research involves charting the possibilities for instrumental technique beyond conventional usage, discovering new and unusual sounds by exploring the outer limits of what an instrument can do. I will present a performance of an original piece, entitled *Whispers from a Dying Sea*, for clarinet and vibraphone that features non-traditional techniques, namely vibraphone bowing and clarinet multiphonics. Clarinet multiphonics are an extended technique in which several notes are produced at once to create a chord. A vibraphone bar may be played with a bow instead of a mallet, allowing the bar to produce a different tone as the tone sustains. My piece focuses on the unique sounds produced by these techniques, demonstrating the ways in which creative research is a necessary component in bringing an innovative idea to life. Following the performance, I will answer questions regarding the techniques and their use in my music.

Faculty Mentor: Daniel Tacke, Music, dtacke@AState.edu

Best, Jonathan – Graduate

jonathan.best@smail.AState.edu

Hooper, Thomas – Graduate

thomas.hooper@smail.AState.edu

Burr, Payton – Graduate

payton.burr@smail.AState.edu

STADIUM FINANCING: DO TAXPAYERS BENEFIT FROM THE PRESENCE OF A PROFESSIONAL STADIUM?

In the 1950s, most professional teams played their games in privately owned facilities. During this time, team owners did not seek much interaction from the public in business matters. From 1991 to 2009, there was a 13 percent increase in the number of stadiums used by professional teams that were publicly owned. This funding often originates from broad-based or special local taxes. Some of the proposed benefits of having a professional stadium include economic growth, job creation, revitalization of business districts and a change in land-use patterns. However, according to Santo (2007), evidence shows professional stadiums have no significant impact on area income or employment, and economic indicators cannot justify public investment in professional facilities. The purpose of this study is to provide a cost/benefit analysis for taxpayers financing sport stadiums. For this study, an economic impact analysis of the AT&T Stadium will be conducted. This study is important because it will aid sport administrators in maximizing benefits and reducing costs for taxpayers.

Faculty Mentor: Joyce Olushola, Sports Management, jolushola@AState.edu

Buechler, Jacob – Graduate

jonathan.best@smail.AState.edu

Travis, Dylan – Graduate

dylan.travis@smail.AState.edu

Williamson, Rachel – Undergraduate

rachel.williamson@smail.AState.edu

DEEP INTO THAT DARKNESS PEERING: A CREATIVE APPROACH TO GENRE THEORY

The cultural and linguistic meaning of the word “darkness” is multi-faceted. One interpretation is the absence of light; another is to denote something that is evil or wicked. This presentation will begin to dissect, through creative mediums, how the force or lack of force of darkness can inspire creative expression. In order to demonstrate this, we will offer the audience three different styles of writing all centered on the issues of darkness. Dylan Travis, a graduate student seeking his M.A. in English, will be our presenter on darkness in the fictional arts. Next, Rachel Williamson, an undergraduate student in the English Department, will bring to light issues of darkness from the realm of non-fiction. Lastly, Jacob Von Buechler, another M.A. student in English, will use the methods and meters of poetry to extract his meaning of the expression. Overall, these three presenters will have different routes of creativity in extracting their own values and consequences of darkness. Even with such unique takes on semantics of the term, this presentation will allude to the overall cultural expectations on what is dark and where does the darkness we feel in our lives give birth and thrive.

Faculty Mentor: Kristi Costello, English and Philosophy, kcostello@AState.edu

Evans, Candace – Graduate

candace.evans@smail.AState.edu

AFRICAN AMERICANS' PORTRAYAL ON PRIMETIME SITCOMS OVER TIME

The purpose of this study is to examine and present how African-Americans were portrayed in three sitcoms: *Good Times*, which began in 1974, *The Cosby Show* in 1984 and *Moesha* in 1996. The *Good Times* sitcom was the first attempt to represent a black family with a father present (Bodroghkozy 2003). *The Cosby Show* was the first to present a picture of a stable, upper-class African-American family (Havens 1999). *Moesha* was a sitcom that put family values first (Jet 1996). All held value for representing African-Americans on television in a positive aspect. This study developed from an interest in the perception of African-Americans on television.

Faculty Mentor: Brenda Randle, Communication Studies, brandle@AState.edu

Hasnat, Dithi – Graduate

dithi.hasnat@smail.AState.edu

BOLLYWOOD FILM: AFFECTING THE BANGLADESHI WEDDING RITUALS

In South Asia, the nations of India, Bangladesh and Pakistan have historically had very different religions and wedding fashions and rituals. However the influence of Bollywood may be influencing these rituals throughout the South Asia region. This research explores how Bollywood films (originating from modern Indian movie culture) is influencing the cultures of South Asia, specifically Bangladeshi upper-class wedding fashion and rituals. Using qualitative content analysis this study examines Bollywood film wedding sequences. I compared these sequences to actual Bangladeshi wedding videos available on YouTube. A notable finding was in the predominantly Muslim culture of Bangladesh, weddings historically did not include vibrant songs and dance. However, the modern Bangladeshi weddings selected for this study incorporated not only the fashions of Bollywood films, but also vibrant singing and dancing, even in many cases repeating songs from Bollywood films. The study found traditional Bangladeshi wedding rituals and fashions of the bride and groom demonstrate evidence of being influenced by Bollywood films.

Faculty Mentor: Lillie Fears, Communication Studies, lfears@AState.edu



Lott, Austin – Undergraduate
austin.lott@smail.AState.edu

Barker, Jody – Undergraduate
jody.barker@smail.AState.edu

Stanage, Blake – Undergraduate
stanage.blake@smail.AState.edu

Woolard, Ethan – Undergraduate
ethan.woolard@smail.AState.edu

THE IMMORTAL GAME

This short film presents the analogy of life as a chess game consisting of our strategies, actions and reactions. The two narrators debate philosophical approaches to life's choices. A sub-plot illustrates the narrators' debate, utilizing point-of-view shots and visual devices.

Presented in collaboration with the Student Section of the 2015 Delta Flix Film and Medial Festival

Nelson, Nathan – Undergraduate
nathanie.nelson@smail.AState.edu

Lindley, Jacob – Undergraduate
jacob.lindley@smail.AState.edu

ARKANSAS STATE WOMEN'S BASKETBALL: HOW TO INCREASE ATTENDANCE AND SUPPORT?

This study examines attendance at women's basketball games, or lack thereof. Unfortunately, attendance at women's basketball games is often much less than at men's games, even when the women's team wins more games than the men's team. The purpose of our study is to quantify this marked difference, discover factors that contribute to the difference and suggest strategies to improve attendance. Data collected by the Arkansas State University athletics and marketing departments will be analyzed using both quantitative and qualitative methods. A brief questionnaire will be administered to fans at basketball games to examine why they watch a particular team (women's versus men's). We hope to identify differences and recommend strategies for the university that will improve attendance at women's basketball games.

Faculty Mentor: Joyce Olushola, Sports Management, jolushola@AState.edu

Pierce, Evan – Undergraduate
evan.pierce@smail.AState.edu

THE RUN THROUGH

The Run Through is a film that was submitted and won an award for Best Editing in the 2014 Little Rock 48-Hour Film Competition. It was written, filmed and edited within 48 hours. The writers were also required to include three things: 1) character of a fortune teller named Zoltar Nickelson, 2) line that included "It's fantastic, I love it," and 3) a journal as a prop. It is a film about a man who goes to a fortune teller named Zoltar Nickelson to get some advice about proposing. Zoltar takes him into the future, so he can run through his proposal. The man tries many different things to impress the girl. When none of them work, he finally learns his lesson.

Presented in collaboration with the Student Section of the 2015 Delta Flix Film and Medial Festival

Russell, Danny – Undergraduate
danny.russell@smail.AState.edu

PLANTING THE FUTURE: RICE'S BEGINNINGS IN WESTERN POINSETT COUNTY

The importance of rice to the economy of Arkansas cannot be overstated. The state's prime agricultural export brings in \$6 billion annually. Poinsett County is home to more than a quarter of Arkansas' rice production land. Poinsett County is also where enterprising men took a chance on an unproven grain and changed the landscape of the state's economy. This paper will focus on the small community of Weiner and its importance in the growth of the rice industry in Northeast Arkansas. Furthermore, it will examine the lives of those responsible for the early success of the crop and the tenacity they showed in propagating its virtues as a new venture in Arkansas agriculture. By examining the birth of the state's rice industry, historians can better understand the economic, social and environmental conditions that led to the establishment of Arkansas' main export. This paper will offer support that these factors were integral to the success of rice and how they continue to shape its future.

Faculty Mentor: Erik Gilbert, History, egilbert@AState.edu

Smith, Andrew – Undergraduate
andrew.smith2@smail.AState.edu

PATRIARCHY, RELIGION, OPPRESSION AND DEVOTION IN CHIMIMANDA NGOZI ADICHIE'S *PURPLE HIBISCUS*

This essay explores the relationship between patriarchy, religion, oppression and devotion in Chimimanda Ngozi Adichie's novel, *Purple Hibiscus*. I argue the patriarchal characters and institutions present in this work use religion, particularly colonial Catholicism, as a tool to maintain control over the lives and voices of the devoted. The patriarchal forces also use their power to oppress those who are not members of the Catholic community, notably those who choose to remain traditionally Igbo. I also argue some of the devoted use religion, strong femininity and an appreciation for their native practices in order to relieve their lives of this oppression. Only with these additions to the lives of the Nigerians can the patriarchal oppression be combated.

Faculty Mentor: Erik Gilbert, History, egilbert@AState.edu

Psychology and Health

Gibson, Molly – Graduate
molly.gibson@smail.AState.edu

Skinner, Alyssa – Undergraduate
alyssa.skinner@smail.AState.edu

Faisst, Erin – Undergraduate
erin.faisst@smail.AState.edu

THE IMPACT OF CREDIT CARD CUES ON WILLINGNESS TO SPEND IN UNDERGRADUATES

This study will investigate the effects of credit card cues on the amount of money undergraduate students are willing to spend on a list of consumer products. Participants will be provided with a list of generic consumer products and asked to indicate a price they would be willing to spend for each product. In one condition a credit card cue will be present, while in the other condition the credit card cue will be absent. This research examines whether credit card cues will affect willingness to spend in undergraduate students. We predict the presence of credit card cues will increase willingness to spend by undergraduates.

Faculty Mentor: Kristin Biondolillo, Psychology and Counseling, kdbiondo@AState.edu

Green, Corey – Undergraduate
corey.green@smail.AState.edu

IMPACT OF PERSONALLY RELEVANT INFORMATION AND GENDER ON STUDENTS' INTEREST IN SCIENCE

Many studies have focused on increasing interest in science education. Among those, researchers found differences in interest in science domains. For example, biology is consistently rated to be more interesting than other science domains, which could be because of its personal relevance. We hypothesize interest levels in other science domains may increase if they were also presented in personally relevant ways. Female students, in particular, may be especially drawn to science fields that are personally relevant, thus explaining the large number of female biology students and their lack of representation in other STEM fields. A survey was administered to Arkansas State University students in which students were asked to rate different science domains based on their interest level, including subjects like chemistry, physics and biology. Definition type varied according to an applied, personally relevant manner or a more standard, text-book version. Results are pending data analysis, but it is expected students will rate domains that are described using the personally relevant definitions as being more interesting than standard definitions. We will evaluate the relationship of gender with the study variables.

Faculty Mentor: Karen Yanowitz, Psychology and Counseling, kyanowit@AState.edu



CHRISTOPHER ELMS, UNDERGRADUATE BIOLOGY STUDENT

"My research has opened my horizons to what is possible with science, and has also helped to bring all my course work into perspective."



Heern, Johnna – Undergraduate
johnna.heern@smail.AState.edu

PERCEPTIONS OF NORTHEAST ARKANSAS HOSPICE NURSES ON THEIR EMOTIONAL WELL-BEING AND COPING INTERVENTIONS WHILE WORKING WITH DEATH AND DYING

Research shows there are clear emotional consequences for nurses who regularly attend to death and dying. The intense needs of the dying patient and family place the attending hospice nurse at a higher risk for negative emotional consequences, such as professional compassion fatigue. The purpose of this study is to determine if hospice nurses in Northeast Arkansas believe their emotional well-being is impacted by working with death and dying, and if they perceive a need for coping interventions while dealing with death and dying. A descriptive study was performed using a questionnaire sent to 84 hospice nurses in Northeast Arkansas. Forty-one nurses completed the questionnaire (49 percent response rate). The data were collected over a five-week period in December 2014 and January 2015. Data analysis was conducted using both quantitative and qualitative methods. Symptoms of compassion fatigue, such as depression and insomnia, are prevalent among hospice workers. Personal relaxation and meditation are examples of coping methods utilized. Results from this study support previous research regarding the prevalence of compassion fatigue. The emotional well-being of hospice nurses continues to be affected and warrants further research.

Faculty Mentor: Annette Stacy, Nursing, astacy@AState.edu

Sencion, Michelle Cebada – Undergraduate
michelle.cebadae@smail.AState.edu

Clay, Brandon – Undergraduate
brandon.clay@smail.AState.edu

MOTIVATIONAL INTERVIEWING WITH MIDDLE SCHOOL STUDENTS: A QUASI-EXPERIMENTAL STUDY TESTING THE EFFECTS OF FIDELITY AND INTERVIEWER TYPE ON GRADE OUTCOMES

Motivational interviewing (MI) is a client-centered intervention strategy developed to intrinsically motivate adults to change problematic behavior (Miller and Rollnick, 2002, 2012). In 2012, Strait et al. demonstrated doctoral students were effective at implementing MI to improve academic behavior and performance of middle school students. Based on these results, this study examines whether undergraduates can implement MI with fidelity and achieve similar effects on grade outcomes. At Create @ State 2014, Lee and Cebada reported MI sessions were significantly shorter when conducted by undergraduate students in comparison to graduate students. However, at that time, no outcome data had been collected on the effects of the interviewer on grade outcomes. The proposed presentation will discuss results of a quasi-experimental study that tested the effects of interviewer type (i.e., undergraduate or graduate) on grade outcomes and the causal effects of MI fidelity.

Faculty Mentor: Gill Strait, Psychology and Counseling, gstrait@AState.edu

Swenson, Alex – Undergraduate
alexande.swenson@smail.AState.edu

THE FACTORS OF CRIME CONTROL VS. DUE PROCESS ORIENTATION

Within the criminal justice system, two competing goals exist, crime control versus due process orientation (CCDPO). Crime control focuses on capturing and punishing criminals at the cost of individual civil rights, while due process focuses on protecting the rights of the individual. Jurors' previous world views and individual opinions toward crime control and due process can substantially influence the verdict of the trial. The goal of the current research was to create a scale designed to examine individual jury member's CCDPO. To accomplish this, participants were presented with 30 questions related to three previously discovered factors of CCDPO. After a factor analysis, two factors for CCDPO were discovered with nine items and a procedural due-process scale of six items was added to form the final survey. This scale will be utilized to examine the effects of CCDPO on various aspects of jury decision making.

Faculty Mentor: Christopher Peters, Psychology and Counseling, cpeters@AState.edu

Co-Author: Tabitha O'Neal

Thomas, Meagan – Undergraduate
meagan.thomas@smail.AState.edu

ENTRAPMENT AND INTELLECTUAL DISABILITY

This study examined the potential impact on jurors of the possibility of entrapment during online sex sting operations when the defendant has an intellectual disability. It was predicted when the defendant had an intellectual disability and was pressured by an undercover agent, jurors would be less-likely to find them guilty. Participants were each presented with different scenarios in which the level of intelligence (normal, border-line intellectual disability and intellectual disability) and the person who initiated the solicitation (the agent or the defendant) varied. The data indicated the biggest predictor of verdicts was the person who initiated the solicitation; however, this effect was not moderated by the intellectual disability of the defendant. It was mediated by causal attribution. The lack of effect of the intellectual disability variable may also be caused by a lack of realization by jurors that intellectual disability is actually the same as mental retardation, and equating it instead with a learning disability. Future research should examine this possibility.

Faculty Mentor: Christopher Peters, Psychology and Counseling, cpeters@AState.edu

Thrasher, Morgan Caples – Graduate
morgan.caples@smail.AState.edu

THE USE OF SPEECH-IN-NOISE TESTING AS A MEASURE OF HEARING AID BENEFIT

This study investigated the feasibility of quantifying hearing aid benefit by means of speech-in-noise testing. Speech-in-noise testing provided the amount of signal-to-noise ratio loss an individual exhibited and was obtained by administration of the commercially available Quick Speech-In-Noise (QuickSIN) Test. Twenty-two adult participants with bilateral sensorineural hearing losses were selected from the files of a local dispensing audiologist. Each participant was an experienced hearing aid user and wore bilateral hearing aids at the time of their participation. QuickSIN scores were obtained in both an aided and unaided condition, with the difference score taken as an indication of hearing aid benefit. The research hypothesis was that participants' ability to recognize words will improve with the addition of the hearing aid. In the event the hypothesis is supported, the finding will further support the idea of behavioral quantification of hearing aid benefit.

Faculty Mentor: Mike McDaniel, Communication Disorders, dmcdan@AState.edu

Vaughn, Caraline – Undergraduate
caraline.vaughn@smail.AState.edu

Smith, Kiara – Undergraduate
kiara.smith@smail.AState.edu

MOTIVATIONAL INTERVIEWING TO ASSESS ACADEMIC ACHIEVEMENT

This research project studies the effects of motivational interviewing on middle school, junior high and high school students. Motivational interviewing (MI) is an intervention that stimulates and strengthens motivation for change within adolescents. In 2014, we replicated Strait's study at Nettleton Middle School and Junior High School in Jonesboro, Ark. This included participants from sixth, seventh and eighth grades. We wanted to test whether undergraduates and paraprofessionals could implement MI with fidelity and effectiveness. All interviewers, undergraduate students, were trained on MI. They each were assigned two to four students to interview. Each student had one 40-minute MI session. Each session included an introduction, self-assessment, and support and feedback. Results showed the treatment and control groups did not show any significant differences in academic grades. The average length of each MI session was significantly shorter than the lengths of MI sessions in the original study, which had a significant effect; therefore, we are currently replicating the study, which will include three sessions instead of one.

Faculty Mentor: Gill Strait, Psychology and Counseling, gstrait@AState.edu

FREE Profile Pic FREE Lunch FREE Job

(not really... but learn how to get linked in!)

"LinkedIn Guru" **Wayne Breitbarth** has trained more than 40,000 business people on how to effectively use the professional networking site. Wayne authored **The Power Formula for LinkedIn Success** and has been featured in Forbes, Inc., Wired, and American Express Open Forum, and seen on NBC and Fox Business.

Noon – 2 P.M. | April 7, 2015
Reng Student Union Auditorium

CREATE @ **STATE**

A Symposium of Research, Scholarship & Creativity

Luncheon & Keynote Speaker

**Also receive a free professional
headshot for your LinkedIn profile!**

WAYNE BREITBARTH, KEYNOTE SPEAKER





The advisory committee extends special appreciation to Arkansas State University's Chapter of The Honor Society of Phi Kappa Phi for their financial support of Create @ State. Phi Kappa Phi is the nation's oldest, largest and most-selective honor society for all academic disciplines. This year, Phi Kappa Phi donated \$500 to support the **Linked in** photo booth. For more information about Phi Kappa Phi, please visit PhiKappaPhi.org.



A Symposium of Research, Scholarship & Creativity

create

