



April 6-7  
**2016**

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**C**REATE @ **STATE**

A Symposium of Research, Scholarship & Creativity

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Welcome to the sixth 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 Sustich, P.h.D.

Vice Provost for Research and Graduate Studies



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**April 6  
2016**

**Schedule**

**8 – 9 A.M.**

Poster Set Up, Centennial Hall

**9 – 11 A.M.**

Session A: Oral Presentations, Various Locations  
Posters on Display, Centennial Hall

**11 A.M. – 3 P.M.**

LinkedIn Photo Booth Open, Alumni Lounge

**11:45 – 1 P.M.**

Poster Presentations (Public is Welcome), Centennial Hall

**2:30 – 4:30 P.M.**

Session B: Oral Presentations, Various Locations

**9 – 11 A.M.**

Session C: Oral Presentations, Various Locations  
Posters on Display, Centennial Hall

**NOON – 1 P.M.**

Awards Ceremony, Centennial Hall

**April 7  
2016**



**Map (Third Floor, Student Union)**



- Room Used
- Room Not Used

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

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## Oral Presentation Schedule

### April 6th, Session A, 9 – 11 A.M.

#### SPRING RIVER A/S ROOM

##### Understanding Biochemical Systems

- Bioproduction and Anti-Inflammatory Activity of Delta-Tocotrienol Enriched Extracts from Hairy Roots of Annatto  
*Jarrod Creameans*
- Expression of a Thermostable Endo-Arabinase in Yeast for Recovery of Functional Oligosaccharides from Cell Wall Polysaccharides  
*Christopher Elms*
- Impacts of a Mammalian RNA Stabilization System on Gene Expression in Plants  
*Jacob Steele*
- Out with the Old, In with the New: Lessons Learned from Analysis of Culture Records of Ceriodaphnia Dubia  
*Briuna Clark*
- Sensitive Electrochemical Sensor to Detect Fluoxetine, Sertraline and Citalopram in Environmental Samples  
*Hayden Cornwell*
- Size Matters: Using Particle Size Analysis to Predict Sediment-Bound Lead (Pb) Concentrations in the Cache River Watershed  
*Shelby Chappell*
- Synthesis of Novel Antibiotics with Dihydropyrimidinone and Phenethylamine Scaffolds  
*Santiago Gonzalez*
- The Methods of Transportation and the Regulation of Interleukin-22 Provides a Potential Therapeutic Target for Inflammatory Bowel Disease  
*Morgan Tripod*

#### CACHE RIVER ROOM

##### Perspectives on the Past and Present

- A Sense of Hope in Poverty  
*Kayla Macomber*
- Clover Bend Interpretive Plan: Making History Usable in a Local Community  
*Amy Ulmer*
- Culture Within the Community  
*Emily Holder*
- Going North: The Burkhammer Family of Greene County, Ark., and Davis, Mich.  
*Ryan Smith*
- Proto-Anarchism in Early America, 1776-1800  
*Zachary Deibel*

#### SAINT FRANCIS RIVER ROOM

##### Cracking the Code

- Comparison of Processed Images Captured by Different Cameras  
*Chin Nee Vong*
- Fourth-Order Hyperbolic Partial Differential Equations Describing the Transverse Motion of Buckling Beams  
*Madison Rowe*
- Mathematical and Numerical Approaches to Cracked, Damageable Euler-Bernoulli Beams  
*Jay Mayfield*
- Multivariate Analysis of Health Insurance Data  
*Macaoe Davis*
- Solving  $f(f(x)) = \exp(x)$  is a sinh  
*Samuel Cowgill*
- Generalized Holm's Procedure for Multiple Hypothesis Testing Problems  
*Christian Helms*

### April 6th, Session B, 2:30 – 4:30 P.M.

#### SPRING RIVER A/S ROOM

##### Row Crops and Water Management

- Artificial Recharge of the Mississippi River Valley Alluvial Aquifer: A Water Quality Study  
*Klarissa Kahill*
- Development of a Wireless Sensor Network for Monitoring and Managing Water Depth in Production Rice Fields  
*Yin Lin Chiu*
- Seeding-Rate Decisions and Impacts on Spatial Yield Variability in Northeast Arkansas Cotton  
*Nelson Benson, Amanda Mann*
- Soybean-Yield Variation Associated with Heterogeneous Soils and Irrigation Timing  
*Amanda Mann*
- Water Hardness and Lead Contamination in the Cache River: How Much is Too Much?  
*Mary Kilmer*

#### CACHE RIVER ROOM

##### Elephants, Fish, Birds and Bugs

- Exploring Symbiotic Relationships Between Feather Mites and Warblers  
*Alix Matthews*
- Factors Influencing Elephant Rampage on the Human Settlements in Nepal  
*Dinesh Neupane*
- Lesser Grain Borer (*Rhyzopertha Dominica*) Development on Two Rough-Rice Cultivars  
*Rachel Hampton*
- Nest Site Selection and Nest Survival of Prothonotary Warblers in East-Central Arkansas  
*Morgan Slevin*
- The Role of Habitat and Community Association in the Spatial Distribution of a Temporary Coral-Reef Fish Parasite  
*John Artim*

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## ST. FRANCIS RIVER ROOM

### Crime and Punishment

- Crime Control Versus Due-Process Orientation as the Motivating Factor Behind Jurors' Regard of Inadmissible Evidence  
*Tabitha O'Neal, Stevie Harmon*
- Entrapment and Intellectual Disability Versus Mental Retardation  
*Cathryn Hall, Kate Cain*
- Hate Crimes in the Classroom  
*Erica Bearden*
- How Many Witnesses Are Sufficient?  
*Meagan Thomas*
- Perceptions on Cyber Stalking Versus In-Person Stalking  
*Madison Brooks, Brittney Grantham, Jennifer Hacker*

## April 7th, Session C, 9 – 11 A.M.

## SPRING RIVER A/S ROOM

### The Influence of Perception

- Social-Media Impact on Saudi Students' Political Knowledge  
*Manasar Alharethi*
- Society's Biggest Taboo: The Effects of Media on Individual Perception of Same-Sex Parents  
*Michita Merriweather, Derika Harris*
- Student Perception of the Benefits of Academic Education Partnered with Technical Training at Homeland Security's Center for Domestic Preparedness  
*Emily Peters*
- Digital Inequality Leads University Graduates Toward Professional Disparity: A Study on Bangladesh Perspective  
*Khairul Islam*
- Divorce and Dating: The Effects on Adult Children  
*Monique Bailey, Michita Merriweather*

## CACHE RIVER ROOM

### Small Particles and Sustainability

- Feasibilities of Harvesting Rainwater in Jonesboro  
*Istiaque Mahmud*
- Examining Drought Using Statistical Analysis of Precipitation and Oceanographic Indices in R and Minitab  
*Anusha Inaganti*
- Achievement of Sustainability Through Greening of Concrete  
*Md. Shahriar Alam*
- Manipulation of Small Particles on the Surface of a Material  
*Nayan Kumar Paul*
- Pulsed Light Aided Nano-Islands Formation and Optical Applications  
*Aktaruzzaman Al-Hossain*

## Poster Presentations, Assigned Poster Numbers

### April 6th, Poster Presentations, 11:45 A.M. – 1 P.M.

#### CENTENNIAL HALL

- 1 Identifying Salt Tolerant Accessions within a Rice Diversity Panel Using Phenomic Approaches  
*Kendl Fischer*
- 2 Effect of Water Stress in the Foliar Ascorbate Content of Selected Rice Cultivars  
*Molly Tibbs*
- 3 Optimization of Drought-Stress, High-Throughput Phenotyping Assays in Arabidopsis  
*Lucia Acosta-Gamboa*
- 4 Contaminant Reduction Ability of Iron Oxides towards 4-Nonylphenol  
*Kristiana Watson*
- 5 Transparent DFT: A Massively Parallel Computing for Density Functional Theory Program  
*Natsuki Tanaka*
- 6 A Greener Cross-Coupling of Silicon and Boron Compounds  
*Chance Lindsey, Charles Mcnamara, Jacob Carter*
- 7 Synthesis and Antimicrobial Studies of Pyrazole Derivatives as Potent Anti-Methicillin-Resistant Staphylococcus Aureus (MRSA) Agents  
*Trent Rowe, Devin Allison*
- 8 Sustainable Approach to Synthesize Nitrogen Heterocycles as Potential Anticancer Agents  
*Zakeyah Alsharif, Hessa Al-Khattabi, Derika Jones*
- 9 Electrodeposition with the Use of a 3D Printer  
*Cody Anderson*
- 10 Population Dynamics of Chelonians in an Urban Lake in Jonesboro, Craighead County, Ark.  
*John Konvalina*
- 11 Take Back the Tap: Stop Paying for Overpriced Bottled Water  
*Annie Savage, Rebecca Hughes*
- 12 Heightening Delivery of Fish Interleukin-22 by Harnessing the Plant Lectin RTB  
*Brandi Mize*
- 13 Understanding and Promoting Neuronal Differentiation Through the Use of Various Matrices  
*Marley Hanna*
- 14 Oligodendrocyte Differentiation of Progenitor Cells Through the Use of Extracellular Matrices and Exosomes  
*Krishna Sharma, Alyssa Aldridge*
- 15 Propagating Human Endothelial Cells on Permeable Inserts to Determine Ability of a Synthesized Chemical Molecule to Cross the Blood-Brain Barrier  
*Alyssa Aldridge*
- 16 Comparing Total Solids and Chlorophyll-A Variables Measured from Components in a Reservoir Tailwater-Recovery Ditch System in Northeast Arkansas  
*Leevi Haas*

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17 CAP1 is Required for both the Invasiveness and Proliferation in Pancreatic Cancer Cells

*Dominic Williams*

18 Cyclase-Associated Protein 1 (CAP1) Exerts Cell Context-Dependent Functions in Breast Cancer

*Morgan Miller*

19 Production of Stilbenoids in Hairy Root Cultures of Peanut and Their Purification by High-Performance, Counter-Current Chromatography

*Carson Day*

20 Analysis of  $\delta$ -Tocotrienol in Seeds and Hairy Roots of Annatto

*Krishna Sasa Vellanki*

21 Decellularized Roots as Potential Scaffolds for Mammalian Stem Cell Culture

*Najwa Lee*

22 Removing an Inhibitor of Recombinant Enzyme in Corn Grain Extracts

*Victoria Davis*

23 Heat Stress of Maize Inbred Lines for RNA Isolation and Sequencing

*Cassie Phillips*

24 Chemical Profiles of *Opuntia Humifusa* Defense and Response to Methyl Jasmonate

*Morgan Harlin*

25 Greenhouse Gas Fluxes over Arkansas Rice Varieties

*Brett Hale*

26 High-Yield Secretion of Growth Factors and Cytokines from Plant-Cell Culture Tailored to Stem-Cell Applications

*Lawrence Dulaney*

27 In Vitro Expression and Application of a Thermostable Endo-Arabinanase for Generating Functional Oligosaccharides from Beet Pulp for Colon-Specific Health Benefits

*Ningning Zhang*

28 A Soil Health Index for Northeast Arkansas

*Allison Gurley*

29 Influence of Cover Crops and Tillage Management on Organic Matter in a Corn/Soybean Rotation

*Robert Bevis, David Patton*

30 Influence of Cover Crops and Tillage Management on Active Soil Carbon in a Corn/Soybean Rotation

*Juan Montoya, David Patton*

31 Fluorescein Diacetate Hydrolysis

*Caleb Smith, David Patton*

32 Impact of Cover Crops and Tillage Management on Corn/Soybean Yields

*David Patton*

33 Monitoring Early Season Colonization and Spatial Distribution of the Tarnished Plant Bug, *Lygus lineolaris*, in Midsouth Cotton

*Whitney Schug*

34 Impacts and Benefits of Polyacrylamide (PAM) on Irrigation Efficiency, Soil-Conservation, and Water Quality in Mid-South Cotton Production

*Brittany Barnes*

35 Late Season Irrigation and Crop Protection Management in Cotton Soil Conservation Systems

*Amanda Mann*

36 Prediction of Creep and Recovery Behavior of Recycled and Polymeric Asphalt Binders in Arkansas

*Mohammed Rahaman*

37 Characterization of Agricultural and Industrial Waste-Modified Asphalt Binders Using an Atomic Force Microscope

*A M Feroze Rashid*

38 Reduction of Carbon Dioxide Gas Emission through Sustainable Uses of Warm-Mix Asphalt (WMA) in Pavement Construction

*Mohammad Badrul Ahsan*

39 Arkansas Climate Diversity

*Megan Land, Hannah Tyler, Hunter Egan*

40 Design & Analysis of Cycloconverter to Run Split Phase Induction Motor Using PWM Control

*Iftakher Ahmed*

41 Optical Tractor Beam on Chip

*Nayan Kumar Paul*

42 Revisiting Mie's Scattering Theory for the Analysis of the Plasmonic Resonance of Metal Nanosphere

*Mohammadhabibur Rahaman*

43 Development of an Image Analysis Toolbox for Biological Imaging

*Samia Sanjari*

44 A Characterization of Concussion Incidence and Timing Among NFL Teams During the 2015 Football Season

*George Salazar, Zachary Simmons*

45 A Quantitative Comparison of Hits Incurred to the Helmets of High School Versus Collegiate Football Players

*Zachary Reynolds, Haley Petrus*

46 Quantitative Analysis of the Putative Speed and Magnitude of Forces Incurred to Helmets of Male and Female Batters and Catchers

*Carrie Varvil, Zachary Simmons, Stephen Moore*

47 Assessment of an Educational Platform Designed to Improve Preservice Physical Therapists' Knowledge of Persons with Autism Spectrum Disorder

*Jordan Hood, Callie Wright, Brittany Green, Hayley Harris, Cody Nickles*

48 The Use of 405nm and 464nm Blue Light to Inhibit *Listeria Monocytogenes* in Ready-To-Eat (RTE) Meat

*Grafton Harrell, Todd Hobson*

49 Using Phototherapy in the Management of Osteoarthritis: Pilot Investigation

*Angela Lewis, Chelsea Patton, Kaleb Brown*

50 Assessing for the Use of Tobacco at Each Office Visit

*David Blount*

51 Lifestyle Modifications: Provider Adherence to JNC 7 Guidelines

*Emily Carpenter*

52 Provider Adherence in the Use of Metformin as First-Line Treatment in T2DM

*Natalie Engelken*

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- 53 Preventive Services in the Intellectually Disabled Population of Northeast Arkansas  
*Megan Burke*
- 54 A Local Pediatric Clinic's HPV Vaccine Rate Versus the National Average of 42 Percent in Boys Aged 13-17  
*Brandy Pace*
- 55 Dysmenorrhea: Provider Adherence to First-Line Treatment  
*Anna Dorton*
- 56 Examining the Use of Albuterol in Pediatric Patients Diagnosed With RSV-Induced Bronchiolitis  
*William Burns*
- 57 Detecting Type 2 Diabetes and Prediabetes among Asymptomatic Adults: A Comparison of the U.S. Preventive Services Task Force Guidelines  
*Ginger Smith*
- 58 Lifestyle Modifications in Patients with Obstructive Sleep Apnea  
*Austin Pitman*
- 59 Are Depression Guidelines Being Followed in the Primary Care Setting?  
*Kelly Vrettos*
- 60 Cardiovascular Disease Preventative Screenings in Obese Patients  
*Nancy White*
- 61 Is the Diagnosis of Pneumonia Less Prevalent in Elderly When Vaccinations PCV13 and PPSV23 are Administered?  
*Tina Skimahorn*
- 62 Local Compliance to Heart Failure Guidelines Compared to National Average  
*Megan Hale*
- 63 Formal Diabetes Education and Greater Control of Blood Glucose Levels  
*Harold Parsons*
- 64 Obesity: Is Diet and Exercise Addressed in the Clinical Setting with Patient with a BMI of 26 or Greater?  
*Mary Krug*
- 65 Provider Adherence in the Initiation of Statin Therapy for Low-Density Lipoprotein Levels >100MG/DL in Well Patients  
*Kirk Williamson*
- 66 School-Reported BMIs and Lifestyle Changes  
*Regina Strop*
- 67 Pneumococcal Pneumonia: Comparing Admission Rates in Those Receiving Recommended Adult Immunizations  
*Kimberly Daniels*
- 68 The Clinical Efficacy of Common-Cold Modalities in Relation to Adipose Tissue: A Pilot Study  
Kyle Byrnes
- 69 Reliability of Hip Range of Motion Measurement: Smart Phone Application Versus the Universal Goniometer by Experienced and Novice Clinicians  
*Lyric Hupp*
- 70 Exercise Motivation in College Students  
*Dominique Tagupa*
- 71 Society's Ethical Acceptance of Blood Sports and Its Cost on the Athlete  
*Danae Delfin*
- 72 Social Media: Is It an Effective Form of Disaster Management?

- Cristi Harvey*
- 73 Unethical Behavior of Professional Athletes off the Field  
*Kristen Buynar*
- 74 Comprehension Strategies for Testing  
*Kathleen Mcnichols*
- 75 The Effects of Social Media on College Students' Motivation Toward Personal Branding Efforts  
*Viet Nguyen*
- 76 Stalking Perceptions with Different Relationship Statuses  
*Laura Tedder*
- 77 Thinking like MacGyver: Overcoming Functional Fixedness in Insight Problem Solving  
*Laura Tedder, Olivia Hitchcock, Libby Lane*



# Oral Presentations

Abstracts Listed in Alphabetic Order by Lead Presenter

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## **PULSED LIGHT AIDED NANO-ISLANDS FORMATION AND OPTICAL APPLICATIONS**

**Aktaruzzaman Al-Hossain** - Graduate  
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Most research in developing arrayed patterns has utilized the lithography process with pre-pattern structures. However, lithography itself, especially by the chemical etching process, is considerably less efficient in cost and time. Furthermore, the chemical etching process also is a potential barrier in three dimensional structures with multi-layered patterns. The limitation of substrate and mask size is also disadvantageous to the larger area in a real-time fabrication process. In this presentation, a new approach using solid thin-film dewetting process with intense pulsed light annealing and optical study towards wavelength transformation is introduced to overcome addressed problems.

*Mentor: Ilwoo Seok, Mechanical Engineering, iseok@AState.edu*

## **ACHIEVEMENT OF SUSTAINABILITY THROUGH GREENING OF CONCRETE**

**Md Shahriar Alam** - Graduate  
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Concrete is the raw material of infrastructure development. Concrete requires cement as a primary constituent which is an energy intensive process that contributes to the global CO<sub>2</sub> emission. Almost 5% of global CO<sub>2</sub> emission originates from the production of cement that eventually leads to global warming. Partial replacement of cement with Supplementary Cementing Materials (SCM) is possible without imparting the required strength of concrete rather the strength is increased. This helps reducing the carbon emission from cement manufacturing and utilization. Up to 30% of cement replacement in concrete is possible using Fly Ash and Rice Husk Ash (RHA). This study uses IPCC 2006 guidelines to quantify emission reduction of CO<sub>2</sub> based on the cement manufacturing statistics of the United States. As per the calculation, Contribution to CO<sub>2</sub> emission in 2015 could be reduced to as high as 24 Million tons from the United States if SCMs were used in every concrete works. Thus an industrial symbiosis and sustainability could be achieved.

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

## **SOCIAL MEDIA IMPACT ON SAUDI STUDENTS' POLITICAL KNOWLEDGE**

**Manasar Alharethi** - Graduate  
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In this research, the impact of social media on Saudi students' political knowledge is studied. The research was focused on Saudi students at Arkansas State University. This study entailed the application of the uses and gratification theory to develop a better understanding of the reasons that motivate Saudi students to use social media to gain political knowledge. The study was conducted using semi-structured in-depth interviews entailing face-to-face interactions with 10 Saudi students. The aim of using this method was to derive wide and deep information from each of these students. Each interview took around 40 minutes to ensure that all questions were answered. The first research question was: to what extent does the use of social media by Saudi students enhance or curtail their political knowledge? The second research question was: to what extent does the Saudi students' exposure to political knowledge via social media influence their interests? By asking the research questions the aim was to explain the influence of social media on the lives of Saudi students and whether they have an interest in political matters or not.

*Mentor: Lillie Fears, Media, lfears@AState.edu*



## THE ROLE OF HABITAT AND COMMUNITY ASSOCIATION IN THE SPATIAL DISTRIBUTION OF A TEMPORARY CORAL-REEF FISH PARASITE

**John Artim** - Graduate  
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Gnathiid isopods are common marine ectoparasites that feed on the blood of a wide range of fishes. They associate only temporarily with hosts, spending most of their lives within benthic substrate, and most species are primarily nocturnal. Thus, quantitative estimates of their spatial distribution and abundance are difficult to obtain. We compared the performance of five trap designs to estimate area of trap coverage, local gnathiid density, and maximum distance traveled by host-seeking gnathiids. We compare the relative sensitivity and variability of these trap designs. In a second study, we deployed large emergence traps to calibrate small light traps for use in in situ surveys of gnathiid density. Data from the emergence traps also provides in situ estimates of key gnathiid life cycle parameters. We conclude by presenting results of use of calibrated light traps to demonstrate a negative association between nearby live stony coral and local gnathiid density in a multi-site gnathiid-density survey and compare these results to our laboratory study of gnathiid-habitat interactions.

*Mentor: Paul Sikkel, Biological Sciences, psikkel@AState.edu*

## DIVORCE AND DATING: THE EFFECTS ON ADULT CHILDREN

**Monique Bailey** - Graduate  
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**Michita Merriweather** - Graduate  
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In this study we explored the acuties of dating from the perspective of adult children who have parents that are divorced. A small sample of 4 adult children ranging from ages 19-25 agreed to take part in a short semi-structured interview. The methodology that was performed included a phenomenological aspect of the sample and case study research. The research methods included collecting data from transcribed semi-structured tape-recorded interviews that were transcribed and analyzed from the sample group according to the grounded theory, in addition to a compilation of Internet blogs. During this study, four major themes emerged concerning dating after divorce and the adult children that it affects. The themes that surfaced during this qualitative analysis included but were not limited to: rejection, avoidance, denial and need for communication. This qualitative analysis also includes a review of literature, a methods section, findings, a detailed discussion and suggestions for future inquiry.

*Mentor: Gilbert Fowler, Media and Communication, gfowler@AState.edu*

## HATE CRIMES IN THE CLASSROOM

**Erica Bearden** - Undergraduate  
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Research suggests that heterosexuals' overall attitudes toward homosexuals may generalize to their attitudes regarding hate crimes, especially for men. However, much of the research is based on correlational surveys or archival data. The goal of this study is to experimentally investigate how participants will judge fellow students whom discriminate against another student due to their sexual orientation. Prior to the study participants will complete a homosexual attitudes scale. During the study participants will read one of three scenarios in which two students gang up on another student to cause him to lose a game. In one scenario the victim identifies as heterosexual, in a second the victim identifies as homosexual, and in the third condition the perpetrators explicitly state they are causing him to lose due to his homosexuality. Afterwards, participants will be asked to penalize the perpetrators. A regression analysis will be conducted to evaluate penalizations given by participants. It is hypothesized that those who score lower on homonegativity will penalize the perpetrators to a harsher degree than those who score higher on the scale. Results will assist policy makers in drafting legislation in regarding sexuality.

*Mentor: Christopher Peters, Psychology, cpeters@AState.edu*



## SEEDING RATE DECISIONS AND IMPACTS ON SPATIAL YIELD VARIABILITY IN NORTHEAST ARKANSAS COTTON

**Nelson Benson** - Graduate  
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**Amanda Mann** - Graduate  
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Midsouth cotton producers must reduce production costs to improve crop profitability. Previous research has suggested that customary uniform seeding rates (3 to 4 seeds per row foot) can be reduced without negatively effecting yield. A 35-acre field in Mississippi County was delineated into three zones: coarse sand, loamy sand and clay. Treatments included seeding rates of 1.5, 3.0 and 4.5 seeds per foot. Plots consisted of 12 rows planted the length of the field. Treatments were replicated 6 times and were arranged as a randomized complete block. Plots were mapped in-season to determine effects of seeding rate and soil texture on plant growth, boll retention and maturity. Yield and fiber quality determinations were made with hand-picked samples and from yield monitor data. Stand counts indicated acceptable plant stand densities across all seeding rate plots. No differences in yield among seeding rates were observed in either hand-harvested plots or yield monitor data from whole plots. Significantly higher yields were observed from plants grown in loamy sand compared to plants growing in coarse sand or clay soils. Results indicate seeding rates can be reduced without negatively effecting yield and may help reduce production costs. Similar findings were observed in the 2014 trial.

*Mentor: Tina Teague, Agriculture and Technology, tteague@AState.edu*

## PERCEPTIONS ON CYBER STALKING VS. IN-PERSON STALKING

**Madison Brooks** - Undergraduate  
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**Brittney Grantham** - Undergraduate  
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**Jennifer Hacker** - Undergraduate  
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Traditional stalking can often be described as giving repeated unwanted attention or pursuing another person to the point of harassment. However, as technology continues to advance and more people are connecting online, the definition of stalking is becoming increasingly blurred. We often times think of stalking situations as involving an adult, but there is increasing interest in stalking activity when it is perpetrated by a teenager. The experiment will involve two independent variables: the age of the stalking perpetrator, as well as cyber-stalking versus physical stalking. The participants will include 400 college students (male and female) and they will be asked to gauge their perceptions about the situation using a Likert scale. For example, we will ask participants to judge how afraid they think the target will be. The dependent variable will be the perceptions of the participants. An ANOVA will be used to analyze the results to see if there are any significant differences between the independent variables. Our hypothesis is participants will be more afraid of a 25 year old in an in-person stalking scenario than a 15 year old in a cyber stalking scenario.

*Mentor: Karen Yanowitz, Psychology, kyanowit@AState.edu*

## SIZE MATTERS: USING PARTICLE SIZE ANALYSIS TO PREDICT SEDIMENT-BOUND LEAD (PB) CONCENTRATIONS IN THE CACHE RIVER WATERSHED

**Shelby Chappell** - Undergraduate  
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The Cache River, located in northeastern Arkansas has been a 303(d) listed waterway by the Arkansas Department of Environmental Quality (ADEQ) for several years due to a lead (Pb) impairment. This impairment is hypothesized to be due to Pb bound to clay particles in soil washing into waterways, primarily as a result of agricultural land practices. If this hypothesis is true, sediment with a greater proportion of clay particles would be expected to have higher Pb concentrations. Consequently, clay content may be used to predict sediment-bound Pb concentrations. In this study, sediment from 23 sites in the Cache River Watershed were sampled quarterly for a year and mean concentrations of sediment-bound Pb were compared to a particle size analysis of sediment collected from the same sites. A strong correlation was observed between particle size and mean concentrations of sediment-bound Pb. Sites with greater concentrations of silt and clay particles had greater measured concentrations of sediment-bound Pb. This relationship shows that particle size analysis could provide a relatively quick and cost-effective means of predicting stream segments with measurable sediment-bound Pb concentrations in the Cache River.

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



## DEVELOPMENT OF A WIRELESS SENSOR NETWORK FOR MONITORING AND MANAGING WATER DEPTH IN PRODUCTION RICE FIELDS

**Yin Lin Chiu** - Graduate

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The inclusion of automation in agricultural irrigation may improve management by providing organized, site-specific and real-time information to producers. The objective of this study was to develop a rugged low cost wireless sensor network (WSN) and infrastructure to retrieve, process and disseminate remote sensor data. A working prototype WSN (consisting of 21 wireless units) was assembled and field tested for flood irrigation in rice production fields (approximately 364 ha). Primary data collected included water depth throughout the growing season. The WSN retrieved water depth data from the production field to a database. The information was viewable through the internet via web browser. The wireless sensor network water depth data was used to create a model to estimate water depth throughout the season. The model was compared to in-field validation data. The comparison was used to determine the effectiveness of the eTape sensor. It was found that the costs (financial and time), and reliability of using the eTape sensor made it difficult to be used in this system. The WSN infrastructure itself was proven to be successful in retrieving data remotely from the rice production fields. Future work will be needed to find alternative sensors to reliably measure water depth.

*Mentor: Michele Reba, USDA-ARS, mreba@AState.edu*

## OUT WITH THE OLD, IN WITH THE NEW: LESSONS LEARNED FROM ANALYSIS OF CULTURE RECORDS OF CERIODAPHNIA DUBIA

**Briuna Clark** - Undergraduate

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The culture and maintenance of standard laboratory organisms is an important component of many biological laboratories. While culture records are typically kept, these records should be examined and analyzed to determine the success of specific culture techniques. An examination of records for an extended time period is also useful to look for any long-term temporal trends. This type of analysis can help to predict potential future issues in culture maintenance and prevent repeatable mistakes. In this study, we examined records for a long term culture of *Ceriodaphnia dubia*, an EPA standard freshwater test organism. Culture records maintained at the Arkansas State University Ecotoxicology Research Facility from 2011 to 2016 were examined, with approximately 300 culture records analyzed. Analysis included an examination of total offspring produced, average offspring produced per parent, date of first reproduction and culture mortality. While most parameters were generally consistent, unacceptable mortality (>20%) occurred in 3.2% of all records. These spikes in mortality were most common in fall and winter months. This examination of records has led to alterations in culture maintenance techniques and thus far, a fall/winter increase in mortality has not been observed for 2015/2016.

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

## SENSITIVE ELECTROCHEMICAL SENSOR TO DETECT FLUOXETINE, SERTRALINE, AND CITALOPRAM IN ENVIRONMENTAL SAMPLES

**Hayden Cornwell** - Undergraduate

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Fluoxetine (Prozac®), citalopram (Celexa®), and sertraline (Zoloft®), as selective serotonin reuptake inhibitors (SSRIs) and commonly prescribed antidepressants drugs, can become persistent environmental contaminants. They are able to block presynaptic serotonin reuptake transporters, and penetrate the cell membrane and are associated with a high risk of developing cancer. Ion-transfer stripping voltammetry (ITSV) was applied to detect aqueous cationic SSRIs in tap and river water samples. In this work we applied ITSV to detect the SSRIs in their cationic form at nanomolar concentrations using a sensitive, inexpensive, and disposable pencil lead electrode. The lower limit of detection was 35, 45, and 25 nM for fluoxetine, sertraline, and citalopram, respectively. Using this double polymer membrane provided information on the lipophilicity of these antidepressants, thus contributing to a better understanding of their environmental toxicity and the risks they pose to humans.

*Mentor: Anahita Izadyar, Chemistry and Physics, aizadyar@AState.edu*

## SOLVING $F(F(X)) = \text{EXP}(X)$ IS A SINH

**Samuel Cowgill** - Graduate

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This presentation addresses the functional equation  $f(f(x)) = \exp(x)$ , which is also called the fractional iteration of the exponential function,  $\exp(x)$ . The classical method of solving these equations involves first solving Abel's functional equation. We will first numerically evaluate a particular solution based on the hyperbolic sine function. A graphical demonstration can be displayed with this particular result. We will then also present a method in which finding the solution could be done on a scientific handheld calculator. The goal is to extend this result to finding a solution that can be applied to the complex plane, which currently is under development.

*Mentor: William Paulsen, Mathematics and Statistics, wpaulsen@AState.edu*

## BIOPRODUCTION AND ANTI-INFLAMMATORY ACTIVITY OF DELTA-TOCOTRIENOL ENRICHED EXTRACTS FROM HAIRY ROOTS OF ANNATTO

**Jarrod Creameans** - Undergraduate

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Annatto (*Bixa orellana*) is a plant native to South America that has been used as a traditional medicine to treat multiple diseases. The highest natural level of delta tocotrienol, one of the eight E-vitamins, has been found in annatto. Hairy root cultures of annatto were established to study the bioactive compounds in this species. Preliminary experiments using cyclohexane, hexane, and ethyl acetate as extraction solvents showed that cyclohexane was the most effective solvent to extract tocotrienols from the root tissue. To determine the effect of growth stage and light on the accumulation of tocotrienols, the hairy roots were cultured in liquid medium under either continuous light or dark conditions for 30 days and root tissue and medium samples were collected every 3 days. Extracts from these samples are being analyzed for tocotrienols using high performance liquid chromatography. Our results indicate that annatto hairy roots produce mainly delta-tocotrienol and trace amounts of gamma-tocotrienol. The anti-inflammatory capacity of extracts containing delta-tocotrienol is being assessed using a cytokine assay with differentiated 3T3-L1 adipocytes, whereas cytotoxicity is being determined by a metabolic activity assay. We propose that hairy root cultures of annatto can be developed as a sustainable source of delta tocotrienol.

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

## Multivariate Analysis of Health Insurance Data

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A large portion of people in the United States currently have health insurance plans, but a substantial amount of the population does not possess any type of health insurance coverage. There are numerous variables which may influence whether an individual possesses a health insurance plan or not. In this manuscript, three variables (education level, sex and family income) are evaluated as independent variables which influence the response variable, which is whether the individual is currently covered by health insurance or not. Log-linear model is implemented to find and confirm relationships among all four variables, and logistic regression analysis is used to find the effects of the independent variables on the response variable.

*Mentor: Seo-eun Choi, Mathematics and Statistics, schoi@AState.edu*





## PROTO-ANARCHISM IN EARLY AMERICA, 1776-1800

Zachary Deibel - Graduate

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In 1776, American colonists revolted against the established authority of the British Empire. Often, scholarly examination of motivations for the revolution center on Enlightenment thought and classical republicanism. However, many Americans argued for radical reconsiderations of the role of the state, the aim of society, and the relationship between the two. Among these ideologies existed roots of anarchist thought. This paper contends this proto-anarchism proved an important political theory of the period, and the delegates to the Constitutional Convention of 1788 drafted a system both opposed to this theory and committed to repression of the radicalism it represented. This study considers the scholarship surrounding American anarchism, a field that largely accepts its first emergence during the mid-nineteenth century. Through an examination of the speeches and personal writings of Thomas Paine and Thomas Jefferson, this study will instead situate roots of anarchist thought in the leadership of the revolutionary and early national period. Additionally, it will look to various letters, newspapers, and correspondences to illustrate the presence of proto-anarchist thought among average revolutionaries. Thus, across the social strata of America, proto-anarchists contributed significantly to the period's political discussions as advocates for localized, socially-driven authority instead of government authority.

*Mentor: Kellie Buford, History, kbuford@AState.edu*

*Mentor: Gary Edwards, History, gedwards@AState.edu*

## EXPRESSION OF A THERMOSTABLE ENDO-ARABINASE IN YEAST FOR RECOVERY OF FUNCTIONAL OLIGOSACCHARIDES FROM CELL WALL POLYSACCHARIDES

Christopher Elms - Undergraduate

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Varieties of "sugar beets" (*Beta vulgaris* L.), while a table sugar resource, are being explored as alternative bioenergy crops. To make 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 arabinooligosaccharides (FAOs), can be extracted from the arabinan-rich beet pulp polysaccharides 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 purpose of this project is to express a thermostable endo-1,5- $\alpha$ -L-arabinase (TS-ABN) in *Pichia pastoris* and test the enzyme function in recovering FAOs from sugar beet pulp. This project also will determine if the FAOs can modulate tight junction function of human colon epithelial cells (colonocytes). This project has three objectives: 1) demonstrate functional TS-ABN expression through a glyceraldehyde 3-phosphate dehydrogenase (GAP) promoter in *P. pastoris*; 2) recover FAOs from sugar beet pulp following treatment with TS-ABN; and 3) test beet FAOs for ability to modulate colonocyte tight junctions.

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

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

## SYNTHESIS OF NOVEL ANTIBIOTICS WITH DIHYDROPYRIMIDINONE AND PHENETHYLAMINE SCAFFOLDS

Santiago Gonzalez - Undergraduate

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Pharmaceutical companies and medicinal chemistry laboratories are not producing enough novel antibiotics to keep up with the evolution of antibiotic-resistant bacteria, which according to the CDC kill at least 23,000 people each year. In order to play a role in the solution of this problem, we have the goal of synthesizing novel antimicrobial agents by combining two privileged structures: dihydropyrimidinones and phenethylamines. Dihydropyrimidinones are significant building blocks and versatile synthons that are frequently seen in medicinal chemistry due to their many pharmacological properties, including calcium channel blocking, bacterial growth inhibiting, HIV inhibiting, and antitumor activity. Phenethylamines form the scaffold for catecholamine adrenergic hormones such as norepinephrine and dopamine. By combining these two privileged bioactive scaffolds, we predict that the resulting structure will also be bioactive. After various experimental trials, we have developed a reaction pathway that encompasses two straightforward steps to synthesize the desired products. We have characterized and tested the synthesized products for bioactivity using the Kirby-Bauer disk diffusion assay.

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

## ENTRAPMENT AND INTELLECTUAL DISABILITY VS. MENTAL RETARDATION

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Kate Cain - Undergraduate

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In 2010, PL 111-256 also known as Rosa's Law was enacted, which changed the term "Mental Retardation" to "Intellectual Disability." Unfortunately, many individuals are unaware of Rosa's Law and the synonymous relationship between the old versus new term. The purpose of this study is to examine how this change in terminology may influence a jury's determination of guilt or innocence. We answer the following research question: do mock jurors' decisions of guilt or innocence differ based on whether a defendant is described as having intellectual disability or mental retardation? Mock jurors will read a trial summary in which a defendant attempts to use an entrapment defense. Afterwards, participants will answer questions specific to perceived innocence or guilt of the defendant. We hypothesize that jurors are less likely to convict the defendant if they are informed the individual has mental retardation rather than intellectual disability. This research is important because of the potential impact that this change in terminology may have on jurors' decisions of a defendant's guilt or innocence.

*Mentor: Gill Strait, Psychology, gstrait@AState.edu*

*Mentor: Christopher Peters, Psychology, cpeters@AState.edu*

## LESSER GRAIN BORER (RHYZOPERTHA DOMINICA) DEVELOPMENT ON TWO ROUGH RICE CULTIVARS

Rachel Hampton - Graduate

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Lesser grain borers (LGB) are primary pests that develop on a variety of whole grains. In the past, LGBs have been shown not to develop on rough rice cultivars; however, more recent studies have shown that LGBs may develop on some cultivars. Knowing what rice cultivars are susceptible to LGBs is important in understanding their biology as well as preventing LGB infestation of stored rough rice. This is especially important since LGBs have been shown to be resistant to some pesticides. This study was developed to look at LGB development on pureline and hybrid cultivars of rough rice, LaKast and XL 745, respectively. Twenty wild LGBs were placed on each rice cultivar. After three days, the adults were removed and any eggs laid were allowed to develop. After approximately 40 days (first generation emergence) and 80 days (second generation emergence), development was stopped and adults for each cultivar were counted and used to assess development. From this study, it can be determined that LGBs can develop on both test cultivars. The results of this study are important to further understanding the biology of LGBs and developing approaches for preventing grain contamination.

*Mentor: Tanja McKay, Biological Sciences, tmckay@astate.edu*

## GENERALIZED HOLM'S PROCEDURE FOR MULTIPLE HYPOTHESIS TESTING PROBLEMS

Christian Helms - Undergraduate

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The multiple comparison is a common statistical procedure when there are more than two hypotheses needed to be tested at same time. Holm's procedure is a sequentially rejective multiple comparisons procedure which can reject only one hypothesis at a time. We developed a new procedure which can reject a pre-specified number of hypotheses at each step. It has been proven that the new procedure can control the familywise error rate strongly, which is mandated by FDA.

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





## CULTURE WITHIN THE COMMUNITY

**Emily Holder** - Undergraduate

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The advanced photojournalism class of spring 2016 is exploring what makes Jonesboro the community it is under the assignment, "This Is Our Jonesboro." The stories are told visually through photographs, a powerful way to show what is found. This creative project "Culture in the Community" highlights different parts of the Hispanic Community in Jonesboro. One focus of the project is the Hispanic Community Center, focusing on the after-school program for children. They come to the center to work on homework, with the help of volunteers. There are many children who come, but there are only a few volunteers. The children come to the after-school program desperate to learn and interact with people. Since being there many have expressed interest in teaching and photography. They want to learn new things, speak with people and build relationships. One in particular has changed within the first couple of visits, he has become engaged in the project by asking questions and having an ear to learn. A visual storyteller is able to experience and feel the story firsthand, but the viewer can relive the story through the photographs. This is a story people in the community will want to feel.

*Mentor: Gabriel Tait, Media, gtait@AState.edu*

## EXAMINING DROUGHT USING STATISTICAL ANALYSIS OF PRECIPITATION AND OCEANOGRAPHIC INDICES IN R AND MINITAB

**Anusha Inaganti** - Graduate

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This research investigated the statistical methods for analysis of drought in the Jonesboro, Arkansas region. It is said, "To know the future, we need to look at the past." Hence, a better understanding of historical PDSI could help in drought forecasting. In this work, drought forecasting was estimated using Palmer Drought Severity Index (PDSI). It demonstrates the feasibility of drought prediction. ENSO forecasts help scientists anticipate and mitigate droughts and floods, and are very useful in agricultural planning too. Monthly ENSO data from 1951 to 2011 was obtained from NOAA. Using this data, the monthly and seasonal variations of El Nino and La Nina were determined and compared with each other. MiniTab 17 and R software was used for statistical analysis. Further analysis was done on PDSI values for years categorized as El Nino and La Nina from ENSO data. By conducting programming on statistical analysis we can handle ensemble forecast outputs. Results of this analysis are supported with statistical and visual interpretations generated from Minitab and using R language. With these results one can find a trend in the variations of El Nino and La Nina years which can be used for drought forecasting.

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

## DIGITAL INEQUALITY LEADS UNIVERSITY GRADUATES TOWARD PROFESSIONAL DISPARITY: A STUDY ON THE BANGLADESH PERSPECTIVE

**Khairul Islam** - Graduate

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University students who have inadequate access to the digital technology are more likely to consume less information that significantly limits their potential opportunities. A study found that digitally disable graduates are more inclined to be less productive and face more challenges compare to the technically privileged group in their professions. This concern is extremely practical in the third world countries like Bangladesh where digital technology is a recent adjustment in higher education. According to study, the majority of the public university students in the country do not have adequate access to those advanced academic tools developing a significant knowledge asymmetry, which might lead the graduates toward professional disparity. A further study is required to explore the factual impacts of the digital divide both physical access to the technology and efficient uses of the digital resources among the public university students in Bangladesh. It also needs to examine digital disparity among the graduates and its relation with their professions.

*Mentor: Gilbert Fowler, Media and Communication, gfowler@AState.edu*

## ARTIFICIAL RECHARGE OF THE MISSISSIPPI RIVER VALLEY

### ALLUVIAL AQUIFER: A WATER QUALITY STUDY

**Klarissa Kahill** - Graduate

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The Mississippi River Valley Alluvial Aquifer (MRVAA) has been the primary source for irrigation in eastern Arkansas since the early 1900s. As crop production expanded across the state, over time pumping from the MRVAA at a rate faster than it can replenish itself has caused a continuous decline in the water table. With agriculture as the foundation of Arkansas' economy, a sustainable water supply is essential to this region. The current study focuses on quantifying water quality of on-farm reservoirs and their associated ditches for potential direct injection artificial recharge (AR), the increase in groundwater by artificial means. Sources were compared to nearby groundwater well samples for nitrogen, phosphorus, and sediment to determine the optimal source of recharge based on water quality and the month that Arkansas would be most ideal (low sediment and dissolved solids). It was hypothesized that on-farm reservoirs would possess a higher water quality when compared to ditches, due to reservoirs acting as settling ponds, and February would be the most ideal month for AR based on data from the previous field season. Data was analyzed using the Kruskal Wallis test and the Bonferroni multiple pairwise testing procedure.

*Mentor: Michele Reba Voicemail Undefined, Environmental Science, mreba\_vm@AState.edu*

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

## WATER HARDNESS AND LEAD CONTAMINATION IN THE CACHE RIVER: HOW MUCH IS TOO MUCH?

**Mary Kilmer** - Graduate

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The Cache River, located in northeastern Arkansas has been a 303(d) listed waterway for several years due to lead (Pb) impairment. Of particular concern to the Arkansas Department of Environmental Quality is dissolved Pb, which can have toxic effects on aquatic organisms. While various water quality parameters provide a protective effect (i.e. water hardness, dissolved organic matter), these parameters may vary seasonally and among sites within the watershed, thus changing the toxic effects of dissolved Pb. In this study, acute and chronic toxicity tests were performed with Ceriodaphnia dubia and Pimephales promelas using ambient water from the Cache River, spiked with lead nitrate. Lethal and sub-lethal endpoints were compared to monthly measured dissolved Pb concentrations from 19 sub-watersheds and four main channel sites of the Cache River to determine if environmentally relevant concentrations of dissolved Pb are of immediate concern to aquatic organisms. Preliminary results indicate that water hardness provides a significant protective effect for both P. promelas and C. dubia. However, low hardness at certain sites during portions of the year indicate that aquatic organisms may be at risk. Sub-lethal toxicity was observed in C. dubia at environmentally relevant concentrations of dissolved Pb under conditions of low water hardness.

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

## A SENSE OF HOPE IN POVERTY

**Kayla Macomber** - Undergraduate

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In Spring 2016, the advanced photojournalism class was challenged by Dr. Gabriel Tait to visually explore the community of Jonesboro. The class developed stories about issues in Jonesboro that were important to students, but also hidden (in plain sight) from the larger community. This creative project examines poverty. Jonesboro is a rapidly growing community. In spite of this growth many many in Northeast Arkansas live in poverty. A United States Census Bureau report notes that Jonesboro is five percent above the state average with 24.2% of people are living in poverty. This creative project is designed to assist the community with understanding the community. This study will offer a myopic perspective of poverty in Northeast Arkansas by visually addressing: homelessness, trying to escape poverty, thankfulness in poverty, and hope passed down through poverty-experienced leadership. Research will be gathered through photographically documenting and interviewing subjects in poverty. We are also interviewing individuals that specialize in supporting these subjects. Though the research is still in process, the following information has been gathered. There is a common trait among subjects, hopefulness. Visually telling the story of those in poverty will help others understand this aspect of their community. Results are pending.

*Mentor: Gabriel Tait, Media, gtait@AState.edu*





## FEASIBILITIES OF HARVESTING RAINWATER IN JONESBORO

**Istiaque Mahmud** - Graduate

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Each year on an average of 48.2 inches of rain falls on the city of Jonesboro, Arkansas, where the primary source of water supply is groundwater withdrawn from underground aquifers. The continuous usage of groundwater could result in dropping the groundwater level as well as creating arsenic hazards. As of June 12, 2012, the peak water usage in the city of Jonesboro is 29.26 million gallon per day (MGD), which was entirely yielded from the water pumped from underground wells. If rainwater can be utilized as drinking water it can potentially reduce the groundwater usage to 85%. To successfully utilize rainwater harvesting at first the feasibility and acceptability of using rainwater as a drinking water has to be determined. From this study it was found that rainwater harvesting could account for at least 17% of the total water demand in Jonesboro, and at a lower cost than the underground water supply to urban dwellers. If the rainwater harvesting system is properly constructed following the guidelines, it could prove to be a sustainable solution to the alternative of groundwater usage in Jonesboro.

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

## SOYBEAN YIELD VARIATION ASSOCIATED WITH HETEROGENEOUS SOILS AND IRRIGATION TIMING

**Amanda Mann** - Graduate

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Progressive soybean producers are interested in expanding their use of precision agriculture technologies to improve resource use efficiency and sustainability. In spatially variable agricultural fields with heterogeneous soils, research has shown utility of using georeferenced soil electrical conductivity (EC) measurements can improve interpretation of crop yield data derived from harvesters equipped with yield monitors coupled with GPS. There has been limited research to evaluate these statistical techniques in the Midsouth. The purpose of this study was to examine spatial relationship of soil EC and yield of soybean using yield data from a 2-year irrigation timing field study conducted in 2014-15 in a commercial field in Manila, Arkansas. The goal was to evaluate analysis methods of yield variability, soil EC and irrigation management. Yield data were acquired using the cooperating producer's harvester, and soil EC measurements were made using a Veris® 3150 Soil Surveyor. Analysis using geographic information system, ArcGIS 10.1© and SAS, showed reduced yields in field areas with soil textures dominated with coarse sand and reduced irrigation inputs. Expanded use of geostatistical tools and spatial data management for use in on-farm decision making will be discussed.

*Mentor: Tina Teague, Agriculture and Technology, tteague@AState.edu*

## EXPLORING SYMBIOTIC RELATIONSHIPS BETWEEN FEATHER MITES AND WARBLERS

**Alix Matthews** - Graduate

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Birds are hosts to a variety of ectosymbionts, including feather mites. Feather mites are obligatory ectosymbionts that may influence individual host condition and fitness, but little is known about the nature and variability of this symbiotic system: is it parasitic, mutualistic, or commensal? We investigated feather mite abundance on two wood-warbler species (Parulidae) that differ in ecological context (one an open-cup canopy nesting species, one an understory cavity nester) to test the hypotheses that individual traits and ecological context can explain variability of abundance and effects of mite infestations on hosts. We captured, took morphometric measurements, banded, and quantified feather mite abundance on individuals using a novel, objective system. We also located and monitored nests of uniquely banded individuals to determine nest fate and number of fledglings produced. Generalized linear mixed models showed that mite abundance differed by species, as well as a species and age interaction, but did not indicate that feather mite abundance was related to an individual's body condition, number of fledglings, or nest survival for either species. These results suggest a commensal relationship between feather mites and hosts in regards to reproduction. However, this relationship may be context or species dependent, warranting further investigation.

*Mentor: Than Boves, Biological Sciences, tboves@AState.edu*

## MATHEMATICAL AND NUMERICAL APPROACHES TO CRACKED

### DAMAGEABLE EULER-BERNOULLI BEAMS

**Jay Mayfield** - Graduate

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A hyperbolic fourth order partial differential equation system which describes the motion of cracked Euler-Bernoulli beams is considered mathematically and numerically. The endpoints of the beams are clamped and a crack in the beams is located at an appropriate location and modeled by a set of natural boundary conditions. The effect of the crack on the beams increases in time, which is apparent from the damage function. The beams will oscillate transversely in space until they break at the point of the crack. The midpoint rule is applied to a discretized time domain. A finite element method with B-splines is proposed to approximate the fully discrete approximations of displacement and velocity of the beams at each time step. We implement the fully discrete numerical schemes to present numerical results.

*Mentor: Jeongho Ahn, Mathematics and Statistics, jahn@AState.edu*

## SOCIETY'S BIGGEST TABOO: THE EFFECTS OF MEDIA ON INDIVIDUAL PERCEPTION OF SAME-SEX PARENTS

**Michita Merriweather** - Graduate

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**Derika Harris** - Graduate

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In today's society, entertainment media has integrated many same-sex parents into storylines particularly on the television screen. Throughout conducting this research, there is a definite possibility that children and other members of gay and lesbian-parented families may look to media representations as they form an understanding of their own identities as members of such families. This study is an exploration of how the media has had an impact on the individual's perception of same-sex parenting, with the intent of contributing a greater understanding of LGBT representation. Where exactly did these negative perceptions derive? There are a number of possibilities: personal experiences or lack thereof, hearsay, television, etc. Exploration of the derivation of individual perception of same sex parents will ultimately aid in enhancing children of same sex families development and well-being. The methodology that was performed included a 35 question Likert scale questionnaire which was administered to participants of this study. The population of this study consisted of 100 students who attend Arkansas State University, who are over the age of 18 years old. This quantitative analysis also includes a review of literature, a methods section, sampling section, measurement section, and data analysis.

*Mentor: Po-Lin Pan, Media and Communication, ppan@AState.edu*

## FACTORS INFLUENCING ELEPHANT RAMPAGE ON THE HUMAN SETTLEMENTS IN NEPAL

**Dinesh Neupane** - Graduate

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Asian elephants (*Elephas maximus*) are endangered species and human elephant conflict (HEC) is the major threat to their survival. HEC causes crop and property loss and occasionally results in death of either group in Nepal. Elephants are responsible for more than 40% of the human-wildlife conflict, 70% of the wildlife-caused human casualties, and a 25% loss in crop production in Nepal. Identification of the factors associated with elephant invasion can help mitigate conflict by allowing residents to change those factors. This study used face-to-face interviews in 1185 houses in villages affected by elephants in southern Nepal using a structured questionnaire to understand how land use practices are related to HEC in the region. Almost all (99%) of the surveyed houses had some damage from elephants. Odd ratio analyses showed that practices such as home alcohol production, the growing of traditional crops (rice and maize) or maintaining certain fruit trees, increase the chances of elephant attacks. Our data also revealed that HEC is most intense in winter months (September-December), when rice is grown. Changing some land use practices could reduce conflict in the region. Therefore, conservation organizations should launch educational programs recommending alternative cropping to residents of southern Nepal.

*Mentor: Ronald Johnson, Biological Sciences, rlj@AState.edu*

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





## CRIME CONTROL VS. DUE PROCESS ORIENTATION AS THE MOTIVATING FACTOR BEHIND JURORS' REGARD OF INADMISSIBLE EVIDENCE

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**Stevie Harmon** - Undergraduate  
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Oftentimes, jurors in a courtroom are faced with the responsibility of ignoring evidence that has been presented due to its unlawful or unreliable nature. Following an objection, a judge will either deem this type of information inadmissible or admissible. If the evidence is deemed inadmissible, the judge will admonish the jurors to disregard it. Despite this admonishment, jurors struggle to ignore the evidence and their verdicts are affected. Due to limitations in current theories, the current research offers Crime Control vs. Due Process Orientation (CCDPO) as the motivator behind jurors' inability to follow instructions and disregard evidence deemed inadmissible. It is hypothesized that whether or not individuals disregard, inadmissible evidence will be moderated by their CCDPO. Participants were assigned to one of three conditions where the applicability of a critical piece of evidence was manipulated. Regression analyses indicated a main effect of condition, where participants in the inadmissible condition were significantly less likely to vote guilty than those in the control condition. Furthermore, two out of the three factors of CCDPO were found to moderate this effect. The current research can offer new insight into the way in which situations involving inadmissible evidence in the courtroom should be handled.

*Mentor: Christopher Peters, Psychology, cpeters@AState.edu*

## MANIPULATION OF SMALL PARTICLES ON THE SURFACE OF A MATERIAL

**Nayan Kumar Paul** - Graduate  
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We demonstrate optical trapping and manipulation of a small particle on a dielectric surface due to the control of evanescent waves generated by the interference of TE waves. The particle can be manipulated in any arbitrary direction on the surface by using two mirrors. The particle position depends on the displacements of the mirrors. We determine the required displacements of the mirrors to trap the particle at a desired position on the surface. The angle of incidence of the light waves to pull the particle toward the surface at the maximum force is revealed.

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

## STUDENT PERCEPTION OF THE BENEFITS OF ACADEMIC EDUCATION PARTNERED WITH TECHNICAL TRAINING AT HOMELAND SECURITY'S CENTER FOR DOMESTIC PREPAREDNESS

**Emily Peters** - Undergraduate  
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The Disaster Preparedness and Emergency Management (DPEM) Program at Arkansas State University provides students with a unique opportunity to train at the Center for Domestic Preparedness (CDP). As a student, I was interested in how this learning experience enhances knowledge, experience, and opportunities in the DPEM field. The question researched was, "is training at the CDP effective in preparing A-State students for a career in the field of DPEM?" The hypothesis was that CDP training is an effective way for students to learn and prepare for a career in the field of DPEM. Survey Monkey® was utilized to send a questionnaire to 57 A-State students who have participated in the training at the CDP. The questionnaire was designed to evaluate student perception of the CDP experience. The results of this study show that partnering academia with practical training is perceived to be beneficial. All results concerning the partnership were positive and many study participants voiced their desire to return to the CDP and expressed how the partnership between academia and the CDP will enhance their career. As a result of this study, DPEM faculty can utilize the information in their evaluation of the program.

*Mentor: Brent Cox, Disaster Preparedness/Emergency Management, brentcox@AState.edu*

## FOURTH ORDER HYPERBOLIC PARTIAL DIFFERENTIAL EQUATIONS DESCRIBING THE TRANSVERSE MOTION OF BUCKLING BEAMS

**Madison Rowe** - Undergraduate  
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The aim of this project is to improve numerical schemes to solve linear fourth order hyperbolic partial differential equations (PDEs), which can be used to model the transverse motion of a buckling beam. The classical Finite Element Methods (FEMs) do not seem to be perfect in terms of computational aspects, since there are the fourth and second order differential orders in the PDE system. Thanks to eigenfunctions of the static case, an approximated equation of the PDE can be established to obtain its exact solution. Further research will include applying a time discretization and Discontinuous Galerkin (DG) Finite Element Methods (FEMs) to obtain numerical results (simulations) and see their numerical efficiency and high accuracy. This research is ongoing and results are pending.

*Mentor: Jeongho Ahn, Mathematics and Statistics, jahn@AState.edu*

## NEST SITE SELECTION AND NEST SURVIVAL OF PROTHONOTARY WARBLERS IN EAST-CENTRAL ARKANSAS

**Morgan Slevin** - Graduate  
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Prothonotary Warblers (*Protonotaria citrea*; PROW) have been experiencing population declines over the past 60 years, however our ability to reverse these declines has been hampered by a lack of basic biological data. Although much research has been devoted to this species, almost all studies have occurred with populations that use artificial nest cavities; we know little about habitat selection behavior or reproductive rates of individuals that use the predominant form of nesting structure, natural cavities. To address this critical knowledge gap, we studied PROW using both nest types in the Dale Bumpers White River NWR during 2014 and 2015. We aimed to estimate: (1) patterns of habitat selection, (2) demographic rates in both nest types, and (3) factors influencing nest survival. Using an information-theoretic framework, we found preference for higher cavities (for those nesting in natural cavities) and larger openings for those using nest boxes. Demographic rates and nest survival did not differ between nest type, however, PROW that used nests surrounded by high leaf density had lower daily survival rates. Our results can be used for improving management practices bottomland hardwood forests on their breeding grounds and the demographic rates can be used in full annual cycle modeling.

*Mentor: Than Boves, Biological Sciences, tboves@AState.edu*

## GOING NORTH: THE BURKHAMMER FAMILY OF GREENE COUNTY, ARKANSAS, AND DAVIS, MICHIGAN

**Ryan Smith** - Graduate  
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In the years following World War II, millions of emigrants from the South moved North in search of work. Joe Burkhammer was one of them. Leaving his family behind in Greene County, Arkansas, Burkhammer moved north to Davis, Michigan for work, sending money back to his wife and family down south. This project utilizes letters and other correspondences found within Dean B. Ellis Library to answer these questions: How did a family on different sides of the country function during the 1940s and 1950s? What challenges, outside of economic ones, did the Burkhammers face? And, what does this tell us about labor and family in the postwar American South? I argue that the Burkhammer's experience highlights the changing face of family life in America - that familial bonds remained strong despite economic needs often separating families for years at a time.

*Mentor: Cherisse Jones, History, crjones@AState.edu*





## IMPACTS OF A MAMMALIAN RNA STABILIZATION SYSTEM ON GENE EXPRESSION IN PLANTS

**Jacob Steele** - Undergraduate  
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Plants as a medium for the “bioproduction” of recombinant proteins offer benefits such as cost-efficiency, negligible probability of human pathogens, and the possibility for a minimized time investment through transient expression. Unfortunately, some genes exhibit poor expression levels in the investigated plant system (*Nicotiana benthamiana*). One such gene was an experimental candidate for universal flu vaccines: the nucleoprotein of influenza, which typically coats the virus’s RNA for delivery into its host. Efforts were made to increase the gene’s expression through codon-optimization and reduction of the gene to key immunogenic epitopes, among other methods, to no avail. The medical implications of this gene inspired us to further investigate increasing expression through novel means, such as a mRNA stabilization system native to mice. The RNA binding protein from this system binds to AU-rich elements (AREs) on the untranslated 3’ end of specific mRNAs, facilitating transport out of the nucleus, stabilizing the transcript, and thereby increasing its half-life and hypothetical translational efficiency. Both the mouse RNA binding protein and the nucleoprotein gene, which was modified to include 3’ AREs, were expressed in *N. benthamiana*, and the impacts on nucleoprotein yields were determined.

*Mentor: Carole Cramer, Biological Sciences, ccramer@AState.edu*

## HOW MANY WITNESSES ARE SUFFICIENT?

**Meagan Thomas** - Undergraduate  
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Eyewitness testimony, despite popular belief, has been shown to be unreliable (Shermer, Rose, & Hoffman, 2011). However, it continues to effectively sway jury decision making. This research examined how the number of witnesses and an individual’s Crime Control and Due Process Orientation (CCDPO) can influence the jury decision making process. It was hypothesized that as the number of witnesses increased, participants’ likelihood of voting guilty would increase; however, this increase would be moderated by the participants’ CCDPO. This research is important because according to the Innocence Project (2015), over 75% of exonerations are because of faulty eyewitness testimony. Therefore, it is important to understand how an individual’s personal beliefs could impact how much they rely on eyewitness testimony in making their decisions. Participants consisted of 196 undergraduate students from Arkansas State University. The study entailed three different mock trials, which differed in the number of witnesses. In all three conditions, the subject was on trial for breaking and entering into a house. When finished, the participants ranked their likelihood of voting guilty on a scale of 1-7. The number of witnesses significantly affected the participants’ likelihood of voting guilty. However, the participants’ CCDPO did not moderate the relationship as predicted.

*Mentor: Christopher Peters, Psychology, cpeters@AState.edu*

## THE METHODS OF TRANSPORTATION AND THE REGULATION OF INTERLEUKIN-22 PROVIDES A POTENTIAL THERAPEUTIC TARGET FOR INFLAMMATORY BOWEL DISEASE

**Morgan Tripod** - Undergraduate  
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Inflammatory bowel disease (IBD) is characterized by chronic inflammation of the intestinal mucosa. Current therapeutic treatments are less effective, which emphasizes the need to identify new therapeutic targets for the treatment of IBD. Mounting evidence shows that interleukin-22 (IL-22) plays a protective role in IBD by enhancing epithelial proliferation and healing responses, most likely by offering key protection to tissues from damage caused by infection and inflammation via interleukin-17. However, the regulation of IL-22 production by TH17 cells remains unknown. Here we provide evidence that a RNA-binding protein negatively regulates IL-22 production in TH17 cells. Knockout of this RNA-binding protein increases IL-22 production in TH17 cells. Mechanistically, this RNA-binding protein promotes TGF- receptor II and c-Maf expression to inhibit IL-22 production in TH17 cells. Further research is being executed using ELISA and Western blot in attempt to better understand this pathway and relationship. Targeting this RNA-binding protein in T cells resulted in up-regulation of IL-22 and down-regulation of IL-17, which may represent a novel therapeutic intervention in IBD.

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

## CLOVER BEND INTERPRETIVE PLAN: MAKING HISTORY USABLE IN A LOCAL COMMUNITY

**Amy Ulmer** - Graduate  
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The Clover Bend Historic District was part of a New Deal agricultural resettlement community developed in 1936 to alleviate rural poverty in Arkansas. Though listed as a historic district on the National Register, the site has no historic interpretation to convey its significance. In addition, the historic buildings remain unused, and many aging residents of Clover Bend fear the loss of the history, as well as the feeling of community generated from that history. This project entailed assessing the needs of the community, researching the history of the site, and exploring the area to develop a historic interpretation plan that might restore the Clover Bend Historic District as the educational and social center of the community. The plan, which proposes that the buildings be opened for use, with available grants going towards the rehabilitation of buildings to provide incentives for entrepreneurs, benefits the local community by providing guidelines for engaging visitors in its unique history. The project has resulted in a written plan that the site developers may use for grant proposals and other purposes and shows how historic interpretation and preservation may be used to make history usable and economically viable.

*Mentor: Edward Salo, Heritage Studies, esalo@AState.edu*

## COMPARISON OF PROCESSED IMAGES CAPTURED BY DIFFERENT CAMERAS

**Chin Nee Vong** - Graduate  
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Image processing techniques have been widely used in various applications in different fields including engineering, medicine, forensics, military, and agriculture. Hence, several image processing software applications have been introduced to process the image for further analysis. In this study, “RGB2X 1.0”, a new software application that enables image processing in Microsoft Excel was utilized in processing images captured by different commercial camera sensors. The main objective of this study was to compare raw and processed image data of images of the same targets taken by different cameras. The experimental design was comprised of five cameras by three targets by three lighting conditions. Three replications of each setting were used giving a total of 45 RGB images. For each image, data from the R (red), G (green), and B (blue) bands were extracted/exported to Excel for processing. The histograms of the raw data and the processed data were compared. The results demonstrate the potential for using different cameras as low-cost analytical sensors in different fields of study.

*Mentor: Peter Larbi, Agriculture and Technology, plarbi@AState.edu*





# Poster Presentations

Abstracts Listed in Alphabetic Order by Lead Presenter

# create



## OPTIMIZATION OF DROUGHT STRESS HIGH THROUGHPUT PHENOTYPING ASSAYS IN ARABIDOPSIS

Lucia Acosta-Gamboa - Graduate

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One of the global challenges we face nowadays is finding new strategies to sustain crop yields despite the drought stress agricultural areas are experiencing worldwide. The potential yield of a crop is determined during the different developmental stages of plants. In this work we are using Arabidopsis as a model to quantify the effects of drought on the phenotype of aerial tissue and ultimately on seed yield. To this purpose we are using a high-throughput phenotyping platform, the Scanalyzer HTS system, that is accurate and non-destructive, allowing the quantification of subtle phenotypes. We have used this tool to acquire high resolution images with visible, fluorescence, and near infrared cameras in conjunction with commercial and open source algorithms that are allowing us to extract the rich information contained on those images. Here we show that under mild drought conditions, plants are able to adjust without a significant penalty in growth, biomass accumulation, or health of the aerial tissue. However, under more severe water limitation, we detect a clear penalty in biomass accumulation and growth, accompanied with reduction of photosynthetic efficiency. Interestingly, we found that even mild drought leads to penalties in the number of branches and ultimately on seed yield.

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

## DESIGN AND ANALYSIS OF CYCLOCONVERTER TO RUN SPLIT PHASE INDUCTION MOTOR USING PWM CONTROL

Iftakher Ahmed - Graduate

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Frequency drive is playing an important role for ever growing demand of industrial applications. Cycloconverter is one such device which generates variable frequency depending on the load. Semiconductor switching devices like Thyristor, Insulated Gate Bipolar Transistor (IGBT), make it possible to control the output frequency according to the requirement. Because of energy efficient characteristics, single phase induction motors are widely accepted in industrial sectors. To control the speed and electromagnetic torque of a motor for the particular frequency a cycloconverter is used to increase the system frequency with a technique known as pulse width modulation (PWM) control. To drive varying mechanical loads for long duty cycle, the machine needs to minimize the transients, which can be made possible with PWM techniques. The output voltage can be accomplished without any external components and PWM will minimize the lower order harmonics by a filter which eliminates the higher order harmonics.

*Mentor: Tanay Bhatt, Electrical Engineering, tbhatt@AState.edu*

## REDUCTION OF CARBON DIOXIDE GAS EMISSION THROUGH SUSTAINABLE USES OF WARM MIX ASPHALT (WMA) IN PAVEMENT CONSTRUCTION

Mohammad Badrul Ahsan - Graduate

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Hot mix asphalt (HMA) produces a significant amount of carbon dioxide (CO<sub>2</sub>) during mixing and compaction processes which contributes to greenhouse effects. The warm mix asphalt (WMA) technology has been developed to reduce mixing and compaction temperatures as well as CO<sub>2</sub> emissions. The WMA technology is reported to reduce mixing temperatures from 30°C to 50°C compared to the HMA. The use of different kinds of additives in WMA reduces the mixing and compaction temperatures without compromising the quality of asphalt. Reduction of temperatures with these technologies saves fuel consumption of about 30% to 35% as well as improves the environment in a sustainable manner by reducing greenhouse gas emissions. This study evaluated the amount of CO<sub>2</sub> emission reduction for different additives modified WMA technologies. A comparative economic analysis of different WMA technologies and a conventional HMA was done by using a life cycle cost analysis (LCCA) software. It was found that Evotherm® reduces highest amount of CO<sub>2</sub> in asphalt production that is 34% though it increases overall life cycle cost by about 4% compared to the HMA. Finally, it was found that the most environmental friendly WMA additive is Evotherm® and most economic WMA technology is Sasobit®.

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



## PROPAGATING HUMAN ENDOTHELIAL CELLS ON PERMEABLE INSERTS TO DETERMINE ABILITY OF A SYNTHESIZED CHEMICAL MOLECULE TO CROSS THE BLOOD-BRAIN BARRIER

**Alyssa Aldridge** - Undergraduate  
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Close to 12,850 new cases of brain and other nervous system cancers were diagnosed in the United States in 2015. Of those diagnosed with brain or nervous system cancer only 33.3% survive beyond five years. One approach to decreasing the number of deaths caused by such cancers is to synthesize molecules that specifically target cancerous glial cells in the brain, while leaving healthy neurons and glial cells intact. A synthesized chemical molecule with preliminary results showing its ability to destroy cancer cells will be tested for its ability to cross the blood-brain barrier. This is achieved by propagating human endothelial cells on permeable inserts under in vitro conditions to form a barrier to replicate the blood-brain barrier. The molecule is introduced to the inserts under both experimental and control conditions. The culture medium beneath the inserts is extracted and examined for presence of the synthesized chemical molecule using fluorescence imaging. The endothelial cells are examined using immunocytochemistry and fluorescence imaging techniques to determine what effect the molecule had on the cells. Results on the ability of a synthesized chemical molecule to cross the blood-brain barrier may lead to life saving treatments for some patients with brain cancer.

*Mentor: Malathi Srivatsan, Biological Sciences, msrivatsan@AState.edu*

## SUSTAINABLE APPROACH TO SYNTHESIZE NITROGEN HETEROCYCLES AS POTENTIAL ANTICANCER AGENTS

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**Derika Jones** - Undergraduate  
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Nitrogen heterocycles (cyclic structure with at least one nitrogen atom) are among the most significant structural components of drugs. 59 percent of US Food and Drug Administration (FDA) approved drugs contain nitrogen heterocycles. Hence, the synthesis of novel nitrogen heterocycles is an attractive area of research for synthetic organic chemists. In this proposal we envisage the synthesis of several fused nitrogen heterocycle by using sustainable approach. As the result of the study, the synthesis and anticancer studies of several new molecules will be presented. These molecules could be potential anticancer agents.

*Mentor: Mohammad Alam, Chemistry and Physics, malam@AState.edu*

## ELECTRODEPOSITION WITH THE USE OF A 3D PRINTER

**Cody Anderson** - Undergraduate  
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The creation of metal objects is costly, time consuming, and can be difficult to produce complex geometries. The idea of using new 3D printing technologies and adapting them to print metal objects from digital designs would help revolutionize industries. We have begun to utilize a platinum electrode that will deposit copper ions to the surface of a substrate as elemental copper. This technology will allow inventors, innovators, and every day people the access to cheap metal objects. This electrochemical 3D printer is created using low budget materials, built upon existing 3D printer platforms, and will help make this technology incredibly affordable to those who need precision metal objects via additive manufacture. Our design will allow people to create and design custom plating and or costume metal objects to use on demand.

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

## IMPACTS AND BENEFITS OF POLYACRYLAMIDE (PAM) ON IRRIGATION EFFICIENCY, SOIL CONSERVATION, AND WATER QUALITY IN MID-SOUTH COTTON PRODUCTION

**Brittany Barnes** - Undergraduate  
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Arkansas is one of the leading states in total irrigated cropland. There is a need for improved irrigation management practices to increase irrigation water use efficiency, as well as reduce soil erosion and associated water quality problems. Polyacrylamide (PAM) is a high molecular weight chemical polymer used in furrow-irrigated row crops in the western U.S. row crops, where it has been found to stabilize soil particles and to decrease soil erosion which improves runoff water quality with reductions in nutrient losses. The purpose of this study was to evaluate PAM application on irrigation efficiency and water quality in northeast Arkansas cotton. Treatments included irrigation, irrigation with PAM, and a non-irrigated control. The small plot experiment was conducted on the Judd Hill Foundation Research Farm near Trumann, Arkansas and was designed as a randomized complete block with three replications. A granular formulation of PAM was applied at planting, and a liquid formulation was injected into water during irrigation events. Extensive crop, soil and water quality measurements were made throughout the season. Positive results observed in 2015 included a reduction in nutrient losses in water quality assessments and no significant effects on lint yield.

*Mentor: Michele Reba, Science and Mathematics, mreba@AState.edu*

*Mentor: Tina Teague, Agriculture and Technology, tteague@AState.edu*

## INFLUENCE OF COVER CROPS AND TILLAGE MANAGEMENT ON ORGANIC MATTER IN A CORN/SOYBEAN ROTATION

**Robert Bevis** - Undergraduate  
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**David Patton** - Graduate  
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Soils sustain life, yet agricultural soils get beat up during tillage operations and often remain lifeless during the winter months. The objective of this research was to determine the impact of reducing tillage and growing a cover crop during the winter on organic matter. Organic matter is matter composed of organic compounds that has come from the remains of organisms such as plants and animals and their waste products in the environment. It was hypothesized that reducing tillage or growing winter cover crops would increase the organic matter levels and to improve soil health. An experiment was set up with treatments of tillage, no-tillage, with cover crop, without cover crop, in all combinations and replicated four times for a total of 16 plots. This experiment was repeated at three locations in Northeast Arkansas. After one complete growing year, samples were taken from each of the plots from the 0-15 cm soil layer. Soil samples were analyzed using the loss of ignition method. Results of the study that involve enhancing organic matter pose many environmental benefits for society.

*Mentor: Steven Green, Agriculture and Technology, sgreen@AState.edu*

## ASSESSING FOR THE USE OF TOBACCO AT EACH OFFICE VISIT

**David Blount** - Graduate  
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This research study focuses on the emphasis of health promotion/disease prevention by addressing tobacco use cessation education in a family practice setting. Although the use of tobacco in adults has decreased from 42.4 percent to 19.3 percent it is still a major problem that is attributed to 443,000 deaths in the US annually (2011 CDC). Around half of all tobacco users will die from a tobacco related illness and also will reduce their life expectancy by up to ten years. The research plan is to conduct a retrospective chart review up to 100 charts of adult patients age 18 years and older that have a current diagnosis of nicotine dependence (ICD-10 F17.21). Data will be collected from all First Choice Health Clinics located throughout northeast Arkansas. The data will examine factors used to determine national guideline screening compliance percentages offered by providers during office visits including: if patients were advised to quit using tobacco, offered help with tobacco cessation tools, and if follow up appointments were scheduled. The findings of this study have potential to reiterate the need of healthcare providers to offer smoking cessation on more consistent basis.

*Mentor: Karen Olson, School of Nursing, kolson@AState.edu*

*Mentor: Mark Foster, School of Nursing, smfoster@AState.edu*





## PREVENTIVE SERVICES IN THE INTELLECTUALLY DISABLED POPULATION OF NORTHEAST ARKANSAS

**Megan Burke** - Graduate  
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Health management of individuals with intellectual disabilities is complex. They often present with nontraditional symptoms, and are more susceptible to disability-related ailments, making the care of the intellectually disabled different from that of the general population. However, these individuals also present with risks for preventable chronic conditions at the same rate of occurrence as the general population. Research will be used to explore the use of preventive services to screen for alcohol misuse, breast cancer, cervical cancer, colorectal cancer, diabetes, hypertension, and lung cancer within the population of intellectually disabled individuals in Northeast Arkansas, and in accordance with the United States Preventative Service Task Force recommendations. A retrospective chart review will be utilized to evaluate the medical records of 30 individuals with a diagnosed intellectual disability, meeting the established inclusion criteria. The researcher will observe the presence or absence of specific preventative services offered to and performed on the sample population, versus United States Preventative Service Task Force age and risk factor appropriate recommended preventative screenings among the same population. Results will allow clinicians to better understand gaps in care that currently exist and amend/expand practices that could contribute to improved care for the intellectually disabled population of Northeast Arkansas.

*Mentor: Mark Foster, Nursing- Graduate, smfoster@AState.edu*

## EXAMINING THE USE OF ALBUTEROL IN PEDIATRIC PATIENTS DIAGNOSED WITH RSV-INDUCED BRONCHIOLITIS

**William Burns** - Graduate  
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Bronchiolitis, an acute lower respiratory tract infection that is considered the hallmark of the respiratory syncytial virus (RSV), accounts for more than 175,000 hospitalizations annually in children younger than 5 years old. For years Albuterol has been used routinely in its treatment, however recent research has demonstrated the medication's potential ineffectiveness. The most current clinical practice guidelines recommend not using a trial of Albuterol in the treatment of this condition. Yet many healthcare providers feel this is an error. Multiple studies have been conducted providing compelling evidence for both sides of the current argument. The purpose of this study is to further examine Albuterol's impact when used for RSV-induced bronchiolitis in order to promote the advancement of evidence-based medicine in the treatment of young children. A retrospective chart review was conducted examining Albuterol's impact on O2 saturation and hospital admission rates of children 5 years of age or younger when given for this condition. The findings of this study have the potential to further strengthen existing research regarding the effectiveness of Albuterol when used as an initial treatment.

*Mentor: Mark Foster, Nursing (Graduate - FNP Option), smfoster@AState.edu*

## UNETHICAL BEHAVIOR OF PROFESSIONAL ATHLETES OFF THE FIELD

**Kristen Buynar** - Graduate  
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The media suggests that professional athletes have the tendency to behave unethically off the field. Does the ability it takes to perform at a professional level lead to violence off the field? The purpose of this study is to help us understand the unethical behavior of professional athletes off the field. In this study, we will look at articles that have compared men's and women's ethical behavior off the field and if male athletes tend to be more violent than female athletes. We will also examine major professional sports to see if one sport has a greater violence rate than the others. There will be data collected by surveying professional sport fans to get their perspective on how professional athletes act off the field. After we have collected our data, we will analyze it by combining the results and various journal articles we have researched. When this study is completed, we hope to have a better understanding of the connection between off field violence and gender.

*Mentor: Joyce Olushola, Health, Physical Education and Sports Science, jolushola@AState.edu*

## THE CLINICAL EFFICACY OF COMMON COLD MODALITIES IN RELATION TO ADIPOSE TISSUE: A PILOT STUDY

**Kyle Byrnes** - Undergraduate  
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Cryotherapy is commonly used in sports medicine. Clinical recommendation for ice immersion (immersion) is 10-15 minutes and commercial cold pack (CCP) has historically been administered for 20 minutes regardless of adipose tissue levels. The purpose of this study was to determine cooling rate of the triceps surae by 5°C in relation to adipose tissue. Twenty healthy adults participated. Two intramuscular thermocouples were inserted into the triceps surae at absolute and relative depths, determined by adipose tissue. Participants randomly received either immersion or CCP until relative depth temperature decreased 5°C from baseline. The independent variable was level of adipose tissue, the dependent variable was cooling rate. Two separated repeated measures analyses of variance determined differences between levels of adipose tissue and cooling rates. There was no significant difference in cooling rate between levels of adipose tissue for immersion ( $F=1.366; p=.379$ ) or CCP ( $F=.926; p=.446$ ). Immersion relative cooling rates ranged from 25.94 to 36.58 minutes. CCP relative cooling rates ranged from 51.25 to 65.81 minutes. Regardless of adipose tissue, current treatment length recommendations for immersion and CCP are insufficient to cool 5°C at relative depths. Based on our results, treatments should last a minimum of 25 minutes for immersion and 50 minutes for CCP.

*Mentor: Ashley Thrasher, Health Physical Education and Sports Science, abthrasher@AState.edu*

*Mentor: Amanda Wheeler, Health Physical Education and Sports Science, awheeler@AState.edu*

## LIFESTYLE MODIFICATIONS: PROVIDER ADHERENCE TO JNC 7 GUIDELINES

**Emily Carpenter** - Graduate  
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The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure (JNC 7) established recommendations for treatment of hypertension, with lifestyle modifications being the initial recommendation, either in combination with medications or without any additional treatment. The objective of this study is to evaluate documented counseling from the provider to the hypertensive patient related to current treatment guidelines recommended in JNC 7. Data was abstracted over a one year time period (2014-2015) through a retrospective chart review of approximately 60 charts with an ICD-9 code of 401.1 and/or 401.9 at a primary care clinic in rural Northeast Arkansas. Individuals were between 25-85 years of age. The implications of this study for practice will reiterate the importance of patient education and the documentation of patient education by providers according to JNC 7 guidelines, as notable to positive effects of patient cardiac health and overall well-being.

*Mentor: Mark Foster, School of Nursing, smfoster@AState.edu*

## PNEUMOCOCCAL PNEUMONIA: COMPARING ADMISSION RATES IN THOSE RECEIVING RECOMMENDED ADULT IMMUNIZATIONS

**Kimberly Daniels** - Graduate  
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It is estimated that one million US adults get pneumococcal pneumonia every year with 5-7% resulting in death. Annual clinical and economic burdens of pneumococcal disease among US adults over age 50 were estimated at \$3.7 billion in total direct costs, and \$1.8 billion in total indirect costs. The Center for Disease Control (CDC) and Prevention and Advisory Committee on Immunization Practices recommends both PPSV23 and PCV13 for adults aged > 65 years old. The objective of the study is to compare the admission rates of patients diagnosed with pneumococcal pneumonia in comparison with patients who received one or both recommended vaccinations. Data was abstracted from January 2015 - January 2016 through a retrospective chart study of convenience using ICD-9 (482.1, 482.2, 482.9, 480.1, 480.2, and 480.9) or ICD-10 (J15.9, J15.4, J14, J12.9, J12.0, and J12.1) codes for all pneumonia admissions in patients > 65 years old into a local hospital in northeast Arkansas. Data analysis is pending. Results for this study are vital in supporting the recommendations set forth by the CDC in northeast Arkansas. There are health risk and cost involved when vulnerable populations are not educated and offered recommended vaccinations by primary care providers.

*Mentor: Debbie Shelton, Department of Nursing, dshelton@AState.edu*





## REMOVING AN INHIBITOR OF RECOMBINANT ENZYME IN CORN GRAIN EXTRACTS

**Victoria Davis** - Undergraduate  
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The advantage of using cellulases produced in plants for biomass conversion is the reduction in the overall production cost compared to microbial production. Part of the cost reduction attributes to being able to scale up production by planting more acres of the production crop rather than building steel infrastructure for growing the microbes for production. The Hood lab uses corn grain for enzyme production. The enzyme must be prepared from the corn grain for utilization by extracting it in buffer or water and concentrating it. While this is a simple and efficient method for preparing bulk quantities of enzyme, we discovered that a major inhibitor of the enzyme was co-concentrating with the cellulase. It is believed that the inhibitor can be separated from the enzyme by isolating and precipitating the protein with ammonium sulfate. The enzymatic activities of precipitated and non-precipitated protein extracts were measured by using a colorimetric assay in which 3,5-Dinitrosalicylic acid reacted with reducing ends of free sugars produced through the cleavage of cellulose by the E1 endocellulase. It was determined that optimal enzymatic activity of E1 could be restored to protein extracts that had undergone a seven-fold concentration by performing ammonium sulfate precipitation.

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

## PRODUCTION OF STILBENOIDS IN HAIRY ROOT CULTURES OF PEANUT AND THEIR PURIFICATION BY HIGH PERFORMANCE COUNTER CURRENT CHROMATOGRAPHY

**Carson Day** - Undergraduate  
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Stilbenoids are polyphenolic compounds found in plants, like peanut and grape, which have a wide range of biological effects and potential benefits to human health. Among the peanut stilbenoids is arachidin-1, which has shown higher antioxidant activity and cytotoxicity in different cancer cell lines and potentially higher metabolic stability than other stilbenoids. In order to produce this and other prenylated stilbenoids, peanut hairy root cultures were co-treated with multiple elicitors for different periods of time. Ethyl acetate extracts were prepared from the culture medium of the elicited cultures and analyzed by HPLC. In addition to previously described stilbenoids, potentially novel stilbenoids were also detected in the culture medium. To further study the biological activity of these compounds, they were purified using high performance counter current chromatography (HPCCC). Fractions corresponding to the various compounds were analyzed by HPLC to assess purity. Our studies have shown that the levels of prenylated stilbenoids can be increased several fold by combining the chosen elicitors and that HPCCC can be used to obtain these compounds with high levels of purity.

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

## SOCIETY'S ETHICAL ACCEPTANCE OF BLOOD SPORTS AND ITS COST ON THE ATHLETE

**Danae Delfin** - Graduate  
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Fans have long been attracted to the violence of sports like American Football and Hockey, but is the fan culture of such sports encouraging aggression and violence at a player's expense? "Blood sports" is a term coined to describe violent sporting acts that aim to incapacitate opponents such as baseball "beamers", chop blocks in football, "stud-up" tackles in soccer, or the "enforcer" position in hockey (Dixon, 2010). Players are encouraged to exhibit violent behavior through fan support, the idea of protecting teammates, monetary bonuses, or contract extensions. What is the ethical acceptability of determining an athlete's worth not based on their skill but on their willingness to give the fans what they want at all costs? We will examine the athlete and fan perspective via surveys, interviews and focus groups to determine popular opinion. We will use convenience sampling and select those who participate in contact sports. We hope to reveal how athletes feel when faced with the ethical dilemma of intentionally harming opponents, and possibly themselves, and how fans would react to situations where their team did not retaliate with violence. Results will garner pertinent information for marketing purposes, increasing fan participation, and enacting policies to safeguard athletes.

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## DYSMENORRHEA: PROVIDER ADHERENCE TO FIRST LINE TREATMENT

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Dysmenorrhea, discomfort and pain associated with menstruation, is the most commonly reported gynecological complaint. Primary dysmenorrhea has no identifiable pathologic etiology and secondary is related to an underlying condition. Dysmenorrhea affects over half of all adolescent and adult women physically, mentally, socially and financially. The symptoms associated with this condition lead to reduced functionality resulting in absenteeism from school and work costing the country billions of dollars. Current guidelines recommend NSAIDs as first line treatment option for those diagnosed with dysmenorrhea. NSAIDs have been found to be effective in treating dysmenorrhea, and if effective treatment is offered, hopefully the debilitating symptoms can be controlled and physical wellbeing and productivity can be improved. This is a retrospective chart review of patients evaluated in a gynecological clinic with a diagnosis of dysmenorrhea, to evaluate if treatment guidelines are being followed. The findings of this study have the potential to reiterate the need for better compliance of national guidelines in a local/regional setting.

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## HIGH-YIELD SECRETION OF GROWTH FACTORS AND CYTOKINES FROM PLANT CELL CULTURE TAILORED TO STEM CELL APPLICATIONS

**Lawrence Dulaney** - Undergraduate  
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Stem cell research is dependent on optimal cell culture systems. Expansion and differentiation of stem cells is reliant on pure and active growth factor and cytokine (GF&CK) supplements. The current dominant expression systems are -E. coli and mammalian cells, but they present risks of unwanted contamination from pathogens/endotoxin. Plant cells are proposed to be safe and efficient alternative production platform for high quality human GF&CK. We leverage a plant-specific hydroxyproline (Hyp)-O-glycosylation "code" for de novo design and engineering of novel Hyp-O-glycosylated peptides ("HypGPs") that function as a molecular carrier to facilitate the secretion of tagged-GF&CK from cultured plant cells. As a proof of this concept, the project focuses on expressing a key hematopoietic cytokine, stem cell factor (SCF), in tobacco cells as fusion with a designer HypGP tag consisting of 20 tandem repeats of "Ala-Pro" dipeptide, or (AP)20. SCF is expected to function in facilitating in vitro generation of red blood cells from hematopoietic stem cells. The recombinant (AP)20-tagged SCF will be characterized in terms of secreted protein yields, molecular structure, Hyp-O-glycosylation, and biological activities in stimulating the proliferation, expansion and differentiation of relevant hematopoietic cell lines.

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

## PROVIDER ADHERENCE IN THE USE OF METFORMIN AS FIRST LINE TREATMENT IN T2DM

**Natalie Engelken** - Graduate  
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Diabetes affects 29.1 million Americans. Of that population, 90-95 percent are diagnosed with type 2 diabetes mellitus (T2DM). Uncontrolled diabetes can lead to numerous health complications and it is the 7th leading cause of death in the United States. Guidelines that stem from the American Diabetes Association have the highest level of evidence-based practice that supports the choice of medications recommended for diabetic patients. Adherence to the guidelines by primary care providers assures that best practice guidelines are being met. Metformin is considered first line pharmacologic treatment for patients with T2DM according to the American Diabetes Association. Metformin aids in weight loss and improvement of insulin resistance and is a cost-effective treatment. The purpose of this study is to assess provider adherence to first line pharmacologic treatment guidelines of the American Diabetes Association, when treating patients diagnosed with T2DM. A retrospective chart review of a convenience sample was performed on 30-40 charts of patients with the diagnosis of T2DM, age 18-85 years old, with diagnosis dates from January 1, 2013 to January 1, 2016. Demographic data was also collected on the relatively new diabetic patients. Results will demonstrate whether best practice guidelines are being met by providers.

*Mentor: Debbie Shelton, School of Nursing, dshelton@AState.edu*

*Mentor: Mark Foster, School of Nursing, smfoster@AState.edu*



## IDENTIFYING SALT TOLERANT ACCESSIONS WITHIN A RICE DIVERSITY PANEL USING PHENOMIC APPROACHES

**Kendl Fischer** - Undergraduate  
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Wheat and rice are the first and second most important crops for global food security. Of all cereals, rice is known to be susceptible to salt, an abiotic stress of growing importance in areas where this crop is cultivated. In order to meet global demand, it is necessary to develop new rice varieties capable of sustaining good yields under saline conditions. This work is part of a collaborative effort between the Walia and Lorence Laboratories. The Walia team has been studying the salt tolerance of a rice diversity panel at two developmental stages that are 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, have been sent to the Lorence team to study their response to salt stress at the early vegetative growth stage in greenhouse experiments. We have utilized a powerful high throughput phenotyping system, the Scanalyzer HTS, to acquire digital images using visible and fluorescence cameras to quantify the tolerance to salt of over 130 rice accessions grown in hydroponic conditions. In this work I will present my progress on the characterization of salt tolerant lines.

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

## A SOIL HEALTH INDEX FOR NORTHEAST ARKANSAS

**Allison Gurley** - Graduate  
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Soil is the basis of agriculture. Crop production requires soil management in order to obtain optimum yields and feed the world. Most of the soil management in agriculture focuses on the chemical aspects: nutrients and pH. However, the biological and physical components are also extremely important for overall soil health and agricultural productivity. The objectives of this research were to 1) develop a soil health index in order to quantify the chemical, physical, and biological properties and processes of the soil as a whole and 2) determine if soil textural differences would necessitate separate soil health indices. It was hypothesized that soil textural differences would necessitate at least two different indices for this region. Seventy soil samples were collected throughout the NE Arkansas region and various soil chemical, physical, and biological assays were performed on the 0-15 cm depth soil samples. Assays included soil organic matter, active carbon, soil enzyme assays, aggregate stability, carbon mineralization and others. Results and conclusions will be presented.

*Mentor: Steven Green, Agriculture and Technology, sgreen@AState.edu*

## COMPARING TOTAL SOLIDS AND CHLOROPHYLL-A VARIABLES MEASURED FROM COMPONENTS IN A RESERVOIR TAILWATER RECOVERY DITCH SYSTEM IN NORTHEAST ARKANSAS

**Leevi Haas** - Graduate  
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Reliance upon an alluvial aquifer and rainfall for irrigation in the Mississippi River basin under conditions of declining recharge, has helped shift considerations for a broader array of water storage and irrigation techniques in the conventional crop production. Sustaining groundwater supplies further emphasizes potential water quality changes that can occur within and downstream of production sites. This study examined water quality characteristics throughout one reservoir tailwater recovery ditch system (R-TWR) during events of water movement from irrigation, significant precipitation, or drawdown. While nitrate and phosphate concentrations were not significantly different in water sampled from GS-2 ditch sites during the 2015 growing season, total solids and chlorophyll-a concentrations were significantly different and trended inversely. These same measures failed to trend similarly at site 2-1, which suggests that the observed relationship may have been more heavily influenced by conventional agricultural production practices and infrastructure (culvert) placement associated with the monitored system.

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

## GREENHOUSE GAS FLUXES OVER ARKANSAS RICE VARIETIES

**Brett Hale** - Undergraduate  
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Arkansas produces 50% of U.S. national rice production. Rice is grown under flooded conditions, and produces more greenhouse gas (GHG) methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O) than other agriculture crops. GHG emissions were measured in four Arkansas rice varieties (Jupiter, CLXL745, Sabine, Francis) in a random block design with four replicates of flood irrigation. Fluxes were measured using vented flux chambers conducted at least once per week throughout the growing season. Known high rice emitters (Sabine, Francis) were compared to known low emitters (CLXL745, Jupiter). Total methane emissions were between 98-117 kg ha<sup>-1</sup> season<sup>-1</sup>, with no statistical difference between the high and low emitters (p<0.05). Nitrous oxide effluxes increased during mid-season fertilizer application and at end of season drain. Francis showed significantly lower above ground biomass in the chambers (4.03 kg m<sup>-2</sup>) than other varieties (5.01-5.09 kg m<sup>-2</sup>), otherwise no statistical differences in biomass were measured. We hypothesize that the low and high emitters were not distinguishable in this study due either to a heavier soil type under study, or to the unusual weather pattern during the 2015 growing season.

*Mentor: Greg Phillips, Agriculture and Technology, gphillips@AState.edu*

## LOCAL COMPLIANCE TO HEART FAILURE GUIDELINES COMPARED TO NATIONAL AVERAGE

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Treatment of heart failure with reduced ejection fraction (<45%) with an Ace-inhibitor or ARB has shown to improve quality of life, symptoms and decrease mortality rates by 20%-26%. (McMurray, et al, 2012). Despite numerous studies that have demonstrated the effectiveness and benefits of ace-inhibitor or ARB therapy, recent studies have demonstrated that compliance to the current recommended guidelines is still lacking. Research suggests that by achieving optimal compliance to these guidelines, mortality rates could be further decreased by 17%, or greater than 6,000 lives annually. (Fonarow, et al, 2011). The purpose of this study is to compare compliance rates of local providers to the national average in treating current heart failure patients according current to treatment guidelines. The study will be conducted using a retrospective chart review and data collection will include pharmacological treatments that utilized national treatment per guidelines. Outcomes of this project are still forthcoming, yet the results have the potential to provide knowledge in regard to the efficiency of adherence to guidelines by local providers. In turn, the findings of this study should help to identify gaps in care that need to be addressed that could have a local as well regional healthcare delivery impact.

*Mentor: Debbie Shelton, School of Nursing, dshelton@AState.edu*

## UNDERSTANDING AND PROMOTING NEURONAL DIFFERENTIATION THROUGH THE USE OF VARIOUS MATRICES

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Neurodegenerative disorders remain a growing, global health concern. Longevity of human lifespan have been on the rise, while neurodegeneration associated with age, as well as obtained from Traumatic Brain Injury (TBI), has increased the need for an effective treatment. The damage that occurs from degeneration could be halted or even be reversed if the damaged neurons are replaced. A hallmark feature of differentiated neurons is their inability to self-replicate, resulting in functional loss once they degenerate. An effective measure to address this would be to generate healthy, functional neurons from undifferentiated cells. A major challenge to this approach is the inability to differentiate functional neurons in large numbers. Specific matrices showed the ability to enhance neural differentiation. In this research rat fetal neural stem cells (NSC) were cultured on various nanoparticle matrices, such as graphene and silver, with the goal of promoting the differentiation of neurons. Neuronal differentiation was quantified using immunocytochemistry techniques and fluorescent imaging. Currently, preliminary results are obtained from the control experiments of differentiating rat neural progenitor cells. Subsequently, the influence that matrices have on differentiation will be investigated. Results of this research will allow us to make greater strides toward clinical applications for stem cell therapies.

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## CHEMICAL PROFILES OF OPUNTIA HUMIFUSA DEFENSE AND RESPONSE TO METHYL JASMONATE

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Cactus of the genus *Opuntia* are used as livestock forage and food crops in arid climates, especially during drought years. *Opuntia* species also promote soil health and prevent desertification. North American populations of *Opuntia* are currently under threat from the invasive South American cactus moth, *Cactoblastis cactorum*. *Cactoblastis* is shown to have strong negative impacts on the prickly pear cacti populations, however the native cactus moth *Melitara prodenialis* has little impact. Host plants are able to mitigate the impacts of *Melitara* through mucilage production and apoptosis, which can be observed. This defense is not induced by *Cactoblastis* herbivory. Volatile signaling has been shown to induce defense against *Cactoblastis*, but the specific defense cannot be visually observed and is unknown. We used HPTLC (High Performance Thin Layer Chromatography) to characterize plant profiles of *Opuntia humifusa* hosting *Cactoblastis* and *Melitara*, as well as methyl jasmonate treated plants. Using methods to visualize phenolics and terpenoids, we defined and quantified chemicals altered by the *Melitara* defense and chemicals induced by methyl jasmonate. This study has led to a better understanding of the defense as well as the role jasmonic acid plays in the regulation of the defense.

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## THE USE OF 405NM AND 464NM BLUE LIGHT TO INHIBIT LISTERIA MONOCYTOGENES IN READY-TO-EAT (RTE) MEAT

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Foodborne illness resulting from contaminating organisms occurring in Ready-to-Eat (RTE) foods and vegetables is a serious health concern in the United States. Improved and cost-effective techniques for disinfection are needed. Visible light ranging from 405nm to 464nm (blue light) was administered via handheld probe to an RTE meat product that had been inoculated with *Listeria monocytogenes*. One application of light energy at doses of 10, 30, 60, 90, and 120 J/cm<sup>2</sup>, was applied, in vitro, for each wavelength (405nm and 464nm). After 20 hours of incubation, colony forming units were counted and compared to controls to determine whether the light energy inhibited growth of *L. monocytogenes*. Each of the dose/wavelength combinations used in the experiment resulted in a significant inhibition of *L. monocytogenes*. Kill rates ranging from 69.55 – 85.25% were obtained. Blue light, delivered in the wavelength/dose combinations used in this study, is an effective in vitro inhibitor of *L. monocytogenes*. Blue light should be considered as a potentially effective, inexpensive tool in the effort to prevent contamination in food processing.

*Mentor: James Guffey, Physical Therapy, jguffey@AState.edu*

## SOCIAL MEDIA: IS IT AN EFFECTIVE FORM OF DISASTER MANAGEMENT?

**Cristi Harvey** - Undergraduate  
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This project aims to show effectiveness of social media within disaster preparedness and emergency management, as well as answer the questions "Who uses social media?" and "What age groups utilize the information given to them through social media outlets?" One example is the Center for Disease Control (CDC) using social media in a "Zombie Apocalypse" to relate information on preparedness for disasters to the younger generation. Using social media allowed target population to relate to disasters in a different way. Another example is the study about the flood in Thailand. It shows how social media has become a key platform that allowed people to interact with each other during the 2011 flood and receive useful information. For this study, several groups of people 18 years old and older were surveyed to find the patterns of their use of social media and when/if they use it during disasters. For additional information news and media sources, disaster response agencies, and peer reviewed articles were used. Results of this study will help agencies and/or institutions to determine whether they should use social media as an effective form of disaster management.

*Mentor: Joyce Olushola, Health, Physical Education and Sports Science, jolushola@AState.edu*

## ASSESSMENT OF AN EDUCATIONAL PLATFORM DESIGNED TO IMPROVE PRESERVICE PHYSICAL THERAPISTS' KNOWLEDGE OF PERSONS WITH AUTISM SPECTRUM DISORDER

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Recent evidence suggests that Autism Spectrum Disorder (ASD) is becoming one of the fastest growing developmental disabilities, making it imperative that healthcare professionals understand diagnostic characteristics and treatment strategies for the disorder. Therefore, the purpose of this study is to develop a tool that teaches doctoral physical therapy students key characteristics of persons diagnosed with ASD and how this knowledge may be applied to the clinical setting to improve care. Accordingly, we developed an electronic platform comprised of different presentation formats (e.g., Prezi, traditional Powerpoint, video linkages, web links for additional resources) on ASD and invited first, second, and third year physical therapy students to view and assess it. Changes in the students' level of knowledge were assessed quantitatively with pre- and post-test scores. In addition, student's qualitative comments about the presentation were analyzed. Long-term, the results of this study will be used to analyze the effectiveness of this novel educational platform and improve pre-service healthcare professional understanding of the clinical characteristics and care for persons with ASD. The findings of this research will be extended to other professional populations (e.g., students enrolled in nursing, educational, and athletic training programs) next year.

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## RELIABILITY OF HIP RANGE OF MOTION MEASUREMENT: SMART PHONE APPLICATION VERSUS THE UNIVERSAL GONIOMETER BY EXPERIENCED AND NOVICE CLINICIANS

**Lyric Hupp** - Undergraduate  
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Range of motion (ROM) is an important aspect of clinical evaluations, providing objective measures of joint motion to identify impairments for developing treatment plans. The purpose of this study was to explore the relationship between the Dr.Goniometer smartphone application (SA) and universal goniometer (UG) when measuring hip ROM between novice and experienced clinicians. Four novice and four experienced clinicians and twenty volunteers participated in this study. Using a counter-balanced design, volunteers rotated to each clinician, where clinicians measured active hip flexion, internal rotation, and external rotation with the UG and SA. Independent variables were the device and clinician experience level and the dependent variable was hip ROM. Intraclass correlation coefficients (ICC<sub>3,k</sub>) determined reliability between devices. Separate Pearson's Correlations determined the relationship between devices and relationship between novice and experienced clinicians for the devices. ICC<sub>3,k</sub> for intrarater reliability between clinicians was excellent, ranging from 0.770 to 0.970 (p<0.001) for all measures. There were strong correlations between the SA and UG for all measures (p<0.001) and between novice and experienced clinicians for all three measures with the SA and UG, ranging from r=0.881 to r=0.968 (p<0.001). Results show the Dr.Goniometer smartphone application can be used clinically by novice and experienced clinicians.

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## POPULATION DYNAMICS OF CHELONIANS IN AN URBAN LAKE IN JONESBORO, CRAIGHEAD COUNTY, ARKANSAS

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We surveyed Craighead Lake in Jonesboro, Craighead County, Arkansas for aquatic turtles. From July 2, 2015 to October 9, 2015 six hoop-net traps baited with fish were placed around the lake. Traps were set twice a week and checked twelve hours after they were set. Carapace length, carapace width, plastron length, and plastron width were all measured for each individual. The individual's sex and species were also noted, and a notch was made in one or more of its scutes to aid in future identification. Finally, a photo was taken of each individual's carapace and plastron. A total of six species were captured with red-eared sliders (*Trachemys scripta*) being the most common. A single, female razor-backed musk turtle (*Sternotherus carinatus*) was found and represented a county record and the first record for this species above the 35°N parallel in Arkansas. The only recaptures were red-eared sliders. Using the Schnabel Index, we estimated there to be 171 red-eared sliders in Craighead Lake. Our findings indicate a diverse chelonian community with a thriving red-eared slider population. Future studies should continue to analyze the effect of urbanization on turtle population demographics.

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

## OBESITY: IS DIET AND EXERCISE ADDRESSED IN THE CLINICAL SETTING WITH PATIENTS WITH A BMI OF 26 OR GREATER?

**Mary Krug** - Graduate  
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Obesity affects 32.2% of the United States population, Arkansas being rated the highest in the nation at 35.9%. (Stateofobesity.org 2015). For the purpose of this study Obesity is defined as a BMI of 30 or greater. This study is a retrospective chart review. The data will look at patient population from the Northwest portion of Arkansas, southern Missouri and west Tennessee. Patient populations will include both males and females of any ethnicity that are twenty years or older who have a BMI of 26 or greater. This is addressed to see if both patients who are at risk for Obesity and those with the diagnoses of Obesity are advised on diet and or exercises as an attempt to loss weight and decrease their risks for comorbidities. Data will also look if appointments were made for follow up to address the outcome of the interventions. Some comorbidities linked to Obesity include: hyperlipidemia, hypertension, diabetes and strokes. Data collection will be done at NEA Baptist in Jonesboro Arkansas. Data collected from this study will echo the need for intervention and the role of healthcare providers in the treatment of obesity.

*Mentor: Debbie Shelton, School of Nursing, dshelton@AState.edu*

## DECELLULARIZED ROOTS AS POTENTIAL SCAFFOLDS FOR MAMMALIAN STEM CELL CULTURE

**Najwa Lee** - Undergraduate  
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The shortage for human organs for transplantation is a very real issue. Bioengineering strategies to address this issue rely on the use of human tissues as scaffolds for the in vitro development of human organs. This project is aimed at providing an alternative approach by utilizing plant tissues as human organ tissue scaffolds. Immortalized "hairy roots" show diverse phenotypes and could offer distinct types of decellularized scaffolds to support growth and proliferation of stem cells. In this project, previously established hairy roots from different plant species are being tested for decellularization. We hypothesize that detergents will remove the cellular content within the root tissue. To test this hypothesis, the hairy roots were grown up to their mid-exponential growth stage and then transferred to different concentrations of detergent solutions. To evaluate the effectiveness of this treatment, protein and nucleic acid content are being measured. Our preliminary results suggest that detergent treatments are effective in decellularizing hairy root tissues offering potential alternative scaffolds that could be tested for growth of human stem cells.

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



## USING PHOTOTHERAPY IN THE MANAGEMENT OF OSTEOARTHRITIS: PILOT INVESTIGATION

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Knee osteoarthritis (OA) is a chronic degenerative disease that causes pain, structural changes, and limited activities of daily living (ADL). OA is the most common diagnosis leading to total knee replacement. Therapeutic exercise has proven effective in increasing quality of life and decreasing pain in OA sufferers. Low level light therapy (LLLT) has demonstrated similar positive effects on OA. This study investigates the effectiveness of combining LLLT with exercise to decrease functional limitation in OA patients. A single-blinded, placebo-controlled design with randomized allocation of a convenience sample was employed. Two treatment groups: the LLLT group (n=3, LLLT and exercise) or placebo group (n=3, placebo light and exercise) were compared. Outcome measures included pain (using a visual analog scale), range of motion, and functional limitation (Western Ontario and McMaster Universities Osteoarthritis [WOMAC] questionnaire). Measures were taken at baseline and the end of the study (8 weeks). The findings suggest that LLLT with exercise may decrease pain and improve functional limitation status more than exercise alone in persons with knee osteoarthritis ( $p < 0.05$ ). Synergistic treatments improve the quality of care as well as giving students experience in research and patient treatment.

*Mentor: James Guffey, Physical Therapy, jguffey@AState.edu*

## A GREENER CROSS-COUPLING OF SILICON AND BORON COMPOUNDS

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This research project explored the coupling of aryl silanes with aryl boron compounds, assisted by atmospheric oxygen. Typically, cross-coupling utilizes an organometaloid (such as aryl boron or aryl silicon) that couples with an organohalide, facilitated by the presence of a metal catalyst. This project demonstrates that the combination of two organometaloids in the presence of atmospheric oxygen results in similar outcomes. Several boronic esters and boronic acids, each with their respective substituents, were coupled with an aryl silane and then examined to determine products and obtain yields. Spectra from both nuclear magnetic resonance (NMR) and gas chromatography were collected to determine the presence and relative amounts of product compounds. Column chromatography was used to isolate the products. The field of synthetic chemistry has established a wide variety of known pathways and mechanisms. The reported chemistry can be considered a new tool in the synthetic toolbox.

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

## LATE SEASON IRRIGATION AND CROP PROTECTION MANAGEMENT IN COTTON SOIL CONSERVATION SYSTEMS

**Amanda Mann** - Graduate  
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Many cotton farmers in Arkansas have adopted soil conservation practices that include incorporation of winter cover crops and reduced tillage. They anticipate positive environmental impacts on soil health and runoff water quality, but they also expect economic benefits with acceptable crop yields without high production costs that reduce farm profit. Adoption of new conservation practices could necessitate adjustments in both irrigation and insect pest control. The purpose of this study was to evaluate whether current University recommendations for late season timing for the final irrigation and for termination of insecticides for crop protection from the key insect pest, *Lygus lineolaris*, were suitable for different conservation systems. The experiment was located on the Judd Hill Foundation Farm and was arranged in a split-split plot design in a 3-2-3 factorial (tillage-irrigation-protection) with three replications. Conservation system main plot treatments were no-till, cover crop with low-till, and conventional tillage. Subplots were termination timing for irrigation (early and recommended) and crop protection (untreated, recommended and extended). Plant, pest and environmental assessments were included through the season. Results validate crop protection recommendations. However, yield reductions indicate a need to review guidelines for irrigation timing and with no-till production.

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## COMPREHENSION STRATEGIES FOR TESTING

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The objective of this study is to observe and interact with a teacher who is teaching a new reading comprehension strategy to 6th grade students and see if this strategy proves to be helpful across all content areas, including the end of year standardized testing. The study will answer the questions: 1) If students are taught a new reading strategy, will they be able to use this strategy in all content areas, including testing? 2) If students are taught a new strategy to mastery, will it improve test scores and in class performance? The investigator will be present in the classroom at least two times to introduce the SQ3R reading strategy. First, the whole group of teachers will be taught to model the strategy, then the progress will be consolidated with the smaller groups. Upon the completion of the study, the investigator will collect observational data from the students, as well as their documented responses on classroom work. The investigator will return a third time to observe teachers using the strategy without guidance. Lastly, the study will examine the end of year testing data to see what the rate of reading comprehension is at the conclusion of the year.

*Mentor: Ryan Kelly, School of Teacher Education and Leadership, rkelly@AState.edu*

## CYCLASE-ASSOCIATED PROTEIN 1 (CAP1) EXERTS CELL CONTEXT-DEPENDENT FUNCTIONS IN BREAST CANCER

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Breast cancer is the leading cause of cancer-related mortalities in women. Identifying therapeutic targets is crucial for developing improved treatment strategies. The purpose of this study is to unravel roles for CAP1 in breast cancer cells, which exhibit substantial genomic and biological heterogeneity. Our hypothesis, based on the literature and findings from our lab, is that the actin-regulating protein CAP1 may regulate both cancer cell invasiveness and proliferation. We established stable CAP1 knockdown in a panel of breast cancer cells lines through RNA interference. Effects of CAP1 depletion on the invasiveness and proliferation of cancer cells were assessed in a variety of cell-based and biochemical assays. Depletion of CAP1 stimulated both proliferation and the metastatic potential in the metastatic cancer cells, whereas it actually inhibited them in the non-metastatic cancer cells. We further identify a pivotal role for ERK in mediating both CAP1 functions. The identification of the cancer cell type-specific functions for CAP1, as well as the mechanistic insights on the responsible cell signals that mediate CAP1 functions, carry important implication in ultimately opening up avenues for strategies effectively targeting CAP1 in the treatment of breast cancer, which is a highly diverse.

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

## HEIGHTENING DELIVERY OF FISH INTERLEUKIN-22 BY HARNESSING THE PLANT LECTIN RTB

**Brandi Mize** - Undergraduate  
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Aquaculture provides a major source of protein to the food supply chain. With limited interventions for managing farmed fish diseases, solutions are needed to limit economic losses to the aquaculture industry. While protein-based therapeutics have increased use in the human health sector, a major limitation to their sustainability in aquaculture is that proteins are naturally unstable and subject to loss-of-function. We hypothesize that an A-State-developed RTB carrier technology (Cramer/Dolan) can be used to deliver protein therapeutic payload across fish epithelial cells for 1) increased stability of the therapeutics and 2) improved efficacy. The cytokine, interleukin-22 (IL-22), identified as a modulator of fish immunity, was expressed as a fusion protein with RTB using a plant-based transient expression platform. Catfish IL-22 was constructed 5' and 3' to the RTB gene and cloned into a plant expression vector. Our cloning strategy and expression of these protein fusions will be presented. Western blot analysis will be used to determine which protein orientation is expressed better in plant systems to later direct the project using a particular construct for further research. The end goal of this project is to test if RTB can target the IL-22 basolateral receptors of fish epithelial cells for increased efficacy.

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



## INFLUENCE OF COVER CROPS AND TILLAGE MANAGEMENT ON ACTIVE SOIL CARBON IN A CORN/SOYBEAN ROTATION

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Soils sustain life, yet agricultural soils get beat up during tillage operations and often remain lifeless during the winter months. The objective of this research was to determine the impact of reducing tillage and growing a cover crop during the winter on active soil carbon. Active soil carbon is the readily available carbon that is decomposed by microorganisms, which releases soil nutrients and builds soil structure. It was hypothesized that reducing tillage or growing winter cover crops would increase the active soil carbon levels, indicating an improvement in organic matter cycling and improvement in soil health. An experiment was set up with treatments of tillage, no-tillage, with cover crop, without cover crop, in all combinations and replicated four times for a total of 16 plots. This experiment was repeated at three locations in Northeast Arkansas. After one complete growing year, samples were taken from each of the plots from the 0-15 cm soil layer. Soil samples were analyzed using the potassium permanganate method where active soil C is oxidized by potassium permanganate. Research on enhancing active soil carbon brings new ways to monitor improvement in soils health due to improved agricultural management.

*Mentor: Steven Green, Agriculture and Technology, sgreen@AState.edu*

## THE EFFECTS OF SOCIAL MEDIA ON COLLEGE STUDENTS' MOTIVATION TOWARD PERSONAL BRANDING EFFORTS

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Today, social media is an indispensable part of the college student's life. Everything students post and share on social media is forming their personal brands (Kapul, 2014). In this context, personal brand is primarily concerned with how an individual's trait, behaviour and action are perceived by others (Collins, 2012). By taking advantage of social media and building a personal brand, college students have the ability to use their skills and qualities to promote themselves to enterprises (Horton, 2011). However, most college students self-brand for other social reasons including dating, establishing friendship, or simply for self-expression (Shepherd, 2005). Therefore, it is important to analyze the significance of social media on personal branding efforts among college students. This study will put forward suggestions on how to enhance their personal brands so they will not be left behind due to hiring employers reviewing online profiles to select highly qualified candidates. In this study, we use a survey research method to measure the effect of social media on personal branding efforts of college students. Data collection will be implemented by a structured questionnaire administered through the mass-administered survey to social media users who are now students at Arkansas State University.

*Mentor: Po-Lin Pan, Media and Communication, ppan@AState.edu*

## A LOCAL PEDIATRIC CLINIC'S HPV VACCINE RATE VERSUS THE NATIONAL AVERAGE OF 42% IN BOYS AGED 13-17.

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Two prophylactic human papillomavirus (HPV) vaccines are available and have been shown in clinical trials to have high efficacy for prevention of infection and associated disease due to HPV types targeted by the vaccine (Markowitz et al, 2013). Even though research has proven the effectiveness of the vaccine, rates of vaccination are low in females and even lower in males. The latest estimates published in July, 2015 show that 60 percent of adolescent girls and 42 percent of adolescent boys have received one or more doses of HPV vaccine. The purpose of this study is to compare the first dose HPV vaccination rate of male patients age 13-17 in a local clinic in Paragould, Arkansas to the national average rate of 42 percent for first dose HPV vaccination in male patients age 13-17. This study will be conducted using a retrospective chart review. This research will show that providing strong recommendations, using each patient encounter to review immunization status, and offering the HPV vaccine at the same time as meningococcal and Tdap can improve the rate of boys aged 13-17 who receive at least their first dose of the HPV vaccine.

*Mentor: Mark Foster, Nursing and Health Professions, smfoster@AState.edu*



## FORMAL DIABETES EDUCATION AND GREATER CONTROL OF BLOOD GLUCOSE LEVELS

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Everyone knows someone who has been diagnosed with diabetes mellitus, Type 2 (T2DM). There are an estimated 23 million people with T2DM in the United States alone. Whether in the clinic or within the hospital setting, countless dollars are spent managing and/or treating this disease process annually. Complications from diabetes includes cardiovascular disease, stroke and renal insufficiency. The control of T2DM includes diet, exercise and proper medication management. Evidence from the literature review reveals that patients who are supported with formal diabetes education have greater success in management of their diabetes diagnosis with lowered glucose readings. This retrospective chart audit examines the charts of 30 patients (male and female) with a new diagnosis of T2DM who present at a local primary care clinic in Northeast Arkansas. Data extraction from the patient charts includes demographics and whether an appointment with a diabetes educator had been secured upon the initial diagnosis. Data analysis is expected to show the value of formal diabetes education in terms of delays in the complications of T2DM and a reduction in medical costs. Results of this study will give patients the opportunity to experience a greater quality of life for a longer period of time.

*Mentor: Debbie Shelton, School of Nursing, dshelton@AState.edu*

## IMPACT OF COVER CROPS AND TILLAGE MANAGEMENT ON CORN/SOYBEAN YIELDS

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Agriculture is known for trying to maximize yields, but the health of the soil gets abused with the repeated tillage and bare soils during non-row crop months. The objective of this research was to determine the impact of reduced tillage and growing cover crop during the row crop off-season on corn and soybean yields. It was hypothesized that in the short term reducing tillage and/or growing cover crops would not show significant difference in yields. An experiment was set up with treatments of tillage, no-tillage, with cover crop, without cover crop, in all combinations and replicated four times for a total of 16 plots. This experiment was repeated at three locations in Northeast Arkansas. After one cropping season the corn and soybeans were harvested and yield data was analyzed. Results of the research pose many environmental benefits for society.

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## OPTICAL TRACTOR BEAM ON CHIP

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Optical forces on a small particle near the surface of a dielectric slab waveguide are considered. A light wave of the fundamental mode is used to excite the particle. The transverse and longitudinal forces acting on the particle are studied. The particle is always trapped near the surface of the slab, where the electric field intensity is high. The particle can be pushed away from or pulled toward the light source along the surface of the slab by tuning the frequency around a switching frequency while the guided light in the material traps the particle. This phenomenon switches between scattering and gradient forces near the switching frequency of the dielectric slab waveguide.

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



## LIFESTYLE MODIFICATIONS IN PATIENTS WITH OBSTRUCTIVE SLEEP APNEA

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Patients who are diagnosed with Obstructive Sleep Apnea (OSA) can greatly benefit from lifestyle modifications. Complications of untreated OSA can include hypertension, stroke, and myocardial infarction. Education on lifestyle modifications could be easily matriculated into the primary care office visit for patients presenting for care. Recommendations for lifestyle modification include exercise, weight loss, sleep positioning, smoking cessation, and avoidance of alcohol and sedatives. There have been large amounts of evidence based research to substantiate the importance of patients to adhere to lifestyle modifications in their care plan. The purpose of this retrospective chart review is to evaluate if patients who are diagnosed with OSA have received education regarding lifestyle modification. Collected data will include patients aged 25-65 years who have an ICD 10 code of G47.33. Charts will be reviewed to evaluate if lifestyle changes were documented. Lifestyle modification education should be readily available for patients diagnosed with OSA. Primary care providers can positively impact these patients' overall health and reduce negative cardiovascular events by implementing lifestyle modification education.

*Mentor: Karen Olson, School of Nursing, kolson@AState.edu*

## REVISITING MIE SCATTERING THEORY FOR THE ANALYSIS OF THE PLASMONIC RESONANCE OF METAL NANOSPHERE

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An alternative correction of Mie scattering theory for the analysis of plasmonics resonance of metal is proposed. The analysis is based on the correction of Mie scattering theory originally developed for negative index media, which employs a solution using the Ricatti-Bessel functions in the calculation of Mie coefficients. Therefore, viewpoint of a time-reversal problem for the scattered fields is not a necessary, fundamental correction to the Mie scattering theory for spherical metal particles.

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## PREDICTION OF CREEP AND RECOVERY BEHAVIOR OF RECYCLED AND POLYMERIC ASPHALT BINDERS IN ARKANSAS

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In order to sustain high traffic volume and temperature, asphalt refinery introduced Polymer Modified Binders (PMBs) to enhance the durability and strength of asphalt concrete pavement. Further, due to the increasing cost of the regular paving grade asphalt binder and its environmental impacts, asphalt industries are compelled to use an increased amount of Reclaimed Asphalt Pavement (RAP) for road construction projects. The widely used American Association of State Highway and Transportation Officials (AASHTO) T315 method is inadequate to characterize PMBs- and RAP- modified binders because of the relatively small impact of the phase angle on the permanent deformation factor. In this study, a recently proposed Multiple Stress Creep Recovery (MSCR) test method was adopted to understand the creep response and recovery behavior of binders for resolving the aforementioned issue. To this end, paving grade PMBs and unmodified binders were collected from different refineries. The RAP binders were recovered from RAP course samples in the laboratory. These binders have been tested at different temperatures and stress levels. The outcome of this study can be used for characterizing the PMBs and RAP-modified binder without putting the supplier and user at risk and for grading these binders at local service temperatures and traffic conditions.

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## CHARACTERIZATION OF AGRICULTURAL AND INDUSTRIAL WASTE MODIFIED ASPHALT BINDERS USING AN ATOMIC FORCE MICROSCOPE

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For last several decades, researchers around the world have used nanoindentation techniques to characterize different materials for biological, medical, and polymer science applications. In recent years, nanoindentation techniques have been explored by some pavement professionals to characterize asphalt materials. This study used the nanoindentation-based PeakForce Quantitative Nanomechanical Mapping (PFQNM™) technique to evaluate ground tire rubber (GTR), reclaimed asphalt pavement (RAP), reclaimed asphalt shingles (RAS), and rice husk ash (RHA) modified asphalt binders. Along with the microstructures of the binders, mechanistic properties such as adhesion, energy dissipation, deformation, and DMT (Derjagin, Muller, and Toropov) moduli were estimated at different morphological phases of tested binders. The GTR-modified samples exhibited two distinct phases, Catana and Peri-phase, but the other additives provided an additional phase called the Perpetua-phase. Nanomechanistic properties in Catana- and Peri-phases were found to be similar but they were different for the Perpetua-phase. The DMT moduli in all three regions varied from 70 to 800 MPa, and the adhesion ranged from 8 to 12 nN. The dissipation energy was related to the adhesion, while the hardness depended on the deformation depth. The RHA reduced the hardness, but the other additives offered a significant increase in hardness for all binders.

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## A QUANTITATIVE COMPARISON OF HITS INCURRED TO THE HELMETS OF HIGH SCHOOL VERSUS COLLEGIATE FOOTBALL PLAYERS

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Increasing attention is being paid to the characteristics of head impacts incurred to the helmets of various football player positions. Indeed, the American Medical Society has identified player position as an important risk factor for concussions in high school and collegiate football and called for additional research in this area given the dearth of information on the topic. For the purposes of this research the helmets of high school and collegiate players were instrumented with Shockbox sensors, and hits incurred to the helmet during the 2015 football season were recorded. Statistical analysis will be used to examine the differences (e.g., cumulative hit number, magnitude, and direction of the hit) between the two groups. Long-term, the results of this study can be used to refine diagnosis, rehabilitation, and prevention efforts for players affected by concussion at both levels of play.

*Mentor: Cristy Phillips, Physical Therapy, cphillips@AState.edu*

## SYNTHESIS AND ANTIMICROBIAL STUDIES OF PYRAZOLE DERIVATIVES AS POTENT ANTI-METHICILLIN-RESISTANT STAPHYLOCOCCUS AUREUS (MRSA) AGENTS

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Antimicrobial resistance to antibiotics is a global concern. Without urgent and coordinated action, the world is moving toward a post-antibiotic era, in which normal infections or minor injuries may become fatal. In an effort to find new agents to combat this resistance, we report the synthesis and antimicrobial activities of ten pyrazole derivatives. These derivatives may be potential antimicrobial agents.

*Mentor: Mohammad Alam, Chemistry and Physics, malam@AState.edu*



## A CHARACTERIZATION OF CONCUSSION INCIDENCE AND TIMING AMONG NFL TEAMS DURING THE 2015 FOOTBALL SEASON

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The topics of concussion diagnosis, prevention, and management have been receiving increased attention in recent years at both the public and professional level. Indeed, several investigations have characterized the magnitude of head impacts that result in concussive events. Yet few studies, if any, have considered whether concussive events vary as a function of team variables (e.g., offensive/defensive schemes and concussion management practices). In this study statistical methods will be used to analyze publicly available NFL data to determine whether concussion incidence, timing, and return to play varies as a function of team membership. Long-term, the results of this study can be used to determine whether the various offensive and defensive schemes deployed by various NFL teams contribute, at least in part, to overall concussive risk.

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## DEVELOPMENT OF AN IMAGE ANALYSIS TOOLBOX FOR BIOLOGICAL IMAGING

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Researchers are using artificial extracellular matrix (aECM) to generate new tissues from cells to control the cell behaviors and replace the damaged tissues. For designing aECMs, it is essential to find out how cells are interacting with aECMs and remodel the matrix. To achieve this aim, automatic cell image analysis plays a vital role. The primary aim of this study is to analyze cell images by using Matlab software and identify the lowest and highest repeating structure that cells added to the aECMs. To this end, this study applied several image preprocessing techniques, including filtering, edge detection, image segmentation and clustering objects on collected and generated images in order to validate the results. Different filtering and edge detection techniques have been used to make the image surface smooth and sharp, to understand the image features and to extract accurate information. Another purpose of using the image segmentation process is to separate different color objects from the image to make our analysis easier for further processing. Finally, the resulting image analysis toolbox will be applied to fabricate the second and future generations of aECMs.

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## TAKE BACK THE TAP: STOP PAYING FOR OVERPRICED BOTTLED WATER

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Bottled water sales have steadily increased in the U.S. in spite of extremely high cost relative to tap water. Reasons for this include convenience, safety, and taste. We tested the hypotheses that people prefer the taste of bottled water over filtered tap water, and that this preference increased with increasing cost of the water. In a single-blind study, A-State students were haphazardly recruited to participate in a taste test comparing three types of water 1) Fiji bottled water (\$7.53/gal), 2) Dasani bottled water (\$3.79/gal), and 3) A-State Hydration Station water (\$0.005/gal). Water was presented in identical cups and temperature, but in randomly varying order, with re-tasting allowed. Students ranked the three waters in order of preference. Data were analyzed for a significant effect of water type and cost using a Kruskal-Wallis test on the ranks. Results suggest that there was no significant difference in the taste preference of tested students, and that increased cost did not result in increased preference. We conclude that there were no significant differences in the taste of bottled vs. tap water and that increasing cost does not result in better tasting water.

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## MONITORING EARLY SEASON COLONIZATION AND SPATIAL DISTRIBUTION OF THE TARNISHED PLANT BUG, *LYGUS LINEOLARIS*, IN MIDSOUTH COTTON

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Effective pest management is one of the most important aspects of producing any successful crop. The tarnished plant bug (*Lygus lineolaris* Palisot de Beauvois) is a key pest of cotton (*Gossypium hirsutum* L.) in the Midsouth. Chemical control is the primary method of crop protection in these areas. However, producers are looking for more environmentally and economically friendly pest management tactics. Current scouting methods using drop cloths and sweep nets are often ineffective in representing the source, distribution, and movement of these insects as they colonize a field. The purpose of this experiment was to evaluate the use of sticky cards for monitoring the origin and gradient of colonizing adults. The study areas were two large farm fields in Northeast Arkansas. Plant and traditional insect monitoring was used to evaluate the spatial distribution of *Lygus* infestations. One practical outcome from improved surveillance of young *Lygus* at the beginning of the season is that crop managers will be better equipped to direct insecticide applications to specific areas of the field in response to the level of infestation rather than applying broadcast applications to the entire field. Both environmental and economic benefits of the proposed approach are anticipated.

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## OLIGODENDROCYTE DIFFERENTIATION OF PROGENITOR CELLS THROUGH THE USE OF EXTRACELLULAR MATRICES AND EXOSOMES

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Oligodendrocytes are glial cells that form myelin sheaths around neuronal axons in the central nervous system. The sheath ensures high-speed conduction of nerve impulse. Damage to the myelin sheath, caused by degeneration of oligodendrocytes, leads to currently incurable diseases, such as multiple sclerosis. However, in recent times, stem cell therapy has given a hope to serve as a potential cure for the disorder. A promising strategy was to differentiate stem cells into oligodendrocytes for cell transplantation. However generating a large number of functional oligodendrocytes for transplantation has been a challenge. Extracellular matrices and exosomes have been shown to influence neuronal differentiation, but their role in oligodendrocyte differentiation is still elusive. Our aim is to differentiate neural progenitor cells into functional oligodendrocytes by using matrices and exosomes to differentiate a large number of functional oligodendrocytes. Neural stem cells are maintained in both control and experimental conditions. Immunocytochemistry - fluorescence imaging techniques - will be employed to determine the rate of differentiation and co-culture of neurons and the newly differentiated oligodendrocytes is planned to test if the newly differentiated oligodendrocytes could form myelin sheaths. Results of stem cell culture and differentiation may be applicable in curing demyelinating disease such as multiple sclerosis.

*Mentor: Malathi Srivatsan, Biological Sciences, msrivatsan@AState.edu*

## IS THE DIAGNOSIS OF PNEUMONIA LESS PREVALENT IN ELDERLY WHEN VACCINATIONS PCV13 AND PPSV23 ARE ADMINISTERED?

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The Centers for Disease Control and Prevention (CDC) recommended two vaccinations, PCV13 and PPSV23, for the prevention of pneumonia in patients ages 65 years of age and older. The objective of this study is to investigate whether patients aged 65 years and older present with a diagnosis of pneumonia with a previous history of one or both recommended vaccinations. Data was collected over a one-year time frame (2015-2016) using a retrospective chart review of approximately 50 charts at a primary care clinic in Jonesboro, Arkansas, with an ICD-10 codes of J15.9, J15.4, J14, J12.9, J12.0, and/or J12.1. Descriptive statistics will be utilized to determine if patients aged 65 years and older who present with a diagnosis of pneumonia received recommended vaccinations. Data analysis is currently pending. The results of this study may reveal the importance of vaccinations and pneumonia prevention with PCV13 and/or PPSV23 as recommended by CDC guidelines, thereby potentially decreasing mortality and morbidity rates due to pneumonia in the elderly population. Understanding the importance of adherence to CDC guidelines enhances regional, state, and national health. Education may be developed from this study to promote the series of vaccinations to the elderly population and healthcare providers.

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## FLUORESCIN DIACETATE HYDROLYSIS

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Agricultural soils get beat up during tillage operations and often remain lifeless during the winter months. The objective of this research was to determine the impact of reducing tillage and growing a cover crop during the winter on Fluorescein Diacetate Hydrolysis. Fluorescein Diacetate Hydrolysis measures the amount of enzyme activity produced by microbes soil samples. The hypothesis was that reducing tillage or growing the winter cover crops would increase the enzyme activity, indicating an improvement in organic matter cycling and improvement in soil health. An experiment was set up with treatments of tillage, no-tillage, with cover crop, without cover crop, in all combinations and replicated four times for a total of 16 plots. Fluorescein Diacetate Hydrolysis was repeated at three locations in Northeast Arkansas. After one growing year, samples were taken from each of the plots from the 0-15 cm soil layer. Soil samples were analyzed using an incubation period of 3 hours with the fluorescein diacetate substrate, which would turn the enzymes in the sample a bright yellow glow and the stronger the glow, the more activity in the sample. Results of this research can be used to advance the use of cover crops through enhancing Fluorescein Diacetate Hydrolysis.

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## DETECTING TYPE 2 DIABETES AND PREDIABETES AMONG ASYMPTOMATIC ADULTS: A COMPARISON OF THE U.S. PREVENTIVE SERVICES TASK FORCE GUIDELINES

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Type 2 diabetes (T2DM) and prediabetes is one of the most prevalent problems facing Arkansans. By incorporating evidenced-based screening guidelines, family nurse practitioners are well-positioned to combat this epidemic. Screening guidelines that identify the greatest number of individuals with prediabetes or T2DM will allow for initiation of evidenced-based interventions that improve patient outcomes and reduce the burden of the disease on individuals and society. In light of new evidence that lifestyle interventions can prevent or delay the progression of T2DM and prediabetes, the U.S. Preventive Services Task Force has revised their screening guidelines in the hope that it will identify more adults with undiagnosed T2DM and prediabetes. To date, there are no studies comparing the case-finding ability of the two guidelines. The aim of this study is to compare the case-finding ability of the two guidelines when applied in a rural family practice setting in Northeast Arkansas. A retrospective chart review and a 2-tailed independent t-test was utilized to determine if there was a significant difference in the case-finding ability of the guidelines. This study will add to the body of knowledge regarding which risk factors for T2DM and prediabetes are most efficacious when applied in screening guidelines.

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## SCHOOL REPORTED BMIS AND LIFESTYLE CHANGES

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Do parents make lifestyle and/or dietary changes upon receiving an elevated BMI from mandated reporting on their children? Childhood obesity is rapidly becoming a health crisis in this nation. Obesity can lead to the development of chronic illnesses, and increased health care costs. To help combat the obesity crisis in the pediatric population, Arkansas legislation mandated that every public school system perform health screenings and report BMI results of students to parents yearly. This research aims to identify the correlation among lifestyle changes and mandated BMI reports among parents of students in Northeastern Arkansas. A cross sectional 10-question survey was administered to parents of school-aged children inquiring about BMI reports and lifestyle changes made. The survey was administered in a rural family practice clinic. Data analysis is pending. Descriptive statistical analysis will be utilized for easily, understandable presentation of results. Childhood obesity is a health crisis that warrants swift and adequate attention. This study helps highlight some success of the mandated BMI reports, as well as identifies areas of needed improvement in Northeastern Arkansas. Further research into limitations of type of lifestyle changes made could highlight ways to better serve this patient population.

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## EXERCISE MOTIVATION IN COLLEGE STUDENTS

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It is apparent that physical activity is deemed necessary for improving overall health. Motivation for exercise among people, specifically college students, is an imperative concern due to the benefits of habitual exercise itself in addition to the decline of exercise among college students. We believe that students, particularly freshmen women living on campus, will be the most frequent in the Red Wolf Center, as this population will be exercising with an event in mind. We plan to survey the college students as they come into the Red Wolf Center. Convenience sampling will be utilized and will not discriminate on race, gender, etc. We believe this method will be best so we will not have to ask the preliminary question of if they go to the gym. For our data analysis, we will be using descriptive statistics to observe and categorize our variables into cohorts based on gender, classification, and reasoning for his or her visit.

*Mentor: Joyce Olushola, Health, Physical Education and Sports Science, jolushola@AState.edu*

## TRANSPARENT DFT: A MASSIVELY PARALLEL COMPUTING FOR DENSITY FUNCTIONAL THEORY PROGRAM

**Natsuki Tanaka** - Undergraduate  
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There are calculations needed in chemistry and other disciplines that are too complex for regular computers to achieve. Among those calculations is the Density Functional Theory (DFT). Most commercial DFT programs are written in multiple programming languages (such as C++, Fortran, or Java), and complex libraries are used to handle large scale computations. In this project, we developed a “transparent” computational DFT code which is written only in C++ and is easy to read for all chemists. We also used GPU-accelerated computing to increase calculation speed. GPU-accelerated computing is the use of a graphic processing unit (GPU) together with a CPU to accelerate scientific discovery and other applications. The simple structure of this program can be useful for students and researchers to understand the flow of DFT calculations. The algorithm we developed runs even through a tablet device, so researchers can check the current status of their calculations anytime and anywhere. The program was successfully translated to C++ AMP (C++ for GPU computing) and its calculation speed is 800~900 times faster than the original CPU-based program.

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

## STALKING PERCEPTIONS WITH DIFFERENT RELATIONSHIP STATUSES

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Stalking is a topic of interest because it can damage the wellbeing of the victim of this behavior. There has been a growing interest in examining what influences perceptions of stalking, as some behaviors may seem to “mimic” normal courtship behavior and thus may be ambiguous and subject to interpretation. The goal of this study is to examine how relationship status and gender impacts perceptions. College students will be asked to gauge their perceptions of stalking based on a 2 (male, female) by 3 (relationship, no relationship, casual dating, married) design. The dependent variable will be the perceptions of stalking that the participant has for each situation. For instance, participants will be asked how scared they think the victim will be, ranging from very scared to not scared at all. The study will be conducted by an online survey. A factorial ANOVA will be used to analyze this study. Our hypothesis is that participants will believe that female victims of male stalking who they are not dating will be more fearful than those who are currently in a dating or married relationship.

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## THINKING LIKE MACGYVER: OVERCOMING FUNCTIONAL FIXEDNESS IN INSIGHT PROBLEM SOLVING

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Functional fixedness is a phenomenon that occurs when a person focuses on an object’s intended purpose rather than considering creative uses. Using a method like MacGyver, (the general parts technique [GPT]), participants can overcome functional fixedness by mentally breaking down objects into individual parts. We hypothesized that if the parts of an object can be thought as separately from the object as a whole, it will decrease functional fixedness for participants using GPT training. Participants in this between-subjects experiment were randomly assigned to either the General Parts technique training or Word Association (control group) prior to attempting to solving five insight problems. Because of this hypothesis, we added the variable of eye closure. We found differences in accuracy between participants who partook in either group. The experimental group (GPT training) had a higher accuracy rate than those in the control (WA training) group. The reason for this finding was because using a General Parts technique (mentally breaking items down into their parts) frees up mental resources and allows for more accurate responses. Support for our research was found by analyzing the data. A factorial ANOVA was run and statistical significance was found at the .05 level.

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## EFFECT OF WATER STRESS IN THE FOLIAR ASCORBATE CONTENT OF SELECTED RICE CULTIVARS

**Molly Tibbs** - Undergraduate  
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Vitamin C (L-ascorbic acid, AsA) is a water-soluble antioxidant that plays a key role in cell growth, cell signaling, and protection from oxidative stress. Humans can’t synthesize vitamin C, so we must acquire it through the diet. Elevated AsA in plants results in longer shelf life, increased nutritive value, and greater tolerance to environmental stresses, including drought. Rice is a primary staple crop for over half of the global population. Rice requires a sufficient water supply in order to thrive. Severe or prolonged drought may cause disturbances in plant metabolism and photosynthesis, and lead to reduced growth, lower yield or plant death. This problem is relevant to rice producing areas including the USA since drought is currently a major global issue. The goals of my project are to 1) determine the total, reduced, and oxidized foliar ascorbate content of selected rice germplasm of importance for Arkansas under normal conditions and 2) study how drought stress alters the redox balance of these rice cultivars. Under normal conditions I have found foliar AsA content to vary between 1.6 and 7  $\mu\text{mol/g}$  fresh weight. I am currently evaluating the effect of water limitation in the AsA content of these valuable genetic resources.

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

## QUANTITATIVE ANALYSIS OF THE PUTATIVE SPEED AND MAGNITUDE OF FORCES INCURRED TO HELMETS OF MALE AND FEMALE BATTERS AND CATCHERS

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Collegiate batters are at risk for concussions after incurring a hit to the helmet. Prior work has shown an incidence of hits to the helmets of collegiate male batters to be 0.23 per 1000 exposures during games, and consequences can be dire. Of the head injuries in baseball, ball impact (e.g., foul ball deflections) has been proposed as the leading mechanism of injury. Notably, little is known about the incidence of concussions in female collegiate batters which is problematic since females experience a greater number of concussions than males during games and have a greater likelihood of adverse outcomes. This knowledge prompted this study to determine whether ball speed or overall differences in magnitude might contribute, at least in part, to adverse neurological sequelae in female versus male players. A catchers helmet was instrumented with a Shockbox sensor and recorded the speed and magnitude of forces incurred to the helmet following pitches from a softball and baseball pitcher. Analysis of the pilot data will provide a better understanding of the biomechanical differences incurred to the helmets of batters and catchers at the collegiate level and will provide new insight into how these factors might contribute to concussions.

*Mentor: Cristy Phillips, Physical Therapy, cphillips@AState.edu*

## ANALYSIS OF Δ-TOCOTRIENOL IN SEEDS AND HAIRY ROOTS OF ANNATTO

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Annatto (*Bixa orellana*) is a tropical plant native to South America which has been used as a traditional medicine to treat multiple diseases including skin infections, respiratory problems and malaria. Previously, the Medina-Bolivar laboratory established hairy root cultures of annatto to identify and produce potential bioactive compounds with potential anti-malarial activity. One of these compounds was  $\gamma$ -tocotrienol, one of the eight E-vitamins. In order to do a thorough characterization of tocotrienols in the hairy roots of annatto, tocotrienols were extracted from the root tissue and analyzed by high performance liquid chromatography (HPLC). Since the seeds are the most common source for annatto-derived tocotrienol, the levels of tocotrienols in seeds are being compared to those obtained from hairy root tissue. Seeds from two different accessions of annatto are being analyzed for tocotrienol content. Due to the high levels of pigments present in annatto seeds, we expect that extracts from the seeds will show a more complex HPLC chemical profile of compounds when compared to the hairy roots. Therefore, annatto hairy root may serve as a better source for the purification of  $\gamma$ -tocotrienol.

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

## ARE DEPRESSION GUIDELINES BEING FOLLOWED IN THE PRIMARY CARE SETTING?

**Kelly Vrettos** - Graduate  
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Are Depression Guidelines Being Followed in the Primary Care Setting? Kelly Vrettos Arkansas State University Abstract This study will examine the treatment modalities of prescribing providers when treating those individuals who are diagnosed with a major depressive disorder (MDD). This study aims to examine prescribing practices and determine if the American Psychiatric Association (APA) guidelines are being followed for the treatment of MDD. Random patient records (N=51) will be accessed through the electronic medical records and recorded based on those individuals who were prescribed medication only, medication and supportive therapies, or supportive therapies only. I predict that the APA guidelines are not being followed and that the majority of patients with MDD will have been prescribed medication only as opposed to being treated with anti-depressants in conjunction with other supportive therapies, which is consistent with recent research conducted on the under treatment of MDD by primary care providers (Bet, et. al., 2013). Results and conclusion are pending. Reference: Bet, P. M., Hugtenburg, J. G., Penninx, B. W., Balkom, A. V., Nolen, W. A., & Hoogendijk, W. J. (2013). Treatment inadequacy in primary and specialized care patients with depressive and/or anxiety disorders. *Psychiatry Research*, 210(2), 594-600. Retrieved February 01, 2016.

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

## CONTAMINANT REDUCTION ABILITY OF IRON OXIDES TOWARDS 4-NONYLPHENOL

**Kristiana Watson** - Undergraduate  
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The adsorption of nonylphenol onto the surface of iron minerals was studied here using spectroscopic and computational methods. Adsorption characteristics of prominent peaks from suspended and adsorbed nonylphenol on surface iron minerals were studied by ATR-FTIR spectroscopy. The adsorption characteristics were then used to test the feasibility of using iron minerals to naturally remove these persistent emerging organic contaminants from polluted waters. Three types of iron oxides were studied. Goethite, micro-hematite and nano-hematite were used as adsorption/ removal agents to investigate their ability to remove nonylphenol from suspended contaminated solution. The highest "removal capability" was observed when nano-hematite was used, which removed about 80% of the nonylphenol from suspended solution. Micro-hematite and goethite each removed approximately 60% and 50% of NP respectively. Since nano-hematite had the largest measured surface area, we could conclude that the adsorption/removal capability of iron oxides related strongly to its surface area (or surface sites) available for adsorption.

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

## CARDIOVASCULAR DISEASE PREVENTATIVE SCREENINGS IN OBESE PATIENTS

**Nancy White** - Graduate  
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Do primary care providers screen for cardiovascular risk factors in obese patients? More than 70% of the population of the United States is considered overweight or obese. Obesity increases the risk of almost all forms of cardiovascular disease (CVD), which is the leading cause of death worldwide. The identification of metabolic abnormalities such as hyperglycemia and hyperlipidemia are important risk factors directly associated to CVD. The goal of this retrospective chart review was to determine whether lipid and glucose screenings are being performed by providers on patients identified as obese (Body Mass Index (BMI)  $\geq 30$ ) as an effort to identify those with increased risk factors for CVD. A retrospective, observational chart review was utilized on charts of patients aged 19-65 years with a BMI  $\geq 30$  at a local private physician's office in Northeast Arkansas. Descriptive statistics will be used to determine whether local providers are screening for hyperglycemia and hyperlipidemia on patients with the co-morbidity of obesity. Data collection is ongoing at this time. Often the burden of health is placed upon compliance of the patient. This study shifts the focus of health promotion/disease prevention to the primary care provider. Early diagnosis and treatment of both hyperglycemia and hyperlipidemia by the provider may potentially lead to better health outcomes for patients.

*Mentor: Debbie Shelton, School of Nursing, dshelton@AState.edu*

## CAP1 IS REQUIRED FOR BOTH INVASIVENESS AND PROLIFERATION IN PANCREATIC CANCER CELLS

**Dominic Williams** - Undergraduate  
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Pancreatic cancer has the worst prognosis among major cancers, with a 5-year survival rate at approximately 4%. The purpose of this study is to determine roles for the actin cytoskeletal protein CAP1 and its phosphorylation in the invasiveness and proliferation of pancreatic cancer cells. Our hypothesis, based on the preliminary results generated in our lab, is that CAP1 may play roles in the two most prominent hallmarks of cancer. We silenced CAP1 in a panel of pancreatic cancer cell lines using RNA interference, and determined effects on cancer cell proliferation and invasiveness in a variety of cell-based and biochemical assays. The specificity of the phenotypes observed was further confirmed through a rescue strategy. While no evidence supports up-regulation of CAP1 in the cancer cells, phosphorylation at the S308/S310 regulatory site on CAP1 was elevated. CAP1 depletion led to reduced cell motility and invasion. Moreover, knockdown of CAP1 also inhibited the anchorage-independent growth of cancer cells, and ERK appears to mediate this function. In conclusion, we unravel roles for both CAP1 and its phosphorylation by upstream cell signals in the the invasiveness and proliferation of pancreatic cancer cells; these findings suggest potential for CAP1 as a therapeutic target for pancreatic cancer.

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

## PROVIDER ADHERENCE IN THE INITIATION OF STATIN THERAPY FOR LOW-DENSITY LIPOPROTEIN LEVELS >100MG/DL IN WELL PATIENTS

**Kirk Williamson** - Graduate  
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Hyperlipidemia is a risk factor for serious diseases including coronary heart disease, peripheral vascular disease, and cerebrovascular accidents. Early identification, treatment of hyperlipidemia has been proven effective in decreasing the incidence of these diseases. Statin medications are recommended therapy for patients who have low-density lipoprotein (LDL) levels of  $>100$ mg/dl by the American Heart Association. The United States Preventive Task Force recommends screening well patients at age 35 for hyperlipidemia. The purpose of this retrospective chart review is determining if statin therapy is begun by primary care providers on patients with LDL levels  $>100$ mg/dl that were detected during routine wellness examinations. The chart audit included charts of patients who presented for wellness examinations with the incidental finding of LDL levels  $>100$ mg/dl. Collected data included whether statin therapy was begun along with demographics of the population included in chart reviews. Data analysis is pending. Guidelines set forth by the American Heart Association are evidence-based and lead to best practices in the clinical setting. Adherence of guidelines by primary care providers in the treatment of hyperlipidemia has potential to reduce consequences such as cardiovascular disease and stroke.

*Mentor: Debbie Shelton, School of Nursing, dshelton@AState.edu*

## IN VITRO EXPRESSION AND APPLICATION OF A THERMOSTABLE ENDO-ARABINANASE FOR GENERATING FUNCTIONAL OLIGOSACCHARIDES FROM BEET PULP FOR COLON-SPECIFIC HEALTH BENEFITS

Ningning Zhang - Graduate  
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Sugar beet pulp (SBP) is a rich source of cell wall polysaccharides, but primarily used as low-value animal feed. To improve the economic viability of the sugar beet industry, SBP can be improved to generate value-added bioproducts. The overall goal is to develop an efficient enzymatic platform for generating functional oligosaccharides, specifically, feruloylated arabino-oligosaccharides (FAOs), from SBP. FAOs may benefit new food and feed applications for better colon functioning through prebiotic and anti-inflammatory activities. FAOs of defined structure can be released from cell wall polysaccharides using a key hydrolytic enzyme, endo-arabinanase (ABN). In this study, a thermostable endo-1,5- $\alpha$ -L-ABN from *Bacillus thermodenitrificans* was expressed in yeast (*Pichia pastoris*) to produce active enzyme for extracting FAOs from SBP. The recombinant enzyme was secreted into culture media at a yield of approximately 70 mg/L and showed a specific enzymatic activity of 350 U/mg. FAOs were recovered from SBP polysaccharides through affinity chromatography following the ABN treatment, and characterized in terms of mono-sugar composition, ferulic acid content and degree of polymerization with GC, HPLC and HPAEC, etc. Finally, human colon epithelial T84 cell was used to assay the functions FAOs in modulating the tight junction of the colonic cells.

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

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

CREATE @ STATE

A Symposium of Research, Scholarship & Creativity

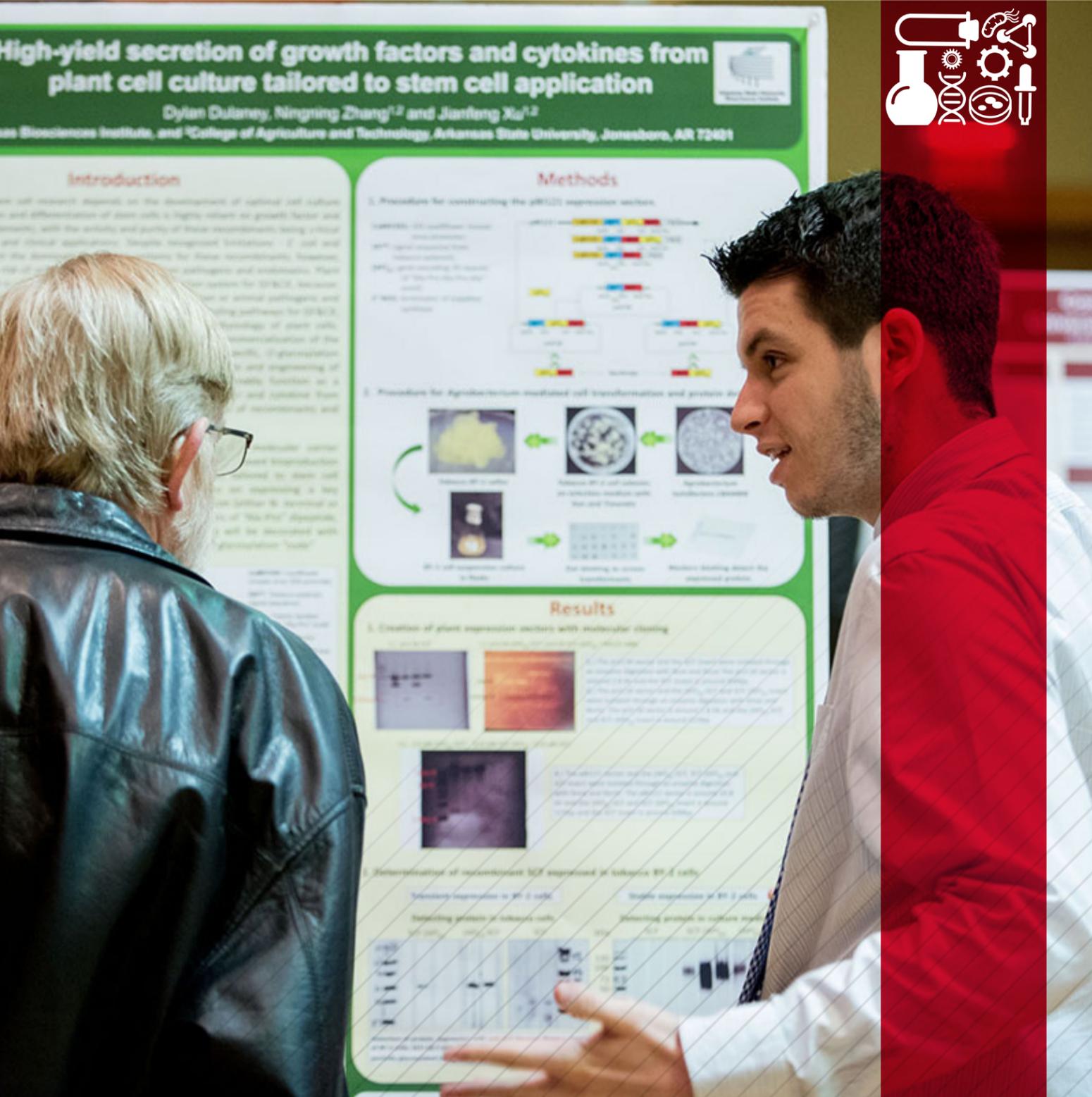
Create @ State was possible because of the tireless efforts and volunteerism of the Student Research Advisory Committee, the Student Research Ambassadors, the Student Research Council, and the presentation judges. Research & Technology Transfer would like to thank all of whom made these efforts such a wonderful and educational experience for the student presenters and the A-State community.





# Presentation Winners

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## ORAL PRESENTATION WINNERS

### Undergraduate - STEM

#### 1st Place **Santiago Gonzalez**

Synthesis of Novel Antibiotics with Dihydropyrimidinone and Phenethylamine Scaffolds  
*Faculty Mentor: John Hershberger, Chemistry and Physics*

#### 2nd Place **Morgan Tripod**

The Methods of Transportation and the Regulation of Interleukin-22 Provides a Potential Therapeutic Target for Inflammatory Bowel Disease  
*Faculty Mentor: Maureen Dolan, Biological Sciences*

### Undergraduate - Psychology and Other Analytical Studies

#### 1st Place **Emily Peters**

Student Perception of the Benefits of Academic Education Partnered with Technical Training at Homeland Security's Center for Domestic Preparedness  
*Faculty Mentor: Brent Cox, Disaster Preparedness/ Emergency Mgmt*

### Graduate - Engineering and Math

#### 1st Place **Nayan Kumar Paul**

Manipulation of Small Particles on the Surface of a Material  
*Faculty Mentor: Brandon Kemp, Electrical Engineering*

### Graduate - Bio and Environmental Studies

#### 1st Place **John Artim**

The Role of Habitat and Community Association in the Spatial Distribution of a Temporary Coral-Reef Fish Parasite  
*Faculty Mentor: Paul Sikkel, Biological Sciences*

#### 2nd Place **Morgan Slevin**

Nest Site Selection and Nest Survival of Prothonotary Warblers in East-Central Arkansas  
*Faculty Mentor: Than Boves, Biological Sciences*

### Graduate - Other Analytical Studies

#### 1st Place **Ryan Smith**

Going North: The Burkhammer Family of Greene County, Arkansas, and Davis, Michigan  
*Faculty Mentor: Cherrise Jones, History*

## POSTER PRESENTATION WINNERS

### Undergraduate - Environmental Studies

#### 1st Place **Morgan Harlin**

Chemical Profiles of *Opuntia humifusa* Defense and Response to Methyl Jasmonate  
*Faculty mentor: Greg Phillips, Agriculture and Technology*

### Undergraduate - Other STEM

#### 1st Place **Kendl Fischer**

Identifying Salt Tolerant Accessions Withing a Rice Diversity Panel Using Phenomic Approaches  
*Faculty mentor: Argelia Lorence, Chemistry and Physics*

### Undergraduate - Behavioral Science

#### 1st Place **Laura Tedder**

Thinking like Macgyver: Overcoming Functional Fixedness in Insight Problem Solving  
*Faculty mentor: Dawn Weatherford, Psychology*



**Undergraduate - Physical Fitness and Health****1st Place Lyric Hupp**

Reliability of Hip Range of Motion Measurement: Smart Phone Application Versus the Universal Goniometer by Experienced and Novice Clinicians  
*Faculty mentor: Ashley Thrasher, HPESS*

**Undergraduate - Biology****1st Place Brandi Mize**

Heightening Delivery of Fish Interleukin-22 by Harnessing the Plant Lectin RTB  
*Faculty mentor: Maureen Dolan, Biological Sciences*

**2nd Place Dominic Williams**

CAP1 is required for both the Invasiveness and Proliferation in Pancreatic Cancer Cells  
*Faculty mentor: Guolei Zhou, Biological Sciences*

**Graduate - Obesity & Diabetes****1st Place Regina Strop**

(Tie) School Reported BMIs and Lifestyle Changes  
*Faculty mentor: Debbie Shelton, School of Nursing*

**1st Place Megan Burke**

(Tie) Preventive Services in the Intellectually Disabled Population of North East Arkansas  
*Faculty mentor: Mark Foster, School of Nursing*

**Graduate - Physical Therapy****1st Place Grafton Harrell**

The Use of 405nm and 464nm Blue Light to Inhibit *Listeria monocytogenes* in Ready-to-Eat (RTE) Meat  
*Faculty mentor: J. Stephen Guffey, Physical Therapy*

**Graduate - Nursing****1st Place William Burns**

Examining the Use of Albuterol in Pediatric Patients Diagnosed with RSV-Induced Bronchiolitis  
*Faculty mentor: Mark Foster, School of Nursing*

**Graduate - Other Analytical Studies****1st Place Viet Nguyen**

The effects of social media on college students' motivation toward personal branding efforts  
*Faculty mentor: Po-Lin Pan, Communication*

**Graduate - Engineering****1st Place Samia Sanjari**

Development of an Image Analysis Toolbox for Biological Imaging  
*Faculty mentor: Brandon Kemp, Electrical Engineering*

**Graduate - Biological and Agricultural Studies****1st Place Ningning Zhang**

In Vitro Expression and Application of a Thermostable Endo-Arabinanase for Generating Functional Oligosaccharides from Beet Pulp for Colon-Specific Health Benefits  
*Faculty mentors: Brett Savary and Jay Xu, ABI*

**2nd Place Lucia Acosta-Gamboa**

Optimization of Drought Stress High Throughput Phenotyping Assays in Arabidopsis  
*Faculty mentor: Argelia Lorence, Chemistry and Physics*



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