

# This is Research: Student Symposium 2018

## Full Program

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**Title:** The core microbiome: Implications for conservation efforts and propagation of freshwater mussels

**Primary Author (and presenter):** Aceves, Alison K.

**Additional Authors:** Arias, Cova R.; Johnson, Paul; & Bullard, Stephen A.

**Department:** Fisheries, Aquaculture and Aquatic Sciences

**College/ School:** College of Agriculture

### **Description:**

Freshwater mussels (Bivalvia: Unionidae) are the most imperiled faunal group in North America. Alabama harbors the highest biodiversity of freshwater mussels in the world and currently leads restoration efforts across the Southeast. In collaboration with the Alabama Department of Conservation and Natural Resources, we are investigating the role of bacterial communities, using 16S rRNA gene sequencing, found in cultured and in-stream mussels and how environmental factors such as water and sediment influence these communities. We collected a total of 21 Alabama rainbows (*Villosa nebulosa*) from the Alabama Aquatic Biodiversity Center, reared from two different wild stocks (Shoal Creek n = 5 and Flannigan Creek n = 5), as well as, in-stream *V. nebulosa* (Shoal Creek n = 9, Flannigan Creek n = 2). Overall, the microbial communities between cultured and wild mussels were significantly different. Within populations, the microbial communities of wild mussels could be differentiated based on collection locality while all cultured mussels exhibited statistically identical communities, regardless of their parent population. Results from multidimensional scaling and analysis of similarity in operational taxonomic units (OTUs) showed that water and sediment had little overlap with the gut bacterial communities found in mussels. Our results do indicate that microbial communities found in sediment samples, although unique to the locality (Shoal Creek, Flannigan Creek, and cultured), were relatively similar, in terms of microbial diversity. Conversely, microbial communities found in water samples were quite different among all three environments sampled and the lower diversity found in cultured water could explain why cultured mussels exhibited a significantly lower microbial diversity than their wild counterparts. These results collectively demonstrate that a core gut microbiome exists in the species *V. nebulosa*, but the microbiome of cultured mussels differed from the wild.

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**Title:** Establishing a New Spectrokinetic Approach to Study the Redox Properties of Solid Catalysts

**Primary Author (and presenter):** Adams, William, R

**Additional Authors:** Moncada, Jorge; Thakur, Raj; Carrero, Carlos A.

**Department:** Department of Chemical Engineering

**College/School:** Samuel Ginn College of Engineering

### **Description:**

The use of heterogeneous catalysts in industry is ubiquitous, with applications to myriad chemical processes such as catalytic cracking, ammonia and sulfuric acid synthesis, Fischer-Tropsch synthesis, steam reforming, and hydrogenation/dehydrogenation. Advances in catalysis science offer more efficient reaction processes that can diminish environmental impact and make processes more economic. However, in the quest to improve catalysts, many variables exist that can be manipulated, and therefore several analytical techniques must be employed. Our research involves the implementation of a novel "Spectrokinetic"

approach that correlates kinetic data with catalyst surface structure, and could pioneer a universal approach to analyze existing and new catalysts.

A state of the art, custom reaction set-up comprised of *Operando* Raman-MS and pulsed gaseous reagent enable a parallel transient-kinetics and spectroscopy analysis of intriguing catalytic materials. Our studies focus on the characterization of metal oxides and metal carbides that can be used to upgrade natural gas, crude oil, and biomass to desired products. Determination of structure-activity-selectivity relationships will enable the tuning of catalyst composition for increased productivity towards desired products. And, the establishment of a “Spectrokinetic” approach could set a precedent as a fundamental empirical measure in the study of catalysts that eliminates the need for other costly and laborious procedures.

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**Title:** Cloning, expression and purification of bacteriocin from soil metagenome

**Primary author (Presenter):** Afroj, Sayma

**Additional authors:** Mead, David; Liles, Mark; & Monu, Emeffa

**Department:** Biological Sciences

**College/ School:** College of Sciences and Mathematics

**Description:**

Every year 48 million foodborne illness occur in the United States, resulting in 128,000 hospitalizations and an estimated economic loss of \$77.7 billion. Recent years have seen the alarming emergence of antibiotic resistant foodborne pathogens and a need for new natural antimicrobials. Bacteriocins are small ribosomally synthesized natural products that can have inhibitory activity against foodborne pathogens. In our study we used a metagenomic approach to discover novel bacteriocins encoded by soil microorganisms sampled from a long-term agricultural rotation (Cullars Rotation) at Auburn University. We generated a soil metagenomic library containing 19,200 clones in a bacterial artificial chromosome vector with an average insert size of 110kb. An Illumina HiSeq next generation sequencer was used to sequence those clones in a pooled format (plate, row and column) and the trimmed sequences were assembled to generate contigs. The contig sequences were compared to the BAGEL3 and antiSMASH3.0 bioinformatics pipelines for bacteriocin mining. In total we were able to identify 59 class III bacteriocins, 40 Lasso peptides, 15 lanthipeptides and 40 bottromycin-like bacteriocins from the soil metagenomic library. The clones containing the selected bacteriocins were identified from the cryopreserved metagenomic library, amplified by PCR and subcloned and expressed using the Expresso Rhamnose SUMO Cloning and Expression system. The predicted bacteriocin gene sequences were highly divergent from known bacteriocins in the GenBank nr/nt database, ranging from 34% to 92% identity to their top BLAST hit. The PCR results confirmed successful cloning of each respective bacteriocin gene into the expression vector and the expression of bacteriocin was confirmed by SDS-PAGE analysis. In future experiments the antimicrobial efficacy of these recombinant bacteriocins will be tested against a wide range of foodborne bacterial pathogens.

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**Title:** What is insect diversity like in a mature loblolly pine stand?

**Primary Author (and presenter):** Ahl, Jessica B.

**Additional Authors:** Nadel, Ryan & Eckhardt, Lori

**Department:** Forestry

**College/School:** School of Forestry and Wildlife Sciences

**Description:**

Insects are known to play a major role in the forestry industry in the Southeastern United States, particularly root feeding beetles and weevils that may result in the vectoring of potential pathogens into tree tissues, thereby impacting tree health. These fungal pathogens occlude xylem and stain wood,

reducing lumber value, and can kill trees prematurely. And yet, insect fauna also act as useful bioindicators for commercial forestry systems, providing information about decomposition and ecosystem health. By understanding biodiversity, we can better understand the role certain insects play in terrestrial food webs and potentially use them as indicators to determine the role of management practices on ecosystem functioning. Previous studies have shown that these bark beetles and other insects of concern are good indicators of poor stand health. A commercial pine stand in Eufaula, Alabama was monitored for twelve months and insects trapped to determine population dynamics and diversity. Sampled insects were retrieved bimonthly with two types of traps – pitfall and panel based – and were reset upon each retrieval. Collected insects were identified to family level where possible and further sorted by morphospecies. We obtained over 300 different species encompassing bark beetles and other insects of concern. These results provide an indication of insect diversity for the area and ongoing work will continue to monitor to observe the impact of future management practices.

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**Title:** Obesity stimulates tumor growth in a novel paired *in vitro* and *in vivo* model using patient-derived colorectal cancer xenografts

**Primary Author (and presenter):** Ahmed, Bulbul

**Additional Authors:** Hassani, Iman & Greene, Michael W.

**Department:** Nutrition, Dietetics and Hospitality Management

**College/School:** College of Human Sciences

**Description:**

Strong epidemiological evidence links certain types of human cancer, including colorectal cancer (CRC), and obesity. However, the mechanistic detail unknown because relevant experimental models are lacking. Here we establish and characterize an innovative methodology for investigating obesity-linked CRC using patient-derived xenograft (PDX) CRC lines in a 3D co-culture system and an orthotopically implanted model. PDX tumors were subcutaneously propagated *in vivo* in NOD-SCID mice, then dissociated and encapsulated by PEG- fibrinogen to create the 3D engineered PDX CRC model. Human and cancer cell populations were assessed over time in the 3D PDX CRC tumors and compared to 2D-cultured PDX CRC cells. In the novel *in vivo* model, Rag1 mice were fed either a high fat Western diet + 4% sugar water (HFWD+S) or chow diet for 12-weeks, orthotopically implanted with a PDX CRC tumor fragment for another seven weeks. In the novel *in vitro* model, 3D PDX CRC tumors co-cultured for 29 days with either insulin resistant (treated with TNF $\alpha$  and 1% hypoxia) or sensitive adipocytes. Human (70%) and cancer (30%) cell populations in 3D PDX CRC tumors remained constant over 29 days of culture and were significantly greater than those observed in the 2D PDX CRC cultures. Significantly elevated serum insulin levels and homeostatic model assessment-insulin resistance score were observed in the HFWD+S fed mice. Importantly, we observed a significant greater than 2-fold increase in weight of PDX CRC tumors grown in mice fed the HFWD+S diet. In our *in vitro* model, we observed a greater number of cancer cell colonies in the 3D PDX CRC tumors after 22 and 29 days of co-culture with insulin resistant adipocytes compared to insulin sensitive adipocytes. In conclusion, we have established a paired *in vivo* and *in vitro* PDX CRC model that is responsive to the growth promoting effects of obesity and could be used to examine mechanistic questions and efficacy of therapeutics.

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**Title:** Tracking biofilm formation of *S. aureus* under flow condition in microfluidic chambers

**Primary Author (and presenter):** Al Mouslem, Abdulaziz, K.

**Additional Authors:** Panizzi, Peter

**Department:** Drug Discovery and Development

**College/School:** Harrison School of Pharmacy

**Description:**

*Staphylococcus aureus* (*S. aureus*) is one of the most frequent causes of biofilm-associated infections isolated from indwelling medical devices in hospitals causing a high degree of morbidity and mortality. *S. aureus* is also an opportunistic pathogen capable of causing a variety of infections in humans, from dermal infections to life-threatening diseases such as endocarditis, osteomyelitis and sepsis. According to the CDC threat assessment, approximately 14 million people seek medical treatment each year for skin and soft tissue infections associated with *S. aureus*. Moreover, the mortality rates of these invasive infections range between 19% and 34%. Since biofilm formation is often a key factor in the development of an infection, we sought to study biofilm formation in real-time with the goal of determining new targets to stop biofilm formation. In this study, we monitored the bacterial adhesion of *S. aureus* in side-by-side channels under constant flow in microfluidic chambers by a light microscopy. Assessment of the impact that certain additives have on the integrity and formation of biofilm was possible through media supplementation in one of the two channels. Our finding is that the percentage of the biofilm formation in the channel had a physiologic concentration of human fibrinogen, which is known to be utilized by *S. aureus* is 3-fold higher than the control channel. In a conclusion, we hope these results can help to discover new drugs targets to treat these bacterial infections.

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**Title:** Graft-interpenetrating polymer networks comprising polyurethane and acrylic copolymer

**Primary Author (and presenter):** Alizadeh, Nima

**Additional Authors:** Agrawal, Vinamra; Celestine, Asha-Dee; & Auad, Maria

**Department:** Polymer and Fiber Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Polymers are known to show a wide range of characteristics like high impact and tensile strength which make them useful for different applications. Interpenetrating polymer networks (IPNs) created by combining two different types of polymers provide a novel avenue for improving overall polymer properties. In this research, acrylic-polyurethane based graft-interpenetrating polymer networks, which are transparent and possess high mechanical properties are synthesized. Chemical crosslinking points between the two polymeric systems are used to decrease the degree of phase separation. Therefore, the degree of transparency and thermo-mechanical properties of the polymers increase. The effects of changing the percentage of acrylic polymer precursors and the percentage of the acrylic copolymer and polyurethane on the stiffness, glass transition temperature, transparency, fracture toughness and phase separation of the IPN are studied by using a number of characterization methods. The data showed that the flexibility of the polyurethane phase and the high glass transition and rigidity of the acrylic copolymer give improved strength and stiffness to the IPN in addition to high impact strength. Moreover, excellent transparency of the IPN networks with different percentages of the acrylic copolymer precursors are obtained. For modeling the system, assumptions are made on linear elasticity behavior and small deformation of the IPNs. MATLAB is used for determining the prony series coefficients which are needed for modeling the relaxation process of the IPNs. As a future work, the framework will be extended to hyperelastic behavior and large deformation of the IPNs.

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**Title:** "Beauty on duty!": Messages produced by the wartime cosmetics industry and the United States Government

**Primary Author (and presenter):** Allsbrook, Kelley, E

**Additional Authors:** N/A

**Department:** History

**College/School:** College of Liberal Arts

**Description:**

During the Second World War, American women saw dramatic shifts in beauty ideals as the government and the cosmetics industry worked together to equate beauty with patriotism, simultaneously mobilizing and romanticising the modern wartime woman. My research concurs with historians who write that these changes in expectation were born out of wartime necessity, forcing the country to redefine what it meant to be womanly. While reviewing Vogue magazine beauty advertisements and military training videos from years 1941-1945, it is clear that instead of presenting women simply as vulnerable virgins in need of protection as they did in the Great War, propaganda expanded on that image to create the woman of the Second World War: strong and capable, needy and dependent, intelligent and informed, beautiful and intrinsically feminine—a perplexing combination of traits that mirrored a perplexing wartime society.

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**Title:** Investigate the dopaminergic neurotoxicity profile of designer drugs: 2- trifluoromethyl benzyl phenylpiperazine (2-TFMBzPP), 3- trifluoromethyl benzyl phenylpiperazine (3-TFMBzPP), 4- trifluoromethyl benzyl phenylpiperazine (4-TFMBzPP) and benzyl phenylpiperazine (BzPP)

**Primary Author (and presenter):** Almaghrabi, Mohammed

**Additional Authors:** Majrashi, M.; Desai, D.; Fujihashi, A.; Mullins, C.; Clark, CR.; Deruiter, J.; & Dhanasekaran, M.

**Department:** Drug Discovery and Development

**College/ School:** Harrison school of Pharmacy

**Description:**

Designer drugs are manufactured as a structural modification of the illegal psychoactive substance. Designer drugs are used for recreational purposes and avoiding interdiction from authorities. Interestingly, designer drugs were synthesized by pharmaceutical companies with the ultimate goal of therapeutic interventions for various central nervous system & peripheral disorders, but abuse liability proved as the collateral. However, very few studies have evaluated the neurotoxic effects of piperazines derivative designer drugs. In this study, we investigated the neurotoxicity of new “Piperazine derived designer drugs”, 2-TFMBzPP, 3-TFMBzPP, 4-TFMBzPP & BzPP. Piperazine derivatives were synthesized & the cellular-based neurotoxicity was elucidated in N27 dopaminergic cells. 2-TFMBzPP, 3-TFMBzPP, 4-TFMBzPP & BzPP induced significant dose-dependent & time-dependent neuronal cell death. However, the dopaminergic neurotoxic effects of the derivatives were significantly lower as compared to TFMPP (parent compound) itself. Currently, piperazines derivatives (new drug of abuse) exhibits amphetamine like effects and are used as substitute for MDMA (Ecstasy). Devastatingly, if the abuse of piperazine derivatives increases, it can increase the risk for various movement disorders like Parkinson’s disease. Our next study is to elucidate the molecular neurotoxic signaling mechanisms associated with the dopaminergic neurotoxicity of the designer drugs of abuse.

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**Title:** Tranexamic acid as an anti-fibrinolytic agent in an in vitro canine model of hyperfibrinolysis

**Primary Author (and presenter):** Almoslem, Mohammed<sup>1</sup>

**Additional Authors:** Brainard, Benjamin<sup>2</sup>; Osekavage, Katie<sup>2</sup>; Lane, Selena<sup>2</sup>; Koenig, Amie<sup>2</sup>; Arnold, Robert<sup>1,2</sup>

**Department:** <sup>1</sup>Drug Development and Discovery, <sup>2</sup>Department of Small Animal Medicine and Surgery

**College/School:** <sup>1</sup>Auburn University, Harrison School of Pharmacy, <sup>2</sup>University of Georgia, College of Veterinary Medicine

**Description:**

Tranexamic Acid (TXA) is an antihyperfibrinolytic that is used to stop bleeding in surgeries or after trauma. The objective of this study is to determine the single-dose pharmacodynamics and pharmacokinetic profile of TXA in dogs using a thromboelastography (TEG)-based model of hyperfibrinolysis and high-performance liquid chromatography-mass spectrometry. Intravenous (IV) (10 and 20mg/Kg) and oral (PO) (15 and 20mg/Kg) doses of TXA were administered in six healthy adult dogs in a randomized, cross-over fashion. Blood samples were collected at baseline and 5, 10, 15, 30, 60, 120, 240, and 360 minutes after each dose for pharmacokinetic analysis. Samples were obtained at baseline, 60, 240, 360 minutes for pharmacodynamics analysis. The maximum amplitude (MA) was significantly increased from baseline for all doses at all time points ( $P < 0.05$ ). At 360 minutes, the MA in the 10mg/Kg IV dose group was significantly lower than that of the other doses. The percentage of lysis at 30 minutes after MA (LY30) was significantly higher for 10mg/Kg IV compared to all other doses and was significantly higher for 20 mg/Kg IV compared to 20 mg/Kg PO. Maximum plasma TXA concentrations were dose dependent.

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**Title:** Optimization of a plasma etcher for cellulose nanocrystal cantilever beam array designed for biosensing applications

**Primary Author (and presenter):** Aloba, Sulihat

**Additional Authors:** Saha Partha; Davis Virginia A.; & Ashurst William R.

**Department:** Chemical Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

A plasma etching system for cellulose nanocrystal cantilever beam array (CNC-CBA) designed for biosensing applications was built in our laboratory. The system consists of a plasma chamber with electrodes, radio frequency generator (RF), direct current voltage source (DC), pressure controller, vacuum pump and gases such as  $O_2$  and  $CF_4$  which selectively etch cellulose and titanium oxide present on the beams respectively. The etching process is based on creating a plasma using excited gas molecules and atoms in a sealed low-pressure vacuum plasma chamber containing the CNC-CBA. Therefore, to accomplish successful etch rates, parameters such as RF power, DC voltage, pressure, and process time were controlled. By varying the parameters, an optimal etch process for both gases on the beams was achieved. Further investigations will be done to test the beams suitability for biosensing applications particularly in single use point of care diagnostics. The research will focus on using CNC-CBA to demonstrate antibodies and other biomolecules detection. The fundamental principles that will be employed for the CNC-CBA detection are that individual cantilevers are functionalized with antibodies or other biomolecules selected to bind with specific biomarkers. The binding will result in a detectable change in the resonance frequency of the beam which enables direct calculation of the biomarker concentration. The resonance frequency will be obtained theoretically and measured with techniques such as the atomic force microscopy, phase shifting interferometry, and laser doppler vibrometry.

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**Title:** Estimating fosa (*Cryptoprocta ferox*) population structures in the rainforests of Madagascar

**Primary Author (and presenter):** Anderson, Cullen C.

**Additional Authors:** Farris, Zach

**Department:** Wildlife Sciences

**College/School:** Forestry and Wildlife Sciences

**Description:**

Understanding carnivore population structures is vital to understanding and ultimately protecting the ecosystems they inhabit. Across the globe, carnivores are especially vulnerable to various anthropogenic pressures (e.g. hunting, deforestation, habitat fragmentation) due to their relatively small populations and large home ranges. The carnivores of Madagascar (Family Eupleridae) are no exception, and they are some of the least studied and most threatened carnivores in the world. Though research is sparse on this group's populations throughout the country, no carnivore studies had been conducted in the critical rainforest habitat around Andasibe village in eastern Madagascar. We conducted the first-ever study of carnivore populations in this area using a grid of camera traps across three protected forests. Our analysis focuses on fosa (*Cryptoprocta ferox*), the largest and most wide-spread of Madagascar's carnivores, due to their greater abundance relative to other native carnivores. We provide an estimate of detection probabilities and a naïve estimate of occupancy of fosa. The results of this study will allow for more informed and effective conservation efforts of fosa, other native carnivores, and Madagascar's rainforests.

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**Title:** 3-D flow simulation in porous media using OpenFOAM for Kemper County, Mississippi

**Primary Author (and presenter):** Anjkar, Ishan S.

**Additional Authors:** Beckingham, Lauren

**Department:** Civil Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Reactive transport modelling is widely used to simulate the evolution of geochemical systems. To predict the transport of supercritical CO<sub>2</sub> injected underground during potential carbon sequestration at the CO<sub>2</sub> Storage Complex in Kemper County, Mississippi, USA (Project ECO2S), fluid flow simulations will be created using an open source software, OpenFOAM. The simulation will be carried out on a 3-D mesh generated from 3D X-ray Computed Tomography images of a wellbore sample obtained from the site. The results from the simulation will enhance understanding of the transport properties of supercritical CO<sub>2</sub> and brine through the porous structure. In initial simulations, fluids will be assumed chemically unreactive. However, previous investigations have revealed CO<sub>2</sub> injection may result in mineral dissolution and precipitation reactions that alter flow paths and formation properties. Future simulations will integrate fluid-rock interactions to elucidate potential changes in porous media that result from CO<sub>2</sub> and brine interacting with reactive minerals.

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**Title:** Effects of the CO<sub>2</sub> on the mechanical behavior of synthetic carbonate rocks

**Primary Author (and presenter):** Arakkal, Dinu

**Additional Authors:** Miletić, Marta; Beckingham, Lauren, Elizabeth

**Department:** Civil Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

The rapid industrialization and following human activities, such as excessive use of automobiles, burning of coal, gases, and oils, have caused an unprecedented increase in the emission of greenhouse gases, especially carbon dioxide (CO<sub>2</sub>), to the atmosphere causing major challenges such as climate change and global warming. To date, the one technologically and economically feasible solution is the

geological sequestration of compressed CO<sub>2</sub> in deep underground rock formations. Nevertheless, in spite of its excellent environmental benefits CO<sub>2</sub> capture and storage in underground geological formations faces major challenges in monitoring and verifying that the gases remain suppressed over a long-time period. This is because the injection of CO<sub>2</sub> in carbonate aquifers dissolves some of the carbonate rock by forming carbonic acid and hence alters the natural rock mechanical properties, which further affects the safety and efficiency of the geological sequestration process. Therefore, the main aim of this research is the experimental investigation of the CO<sub>2</sub> effect on the mechanical properties of the carbonate rock. In this study, the synthetic rock samples were artificially prepared by thoroughly mixing the desired mass of quartz sand, kaolinite clay and calcite aggregate, followed by the slurry consolidation process. Once prepared, one half of the synthetic rock samples were then kept in a tank containing synthetic acidified formation brine for seven days, then tested to determine their altered mechanical properties. The mechanical properties of these non-treated and acid treated rock samples were analysed using the indirect tensile and unconfined compression tests. The experimental results showed that exposure of carbonate rock to acid significantly degraded the mechanical properties of the carbonate rocks due to the breakdown of the mineral structure, with important practical consequences for the sequestration process.

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**Title:** Effects of online video and text educational material on knowledge, perceptions, and intention of Men B vaccination among college students

**Primary Author (and presenter):** Aref, Heba, A.T.

**Additional Authors:** Garza, Kimberly; Westrick, Salisa; Chou, Edward; Worthington, Debra; & Kam, Fred

**Department:** Health Outcomes Research and Policy

**College/School:** Harrison School of Pharmacy

### **Description:**

Despite the effectiveness of the Men B vaccine, the vaccination rate remains low among college students. This study aims to compare the effect of multi-modal (audiovisual with text) with single mode (text-only) online health messages on college students' knowledge, perceptions (such as perceived susceptibility, severity, and self-efficacy), and intention to obtain Men B vaccine. The Health Belief Model was used as the theoretical framework. We recruited 132 first year college students using student email listserv for a two-group randomized controlled trial. Participants received either online audiovisual with text or online text only-based educational intervention that described the Men B disease and the benefits of Men B vaccination. In both groups, participants' knowledge, perceptions, and intention of Men B vaccination were assessed at baseline and after the intervention using an online survey. Paired t tests were used to examine the pre-post intervention difference within the group, and difference-in-differences were used for between two groups. Participants in both groups had similar levels of baseline knowledge, perceptions, and intention ( $p>0.05$ ). Both video and text groups showed significant post-test mean score improvement in perceived susceptibility, severity, benefits, barriers, self-efficacy and intention to obtain Men B vaccine ( $p<0.05$ ). The video group also showed a significant post-test mean score improvement in knowledge and perceived cues to action ( $p<0.05$ ). No significant difference was found in mean score improvement of knowledge, perceptions, and intention for multi-modal compared to single mode educational material ( $p>0.05$ ). Both online text and video-based learning are effective educational tools for promoting vaccination among college students. Using these educational techniques has the potential to positively impact disease prevention.

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**Title:** A theoretical exploration of the chemical bonding of  $\text{Be}(\text{CX})_3$  [ $\text{X} = \text{O}, \text{S}, \text{Se}, \text{Te}, \text{Po}$ ],  $\text{Be}(\text{NH}_3)_3$ , and  $\text{Be}(\text{PH}_3)_3$

**Primary Author (and presenter):** Ariyaratna, Isuru R.

**Additional Authors:** Miliordos, Evangelos

**Department:** Chemistry and Biochemistry

**College/School:** College of Sciences and Mathematics

**Description:**

The formation mechanisms of  $\text{Be}(\text{CX})_3$  [ $\text{X} = \text{O}, \text{S}, \text{Se}, \text{Te}, \text{Po}$ ],  $\text{Be}(\text{NH}_3)_3$ , and  $\text{Be}(\text{PH}_3)_3$  were studied in detail. High level multi-reference and coupled cluster methods were carried out to construct potential energy curves and produce energetics. Potential energy curves are obtained as a function of Be-C, Be-N, and Be-P distances. We observed that in all cases there are three ligand→Be dative bonds, but in each case the remaining electron pair resides different kind of molecular orbital.  $\text{Be}(\text{CX})_3$  complexes are planar and the binding energies vary linearly with the dipole moment of C-X. Here the electron pair occupies the  $2p_\pi$  orbital of Be delocalized towards the  $\pi$ -frame of the ligands via  $\pi$ -back donation. The two isovalent  $\text{Be}(\text{PH}_3)_3$  and  $\text{Be}(\text{NH}_3)_3$  complexes reveal different bonding patterns. The electron pair is now more localized on Be in the  $\text{Be}(\text{PH}_3)_3$  case. On the other hand, ammonia expresses its known ability to solvate electrons pushing the  $2s^2$  electron pair of Be to the periphery of the  $\text{Be}(\text{NH}_3)_3$  molecule. This variety of chemical bonding patterns reveal the unique chemical activity of beryllium.

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**Title:** Modeling effectiveness of best management practices to reduce phosphorus losses in Big Creek watershed

**Primary Author (and presenter):** Arora, Palki

**Additional Authors:** Lamba, Jasmeet; Kalin Latif; & Srivastava Puneet

**Department:** Biosystems Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Excessive delivery of nutrients, such as phosphorus (P) from agricultural landscapes to surface waters results in water quality impairment. Implementation of effective best management practices can help to reduce nutrient loss from agricultural landscapes and therefore improve water quality. Watershed models can help to better understand the fate and transport processes of nutrients within watersheds. The overall goal of this study is to advance our knowledge on Phosphorus (P) transport processes at the watershed-level. Specific objectives of our proposed research are to: (a) quantify P loss in surface and subsurface flow pathways as a function of runoff generating and infiltrating storm events, and (b) determine the impact of subsurface-band application of manure on P loss in surface and subsurface flow pathways as a function of runoff generating and infiltrating storm events. The study site for this research is the Big Creek watershed (8024 ha) located in Mobile County, AL. The Soil and Water Assessment Tool (SWAT) model was used to evaluate the effectiveness of best management practices to improve water quality on a long-term scale. Total P and soluble P has been reduced significantly with subsurface application of broiler litter. P losses were maximum in winter and spring followed by summer and fall due to more rainfall and surface runoff in former.

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**Title:** The Effect of Music Genre on Exercise Performance

**Primary Author (and presenter):** Frequency Freaks

**Additional Authors:** Arthur, Davis; Gannett, Jean; van Ginkel, Kegan; Benton, Braxton; Middleton, Kerri

**Department:** Music

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**College/School:** College of Liberal Arts

**Description:**

Years of research into the psychological and physiological effects of music have resulted in a wide array of compelling studies. One such study found correlation between music tempo and physical performance when listening to music. The purpose of our experiment is to expand upon this finding and test how music genre affects exercise performance, provided the music samples are kept at a constant tempo. Using a one-mile stationary cycling time trial as a baseline for physical performance, we had 11 individuals complete three separate cycling time trials; each trial they either listened to one of our two music samples (hip-hop or march) or no music at all. Our results suggest that music genre does affect exercise performance; however, the effect depends on the person.

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**Title:** Characterization of pyrolysis and hydrothermal liquefaction bio-oils from loblolly pine biomass as a biopolyol

**Primary Author (and presenter):** Asafu-Adjaye, Osei A.

**Additional Authors:** Celikbag, Yusuf; Street, Jason; Via, Brian; Peresin, Maria; Auad, Maria; Adhikari, Sushil

**Department:** Forestry

**College/School:** School of Forestry and Wildlife Science

**Description:**

Bio-oils obtained from loblolly pine biomass from two thermochemical conversion processes, fast pyrolysis and hydrothermal liquefaction (HTL), were investigated. Water/ethanol mixture (1/1, wt/wt) was used as liquefying solvent in the HTL process at 300 °C, and the pyrolysis bio-oil was produced at 450 °C. The physical and chemical properties of the bio-oils were characterized by gas chromatography/mass spectrometer (GC/MS), <sup>31</sup>P NMR according to the phosphitylation method, FTIR spectrometry analysis, elemental analyses, calorific values, viscosity based on shear rates and temperatures, moisture content, heating value and pH. The results indicated that the physicochemical properties of HTL bio-oil and pyrolysis bio-oil were similar, however, there were variations in the composition of the bio-oils from the same biomass. The analysis further revealed that the pyrolysis bio-oil is rich in phenolic OH and the HTL bio-oil is rich in aliphatic OH functionalities and that the bio-oils could be used as biopolyol in resin synthesis.

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**Title:** Rediscovery of *Aedes aegypti* in Southern Alabama and the Subsequent Risk of Zika

**Primary Author (and presenter):** Ashby, Victoria M.

**Additional Authors:** Zohdy, Sarah

**Department:** Disease Ecology

**College/School:** School of Forestry and Wildlife Sciences

**Description:**

For the past 26 years, *Aedes aegypti*, or the primary vector of Zika, has been considered absent from the state of Alabama. However, we have reported its presence in the Mobile Bay region of the state, raising alarms due to the introduction of Zika into the Americas. Capturing and studying *A. aegypti* versus other species is vital to evaluating the potential transmission of Zika and other arboviruses in the state. Prior to the fieldwork conducted for this long-term project, 25 urban sites were chosen at random within the 12 zip-codes of the Mobile area. Each of these sites fell into categories of abandoned houses, tire shops, gas stations, etc. At each site, a backpack aspirator was used for 20 minutes to capture as many

adult mosquitoes as possible. The number of containers filled with water were documented, and larvae, if applicable, were collected and reared in the lab. Traps were also set. Molecular results from the collected mosquitoes have not yet been recorded.

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**Title:** Factors influencing degradation in protected areas conservation: A case study of the W Biosphere reserve in West Africa

**Primary Author (and presenter):** Assogba, Noel P.

**Additional Authors:** Zhang, Daowei

**Department:** Forestry

**College/School:** School of Forestry and Wildlife Science

**Description:**

In this paper, we measure the degradation of the W Reserve in West Africa using the number of cases of illegal farming and illegal cattle grazing recorded and analyse the factors influencing such degradation using nonlinear Seemingly Unrelated Regression (SUR) model. Our results indicate that the Reserve degradation was negatively correlated with the average income level, the number of financial institutions, and the distance while a positive correlation with the average farm areas in the villages. The institutional characteristics of the villages, namely the number of non-governmental organizations promoting nature preservation, and the existence of check points between the Reserve and the villages in its periphery were negatively correlated with its degradation.

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**Title:** Analyzing the characteristics of distracted driving behavior in crash/near-crash situations using SHRP 2 Naturalistic Driving Study (NDS) data

**Primary Author (and presenter):** Atiquzzaman, Md

**Department:** Civil Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Distracted driving is a serious traffic safety issue. Although many researchers attempted to study the effect driver distraction and develop distracted driving detection algorithms, the focus was limited to quantify and detect the effect of driver distraction compared to baseline driving using driving simulator experiments. This study analyzed the difference in distracted driving behavior that resulted in crash/near-crash situations compared to the distracted driving that did not result in crash as well as baseline driving. The Naturalistic Engagement in Secondary Task (NEST) database, which is developed based on Second Strategic Highway Research Program Naturalistic Driving Study, was used to achieve the research goals. The results show that the standard deviation of pedal gas position, speed, longitudinal and vertical acceleration, pitch rate, and yaw rate are significantly different before a crash/near-crash resulted from distracted driving compared to both baseline driving and distracted driving without crash. Finally, several mathematical models were developed based on random forests algorithm to predict a potential crash/near-crash based on the driving performance data. The developed models were associated with an accuracy ranging from approximately 87% to 90%. These models can be a foreground for developing an in-vehicle system that can detect crash/near-crash situations resulting from distracted driving and give warning to the drivers when a hazardous situation is detected. It can also be used to develop an automated distraction detection and mitigation system that automatically takes corrective measures when a hazardous situation is detected.

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**Title:** Changes in child expectations, and preschool priorities: a fifteen-year synopsis

**Primary Author (and presenter):** Atwater, Madison B.

**Additional Authors:** Nichols, Oliva; Vaughn, Brian

**Department:** Human Development and Family Studies

**College/School:** College of Human Sciences

**Description:**

Over the last decade and a half (2003 to 2017), parents ( $N = 437$  total; 204 fathers) expectations and priorities of their preschool-aged children were examined. Exploratory analyses showed significant change in parent, particularly maternal, reports of obedience and autonomy expectations over the fourteen years, with little fluctuation in social regard and self-control. Through the fourteen years, non-European-Americans reported higher expectations in obedience, autonomy, social regard and self-control than European-Americans. The child's sex had very little influence on parent's reported expectations, regardless of parental role. Few differences were found in the traits parent's value in their preschooler based on parental role and child sex, but significant differences were again, found by ethnicity. Throughout the fourteen years, Asian-Americans valued creativity, autonomy, and following rules more than European-American parents, who valued academic skills, motor skills, and certain social skills more than Asian-American parents. These findings demonstrate (1) the weakening emphasis on parent expectations and values by the child's sex, and (2) the need to dismiss the traditional categorization of inherited individualistic and collectivistic culture expectations, and better defines values within ethnically diverse (rather than homogenous) and highly educated societies.

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**Title:** Synthesis of Unsaturated Monomers from Carbonyl Compounds in Pyrolytic Bio-oil

**Primary Author (and presenter):** Avery, Katrina, N.

**Additional Authors:** Barde, Mehul; Auad, Maria

**Department:** Chemical Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

The goal of this research is to utilize the aqueous phase of bio-oil for polymer synthesis. Bio-oil is a liquid product obtained through the pyrolysis of biomass containing lignin, cellulose, and hemicellulose. Currently, the aqueous phase does not have much commercial value but consists of water, alcohols, aldehydes, ketones, sugar and phenols... In order to polymerize the bio-oil components, the bio-oil was altered to contain as high of a ratio of olefins as possible. In the first stage, primary and secondary alcohols in the bio-oil were converted into aldehydes and ketones, respectively. Then, through Wittig reaction, aldehydes and ketones were converted into olefins. The Wittig reaction takes advantage of a triphenyl phosphonium ylide attaching to an aldehyde/ketone and taking away the oxygen atom while leaving behind an olefin. Therefore, the more aldehydes/ketones available in the bio-oil, the more olefins that may result from the Wittig reaction. Wittig reactions were attempted with both a stabilized and non-stabilized ylide to yield different olefins. Fourier transform infrared spectroscopy (FTIR) and  $^1\text{H}$  and  $^{13}\text{C}$  nuclear magnetic resonance (NMR) were used for characterization. The results of the Wittig reaction were analyzed through chromatography to analyze the results for the desired product. Finally, the functionalized bio-oil olefins were polymerized by AIBN initiator at elevated temperature.

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**Title:** Improving acquisition of manual-wheelchair skills: An EEG study using motor learning principles

**Primary Author (and presenter):** Bacelar, Mariane & Rhoads, Jence

**Additional Authors:** Daou, Marcos; Valerius, Won; Carter, Briana; Scaglione, Lucia; Lohse, Keith; & Miller, Matthew

**Department:** Kinesiology

**College/School:** College of Education

**Description:**

Yearly, more than 130,000 people in the US have a lower extremity amputation. Efficient acquisition of motor skills required to maneuver a wheelchair is necessary for these individuals' quality of life. Thus, it is crucial to find practical ways to enhance this learning process. Recent research has revealed that having the expectation to teach a motor skill to another person enhances the learning of that skill. Specifically, participants who study/practice with the expectation to teach exhibit superior performance on posttests compared to participants who study/practice expecting to test. In this study, we applied this paradigm to learning manual wheelchair operation. On Day 1, participants completed a pretest of wheelchair skills (forward/backward slalom course), and then were assigned to one of two groups. One group studied/practiced the wheelchair skills with the expectation to teach them to another participant the following day, while the second group studied/practiced with the expectation of being tested on the skills (10 trials/skill for both groups). Electroencephalography (EEG) was recorded during pretest and practice to examine neural correlates of wheelchair skill acquisition (EEG results are pending). All participants completed a posttest 24 h later. Time to complete the course was utilized to evaluate motor learning at posttest, controlling for pretest time. Results revealed a main effect of phase (pre/posttest), test type (forward/backward), and a Phase x Test Type interaction ( $p \leq .001$ ), but no main effect or interaction involving group ( $p \geq .551$ ). The participants improved from pretest to posttest, with greater improvement for the backward test compared to the forward test. Though no effect of group was revealed, this wheelchair skill acquisition paradigm could be used in the future, as learning effects were found. Future paradigms should include more practice trials, which may increase the likelihood of experimental conditions affecting learning.

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**Title:** TRYAD system analysis and control methods and design

**Primary Author (and presenter):** Bahder, Joseph, P

**Additional Authors:** Dr. Fogle

**Department:** Physics

**College/School:** College of Science and Mathematics

**Description:**

In the world of CubeSats, the community generally trends towards viewing thermal analysis and control as an afterthought. Similarly, all simulation verification seems to lag behind the increasing complexity of successive generations of Cubesats. Some missions, particularly the TRYAD (Terrestrial Rays Analysis and Detection) mission from the AUSSP (Auburn University Small Satellite Program), require more precise or more efficient thermal control and simulated verification due to complicated experimental systems. This is a growing trend in the world of CubeSats, and as the complexity of design in various missions is increased, the need for precise control and analysis grows in tandem. This presentation aims to cover the methods of thermal and system analysis and control for the two TRYAD CubeSats, and how these practices and designs can be applied to future projects. Specifically, the thermal analysis process based on finite analysis and ray-tracing software, a generalizable Earth-tracking radiative control system establishing a form of dynamic equilibrium between Earth's surface and the satellite, and simulation techniques proving the effectiveness of differential drag station keeping will be covered. This will include notes on the minute control of the equilibrium state with insulation, optical coating selections, thermal straps, and small scale Kapton heaters. The contents of this presentation are a coherent

push towards more powerful verification and even greater design potential of University and Professional Cubesats.

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**Title:** *Isolated in a Canyon*

**Primary Author:** Bailey, Blair, J

**Department:** History

**College/School:** College of Liberal Arts

**Description:**

When beginning my semester long research for Historian's craft, I decided to look at how the formation of the National Parks system affected people already living in areas that became National Parks. In searching for groups affected by the system's formation, I discovered that many Native American groups were particularly affected. Specifically, I found that at Grand Canyon National Park, the Havasupai tribe were greatly affected by the formation of the park. Further study of the Havasupai and their relationship with the National Parks Service revealed a history of neglect and attempts of park's officials to rid themselves of their "Havasupai problem". My research paper discusses the unique relationship that the Havasupai have with one of the iconic American landmarks and the organization that preserves it and touches on issues such as changing Native American-U.S. relations, values of conservatism, and self-determination.

My research focuses on the time period between 1880 and 1973, when the Havasupai regained over 100,000 acres of land they had lived on before the park's formation and is based on primary sources found on online databases and at the Auburn University library. Looking at both Havasupai, European settler, and National Park records and letters gave me a comprehensive look at the issue, while secondary sources provided context and existing historiography. This historiography helped me find where my research fit into the existing narrative of the Havasupai's land struggle.

Primary sources include the Havasupai tribe's Constitution, memoirs of Havasupai men and women, correspondence of the National Parks Service, material written by the National Park Service, and letters written by white settlers of the Grand Canyon before the formation of the National Park. Secondary sources include books and journals written about the Havasupai's struggle, tourism at the Grand Canyon, and administrative histories of the National Park Service at the Grand Canyon.

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**Title:** The people's response to government support for children and youth during the Great Depression

**Primary Author (and presenter):** Baird, Lindsey, J

**Additional Authors:** Not applicable

**Department:** History

**College/School:** College of Liberal Arts

**Description:**

My research focused on the differing responses the American people had towards federal funding for children and youth during the Great Depression based on the idea of the American Dream. The definition of the American Dream has changed throughout the years, but during the 1930s people believed success was earned through hard work and determination. The Great Depression challenged this ideal because people were not able to achieve the same success they had enjoyed previously. The New Deal programs were seen as an opposition to the American Dream.

Children received funding through welfare, but the people's responded negatively to this because welfare was seen as handouts and children were not perceived as full citizens in the eyes of adults. This can be seen by comparing the weekday and the Sunday Little Orphan Annie comic strips. Harold Gray, the creator of Little Orphan Annie, thought children only read the Sunday funny pages. The weekday

comics focused on serious problems of the day while the Sunday comic was light and easy-to-read. Historians can see that children were able to understand the bleak economic difficulties of the 1930s through letters written to First Lady Eleanor Roosevelt. The letters she received from children mostly asked for either money to pay a bill or old clothes to wear because their fathers did not want to be on the welfare program.

The youth were given their federal funding through the National Youth Administration (NYA). This organization used the funding to create blue-collar jobs and vocational job training. The people responded positively to the NYA because the youth had to work to earn the funding they received. The NYA funding was split racially and by gender so the white men received the most funding/training while black girls received very little funding for their vocational training. When World War Two broke out in Europe, the NYA was cut to help the war effort, many organizations called for the NYA to become permanent.

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**Title:** The efficacy of engineering- controlled barriers on noise levels of machining processes in industry

**Primary Author (and presenter):** Habibi, Shabnam & Baker, Gena A.

**Additional Authors:** Krishnamurti, Sridhar & Sesek, Richard

**Department:** Communication Disorders; Industrial Hygiene and Safety

**College/School:** College of Liberal Arts; Samuel Ginn College of Engineering

**Description:**

The Occupational Safety and Health Administration (OSHA) requires that all workers exposed to noise levels greater than 90 dBA over an 8-hour workday must be enrolled in a Hearing Conservation Program and Engineering controls be administered. In this study we evaluated noise levels and the effects of engineering controls at two different plants. Various types of engineering processes were found to influence the frequency distribution of noise in plants. Octave band analysis of noise exhibited low frequency noise (250 and 500 Hz) associated with contact press, while shearing, tumbler, and deburring processes were associated with high frequency noise (4000 and 6000 Hz). Time weighted averages of machine noise were found to be well above hazardous levels (per OSHA) and varied between 95-105 dBA. Engineering controls in the form of physical barriers showed that polystyrene and vinyl type materials provided the best attenuation for the high frequencies (2000 Hz, 4000 Hz), but low frequencies were not effectively attenuated by any of the barriers.

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**Title:** Motivating afterschool programs to implement STEM

**Primary Author (and presenter):** Bales, Shannon M.

**Additional Authors:** Schnittka, Christine

**Department:** Curriculum and Teaching

**College/School:** College of Education

**Description:**

STEM (Science Technology Engineering Mathematics) is a buzzword among policy makers, stakeholders, and educators. However, there is no consensus on how STEM is defined. This disagreement has left educators uncertain when implementing integrated STEM in their afterschool programs. Therefore, we created a survey to measure teacher motivation and self-efficacy regarding STEM implementation and administered it to afterschool teachers before and after a workshop to better understand how a STEM focused workshop improves teachers' self-efficacy and motivation. The survey containing 17 Likert-scale questions was administered to 37 afterschool program staff before and after a workshop. Statistical analysis using Paired Samples *t* Test was conducted to look for differences in teachers' motivation scores as well as self-efficacy scores before attending the workshop and after the

workshop. Based on preliminary workshop data, afterschool teachers came away from the workshop with increased confidence in implementing STEM activities, creating opportunities for students to engage in STEM practices, guiding student reflections about STEM activities, understanding and explaining the engineering design process, connecting STEM activities with the real world, creating minds-on/hands-on activities, creating opportunities for student choice, and retaining student engagement in STEM activities. With such a high emphasis on providing integrated STEM in the out-of-school time, stakeholders, policy makers, and educators should be aware of the foundation of providing maximum learning opportunities in STEM which I believe to be teacher motivation and self-efficacy. Therefore, this research has the ability to inform practitioners, stakeholders, researchers, and policymakers about how to motivate afterschool program staff to effectively provide integrated STEM learning with confidence.

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**Title:** Does soybean irrigation scheduling need to be cultivar specific?

**Primary Author (and presenter):** Bangert, Cristopher, T.

**Additional Authors:** Koebernick, Jenny.

**Department:** Crop, Soil, and Environmental Science

**College/School:** College of Agriculture

**Description:**

Soybean is an economic crop of vital importance in Alabama with water requirements relating directly to yield. Irrigation scheduling has evolved in recent years with the use of soil sensors and variable rate pivots allowing efficient water use to combat the global climate shift toward warmer and drier conditions. This study investigates the relationship of soybean cultivars and the timing of irrigation. Rain-fed plots were compared to five irrigation-scheduling treatments employing checkbook, soil sensors, and specific growth stages. Leaf sample photosynthetic rates were analysed at two different growth stages, R3 and R5. One-meter cuttings were collected at R5 and just before harvest in order to determine the change in biomass partitioning. The results of this study are being processed and will be presented in full at the symposium. If irrigation scheduling leads to varying yield potential by cultivar, further studies will be necessary and pertinent to help reduce input cost of growers, reduce soil leaching of pesticides and nutrients, and increase overall water use efficiency.

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**Title:** Using anaerobic digesters to treat poultry litter waste & grow microalgae

**Primary Author (and presenter):** Bankston, Elizabeth M.

**Additional Authors:** Higgins, Brendan

**Department:** Biosystems Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

The focus of this research will be on the treatment and conversion of poultry litter waste, given its relevance to the Alabama agriculture industry. Poultry products, like broilers and chicken eggs, are one of Alabama's top agricultural products. The current method for treating poultry litter waste involves applying alum to it while it's still in the poultry house, which will decrease ammonia emissions and reduce phosphorous runoff. Typically, poultry litter is then applied as a fertilizer for other agricultural crops. Often, more poultry litter is applied than is needed due to the large amount produced and the high cost of long-distance transport. This excess application of poultry litter leads to nitrate & phosphorous leaching into nearby water sources; in addition, there is potential for excess application to cause bacterial or viral pathogen levels to rise in surface waters. We are exploring an alternative treatment process for poultry litter that uses anaerobic digestion and algae cultivation on the digestate effluent. The resulting algal biomass could then be used for production of fuels and animal feed. The goal of this project is to

determine the impact of a combined digestion-algal process on microbes and nutrient removal. In this project, two strains of microalgae, *A. protothecoides* and *C. sporokiniana*, are being used to treat an anaerobic digestate mixture of 80% volatile solids (VS) from poultry litter and 20% VS from human wastewater sludge. Lab scale bioreactors were used to culture algae in poultry litter digestate. Initial experiments have shown that algae do not grow well on full strength digestate. We are engaged in experiments to determine the level of dilution needed to effectively culture algae on poultry litter digestate. Future work will involve experiments testing biomass composition and nutrient levels when algae is grown in this digestate mixture without microbes, with microbes, and when only microbes are present.

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**Title:** Use of electrospinning and wet spinning processing methods for the formation of carbon fibers from alkaline Lignin

**Primary Author (and presenter):** Bansode, Archana S.

**Additional Authors:** Hinkle, Tripp; Upp, Christopher; Nam, Hyungseok; Flipponen, Ilari; & Auad, Maria, L.

**Department:** Chemical Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Currently, there is an increasing trend of utilization of renewable sources such as forest biomass, to replace the non-renewable petroleum-based fuels and chemicals. Therefore, lignin has attracted much attention as an alternative for petroleum-based materials. In this study, biomass-based carbon fibers have been developed from lignin via electrospinning and wet spinning processing methods. The electrospinning method facilitates the formation of precursor nanofibers with the mixture of polyethylene oxide (PEO) and lignin in the presence of an alkali such as NaOH and KOH and water. PEO induces chain entanglements to trap lignin molecules. On the other side, wet spinning is a novel method to produce micron-sized fibers using calcium chloride as crosslinker agent. The obtained fibers were subject to thermo-stabilization and carbonization to achieve the final carbon structure. Furthermore, the study included the chemical and mechanical characterization of the resulting carbon fibers, in addition to the electrical conductivity, wettability and microstructure.

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**Title:** Synthesis of olefins and subsequent polymers from low-value aqueous phase of bio-oil

**Primary Author (and presenter):** Barde, Mehul

**Additional Authors:** Avery, Katrina; Edmunds, Charles; Labbe, Nicole; & Auad, Maria L.

**Department:** Chemical Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Aqueous stream of fast pyrolysis of wood biomass was considered as feedstock for monomer synthesis. Aqueous phase is a low value liquid phase which is often considered as waste due to high water content and low heat value. Gas chromatography-mass spectroscopy (GC-MS) analysis of aqueous bio-oil indicated the presence of aliphatic organic compounds, including aldehydes, ketones and alcohols. Quantification of hydroxyl groups was carried out using  $^{31}\text{P}$ -nuclear magnetic resonance ( $^{31}\text{P}$ -NMR) analysis. Olefination of bio-oil components was performed via different routes. Alcohols and phenols were reacted with methacryloyl chloride to carry out methacrylation of hydroxyl groups of the organic compounds. In another approach, maleic anhydride was used for derivatization of bio-oil hydroxyl compounds to produce a mixture of maleic acid and monoalkyl maleates. The bio-oil-based olefins were characterized by Fourier transform infrared (FTIR),  $^1\text{H}$ -NMR and differential scanning calorimetry

(DSC). Characteristic peaks of unsaturated C=C and sp<sup>2</sup> hybridized C-H bonds were observed during characterization. Olefinated bio-oil was polymerized to produce solid films. The resulting polymers showed a wide range of properties depending on the olefination route. Polyolefin synthesis proved to be a potential, efficient method of valorization of aqueous phase of bio-oil. Bio-oil based polyolefins can be used to replace traditional polyolefins in packaging, biomedical and agricultural applications such as hydrogels and superabsorbent polymers.

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**Title:** Pitcher's Nightmare swing trainer's effect on baseball swing kinematics

**Primary Author (and presenter):** Barfield, Jeff W.

**Additional Authors:** Oliver, Gretchen

**Department:** Kinesiology

**College/School:** College of Education

**Description:**

The aim of this pilot study was to examine the effects the Pitcher's Nightmare (PN) has on the hitter's center of mass in relation to base of support (COMtoBOS), ball exit speed (BES), and hand velocity (hv) throughout various time points of the baseball swing. We hypothesize that the hitter's COMtoBOS will be shifted posteriorly (towards back leg) when using the PN and subsequent hitting following use, and an increase in ball exit speed and hand speed after use of the training aid. Six youth baseball players ( $13.8 \pm 0.84$  yrs.,  $167.03 \pm 11.17$  cm,  $62.92 \pm 9.49$ kg,  $6.4 \pm 2.88$  yrs. of experience) participated. Using a quasi-experimental design, participants performed five swings off a tee, 20 swings without the tee while wearing the PN, five swings off the tee while wearing the PN, and then another five swings off the tee without the PN. A within-subjects Manova revealed a significant difference among COMtoBOS, BES, and hv ( $\lambda = .220$ ,  $F_{6, 16} = 3.02$ ,  $p = .036$ ). About 53 percent of the variance was accounted for by the PN ( $\eta^2 = .53$ ). We used repeated measures ANOVAs to follow up the significant Manova, and applied Greenhouse-Geisser correction to COMtoBOS and BES because the assumption of sphericity was not met for those variables. There was no significant difference among usage of the PN with COMtoBOS ( $F_{1,04, 5,21} = 4.81$ ,  $p = .077$ ,  $\eta^2 = .49$ ) or BES ( $F_{1,11, 5,55} = .66$ ,  $p = .465$ ,  $\eta^2 = .12$ ). However, there was a significant difference between usage of the PN and hv ( $F_{2, 10} = 7.23$ ,  $p = .011$ ,  $\eta^2 = .59$ ). Results revealed that the participants had slower hv while wearing the PN, which could be an effect of the resistance given by the PN. Additionally, participants' COMtoBOS was more posterior after using the PN compared with swings prior to PN use. A more posterior COMtoBOS could increase the force couple applied up the kinetic chain to the hip segment. With the significant findings in this small pilot, further investigation should be conducted.

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**Title:** Computational Fluid Dynamic Modelling of a Wedge Airfoil in Supersonic Flow

**Primary Author (and presenter):** Barkley, Zachary

**Additional Authors:** Hu, JIayue

**Department:** Aerospace Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Computational fluid dynamics (CFD) is used to predict and visualize fluid flows. The team employed a CFD modeller developed by University of Tennessee Chattanooga named Tenasi to observe the shock wave boundary layer interaction between a wedge airfoil and a flat mounting plate. The information gathered from this experiment helps us to better understand the interactions between airplane fuselages and wings when subjected to supersonic wind speeds. Additionally, this simulation is being used

to compare our numerical method results to wind tunnel tests. The team created a computer model of a wind tunnel to smoothly create the conditions observed in the physical test instead of manually pre-setting all flow conditions. The results will allow for visualization of the flow in the region near the plate and wall attachment. Valuable numerical data regarding important flow characteristics will be extracted from the region as well. The results of this experiment will provide insight into supersonic flow behaviour within boundary regions near an airfoil and a flat plate. The results will also validate the technique of using a wind tunnel computer model to organically produce supersonic flows.

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**Title:** Detection of target site resistance to acetyl-coenzyme A carboxylase inhibiting herbicide in the large crabgrass (*Digitaria sanguinalis*)

**Primary Author (and presenter):** Basak, Suma

**Additional Authors:** McElroy, Scott

**Department:** Crop, Soil, and Environmental Sciences

**College/ School:** College of Agriculture

**Description:**

Large crabgrass (*Digitaria sanguinalis* (L.) Scop.) is a major problematic annual grass weed in turf, lawns, pastures, roadsides, and old fields. It belongs to the subfamily Panicoideae of the Poaceae, one of the most important grass family in both ecologically and economically. Acetyl-coenzyme A carboxylase (ACCase)-inhibiting herbicides are commonly used for postemergence control of large crabgrass in managed turfgrass unit. It is an essential enzyme for catalyzing the first step of *de novo* fatty acid biosynthesis by the formation of malonyl CoA in both eukaryotes and prokaryotes. Resistance to ACCase inhibiting herbicide is common and continues to develop. The resistant biotypes of large crabgrass were collected from the sod production fields in Georgia. An agar-based rapid diagnostic assay was developed to detect the herbicide-resistant field populations. Testing confirmed that slower phytotoxicity developed in the Georgia population to fluazifop and sethoxydim when compared to a susceptible population collected locally at Alabama population. We also investigated the molecular basis of resistance to ACCase-inhibiting herbicides for large crabgrass populations. An allele-specific polymerase chain reaction (PCR) test was designed to identify the most prevalence five amino acid substitutions in large crabgrass population: Ile-1781-Leu, Asp-2078-Gly, Trp-1999-Cys, Trp-2027-Cys, Ile-2041-Asn. Resulting from that the large crabgrass population resistance was correlated with all five mutations. Gene sequencing of the resistance biotype revealed that the heterozygous double peaks in the chromatograms of nucleotide sequence indicating a point mutation in an amino acid substitution surrounding the Ile<sub>1781</sub> region. The two different alleles, Ile<sub>1781</sub>, and Leu<sub>1781</sub> were yielded through the cloning of ACCase gene sequence at Ile<sub>1781</sub> codon. This research determines the possible mechanism of target site resistance of large crabgrass to ACCase-inhibiting herbicides.

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**Title:** Liquefaction study of a soil site considering spatial variability of soil

**Primary Author (and presenter):** Basu, Devdeep

**Additional Authors:** Montgomery, Jack

**Department:** Civil Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Liquefaction is a complex and important phenomenon in geotechnical earthquake engineering which may cause sandy soils to lose their strength and stiffness under cyclic loading leading to damages to bridges, buildings and underground structures. Potential deformations due to liquefaction can be

evaluated using a variety of procedures ranging from simplified empirical methods to more complex numerical models. These methods often assume that the soil has uniform properties which is a significant simplification of reality where soil properties may vary significantly in both the vertical and horizontal direction. This simplification can lead to significant uncertainty in predicted deformations. Numerical models offer a means to evaluate the effect of non-uniform properties on the potential for liquefaction-induced deformations. The results of these models may be used to develop new simplified approaches which can better account for the potential impacts of soil variability. This presentation will describe a research effort to compare results from numerical simulations with simplified approaches for evaluating liquefaction-induced settlements. This study has been carried out using data from a real test site in Hollywood, South Carolina which has been extensively characterized to quantify the variability in properties. The numerical simulations have been performed using the finite difference program FLAC and a series of recordings from previous earthquakes. The main objectives of this project are to incorporate the spatial variation of soil properties in the numerical model, to study the response of the sandy soils both during and after earthquake shaking and to compare the results with simplified methods for evaluating post-liquefaction settlement. It is hoped that the results of this research will provide insights into the effects of soil variability on liquefaction-induced settlements and how these settlements can be evaluated for future earthquakes.

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**Title:** Timothy H. O’Sullivan: from war to the west  
**Author:** Seemann, Lillian Catherine  
**Co-Author:** Beam, Morgan  
**Department:** Art and Art History  
**College/School:** Auburn University/College of Liberal Arts

**Description:**

While images of death and demise were circulated in gruesome photographs of Civil War dead, stunning views of the West gave the American people a vision of hope. This imagery emphasized the idea of this landscape as being yet untouched and unmarred by human influence. These images were glimpses of America’s future beyond the horrors of war. Timothy H. O’Sullivan was a part of both worlds: he was active in photographing and surveying post-battle scenes during the war, and in 1867 he became the official photographer of the Geological Exploration of the Fortieth Parallel, a project seeking to attract settlers to the West. This poster presentation juxtaposes O’Sullivan’s *Harvest of Death* (1863), a photograph of the aftermath of the Battle of Gettysburg, and *Tufa Domes, Pyramid Lake, Nevada* (1867), which provokes a feeling of rehabilitation from war. O’Sullivan’s photographic career is historically organized in phases—Civil War and landscape—but they are not treated as related bodies of work. Our poster addresses this issue in the visual analysis and contextual explanation of *Harvest of Death* and *Tufa Domes*, which reveals a national push towards the West in dialog with a nation seeking healing from war.

This project is an exploration of O’Sullivan’s career, specifically concentrating on his motives in his documentation of battle scenes and the landscapes of Nevada—both of which he was commissioned to do by the government. At the conclusion of this project, our long-term hope is to add to the art historical conversation surrounding early landscape photography in this era, such as the figural reading of natural structures, and to lend greater insight to nationally sponsored photography.

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**Title:** The engineer in me  
**Primary Author (and presenter):** Bennett, Njeri, A  
**Additional Authors:** N/A  
**Department:** Department of Industrial and Systems Engineer/Department of Curriculum and Teaching  
**College/School:** Samuel Ginn College of Engineering /College of Education

**Description:**

Early exposure to STEM (Science, Technology, Engineering, and Math) education positively impacts student's attitudes towards math and science. Students of color in lower socioeconomic (SES) areas are less likely to get exposed to STEM content before they step foot into a college classroom. The purpose of this research was to investigate an arts-infused Science, Technology, Engineering, Arts, and Math (STEAM) curricula centered on spatial thinking skills, science content knowledge, and attitudes towards science and engineering. We showed that exposing students at an early age to science and engineering is a worthwhile and impactful experience. We completed our research at an afterschool program called I Am My Brother's Keeper (IAMBK) for 23 weeks. We administered a pre and post-test that asked youth to draw an engineer and a scientist, and provide (1) Personal Information (2) Work Setting (3) Job Description, and answer the question, (4) What is the science/engineer in your drawing doing? Before the program started, students drew and answered questions in a way that indicated a lack of exposure to engineers and scientists that reflected their identity and the workforce experience of engineers and scientists. After the program, we saw that students made gains in drawing their scientist/engineers and describing a more global depiction in these areas. In addition to exposing students weekly STEAM activities, we introduced them to an assortment of engineers and scientists from similar underrepresented/marginalized groups through story telling and books. During the post-assessment students were more aware of self-identifying with the ability to become a scientist or engineer and they were exposed to the problem-solving skills that scientists and engineers possess.

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**Title:** The effects of scan strategies on additively manufactured metal parts

**Primary Author:** Bennett, William, H.

**Additional Authors:** Thompson, Scott & Masoomi, Mohammad

**Department:** Mechanical Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Additive manufacturing (AM) is currently at the forefront of engineering, demonstrating to be a unique method for constructing metal (e.g. Ti-6Al-4V, stainless steels, nickel superalloys, etc.) parts. However, there remains many questions regarding optimal laser scanning approaches, or scan strategies, when using AM. Since scan strategies can impact local, maximum temperatures, temperature gradients, and cooling rates, by learning optimal scan strategies, end-users can obtain more control over metal part properties/quality. Scan strategies should change based on part geometry, AM machine, residual heat in the solid, powder bed temperature, multiple vs. single lasers, island/partition planning, and more. Temperature gradients are an issue during the AM of metals because they are often non-uniform throughout the bodies and layers of construction and these creates residual, internal stresses in the metal that deform the intended shape of the part. High maximum temperatures can lead to vaporization and instability in the melt pool leading to porous builds. Local cooling rates affect the microstructure type and homogeneity of the final product. The focus of this study is to determine the best combinations of scan strategies to control the outcome and properties of metal objects. Computer simulations will be used, with the aid of Auburn University supercomputing resources, to numerically determine feasible scan strategies for various objectives (e.g. uniform cooling rates, reduced residual stress, etc.). Results will be presented to elucidate effects of scan strategy on these various objectives.

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**Title:** Assessment of macroscopic porosity-permeability relationships for pore network models undergoing uniform and non-uniform pore-scale dissolution and precipitation alterations

**Primary Author (and presenter):** Bensinger, Jacob H

**Additional Authors:** Beckingham, Lauren  
**Department:** Civil Engineering  
**College/School:** Samuel Ginn College of Engineering

**Description:**

Pore-scale mineral dissolution and precipitation reactions have a determinable effect on overall porosity and permeability. It is known that, generally, dissolution causes an increase in porosity while precipitation can lower porosity. Conversely, changes in permeability are more complex and not easily predictable. At the continuum scale, there are several different porosity-permeability equations such as the Kozeny-Carmen, Modified Fair-Hatch, and Verma Pruess relationships. However, the validity of these relationships for predicting permeability evolution for non-uniform pore scale alterations is unknown. In this work, pore network models (PNM) are used to evaluate the ability of macroscopic relationships to reflect permeability evolution due to uniform, size-dependent, and channelized pore-scale reactions with predictable effects on porosity. Here, pore radius, throat radius, and coordination number distributions for a 15% porosity Fontainebleau sandstone sample were interpolated from Lindquist et. al., (2000). The interpolation was done by using ImageJ, a National Institute of Health program, which allowed the distribution's values to be determined by breaking the image down into pixels and ultimately discrete values. MATLAB was then used to create a PNM and test changes in porosity and permeability under different alteration conditions. While the relationships fit the general shape of the distribution for many scenarios, they are unable to reflect the uniform coating and size-dependent reaction scenarios.

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**Title:** Identifying *RECQL* variants as breast cancer risk factors in European and African Americans.

**Primary Author (and presenter):** Bergstresser, Sydney, N

**Additional Authors:** Bishop, Madison; Huskey, Anna; Merner, Nancy

**Department:** Pathobiology

**College/School:** Auburn University College of Veterinary Medicine

**Description:**

Inherited genetic risk variants in breast cancer (BC) susceptibility genes can greatly influence a woman's overall lifetime risk of developing BC and are reported to explain ~35% of hereditary BC cases. Several attempts using whole-exome sequencing have been carried out to identify the genetically unsolved portion (~65%) of hereditary BC cases. Although the majority of these studies were unsuccessful, Cybulski *et al.* (2015) associated *RECQL* germline variants with hereditary breast cancer (BC) after screening BC-affected French-Canadian and Polish individuals. Since then, researchers have aimed to validate these findings by screening *RECQL* to identify variants in Chinese populations. However, to date, *RECQL* variant association studies have not been carried out in European Americans (EAs) or African Americans (AAs). Therefore, this project aims to investigate *RECQL* variants in EAs and AAs to provide insight of the contribution of *RECQL* variants towards hereditary BC.

Initially, 49 BC cases (19 AAs and 30 EAs) were screened for *RECQL* variants in coding exons using polymerase chain reaction and Sanger sequencing. Interestingly, the majority of variants detected were synonymous; thus, to further investigate the role of synonymous variants in *RECQL*, sequencing data from the blood-derived exomes of 168 and 580 BC-affected AAs and EAs were downloaded from The Cancer Genome Atlas (TCGA) project, and variants were identified using an in-house bioinformatics pipeline. After performing a case-control analysis, *RECQL* p.S64= was significantly associated in both ethnicities. Noteworthy, only one truncation variant, p.Y492\*, was detected after screening all 748 BC affected individuals. Unlike previous findings, this preliminary analysis suggests that rare *RECQL* synonymous variants may also increase an individual's lifetime risk of developing BC. Future efforts will involve carrying out a complete gene-based aggregation analysis.

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**Title:** What effect does wine closure type have on perceptions of wine's appearance, bouquet, taste, and overall quality? An empirical investigation

**Primary Author (and presenter):** Bernard, Shaniel A.

**Additional Authors:** Rahman, Imran; Reynolds, Dennis; & Holbrook, Amy

**Department:** Nutrition, Dietetics and Hospitality Management

**College/School:** College of Human Sciences

**Description:**

This study investigated the association between wine bottle closure type and consumer perceptions of intrinsic wine attributes (appearance, bouquet, taste, and overall quality) using evaluative conditioning theory and halo effect in real tasting situations. As such, the comparative effects of an extrinsic attribute of wine; closure type (natural, screw, synthetic and glass) on perceptions of intrinsic attributes of wine (appearance, taste, bouquet, and overall quality) among two separate samples of tasters was examined to determine whether differences between and within the means of the two factors exist. A random sample of students, parents, faculty, staff, and community members, from a college town in the northwestern United States participated in the study. The findings confirmed the positive halo effect of natural corks when compared to screw cap and synthetic cork closure. More specifically, wine in a bottle with a natural cork enclosure registered significant higher ratings on appearance, bouquet, taste, and overall quality compared with wines enclosed with screw cap and synthetic cork closures but not glass seals. As such, our findings showed promise for glass cap closures as a potential replacement product for natural corks. The implications for hospitality marketing professionals, restaurateurs, and other food and beverage operators are discussed.

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**Title:** Investigate bacterial leaf spot pathogen population dynamics on tomato and pepper in Alabama

**Primary Author (and presenter):** Bhandari, Rishi R.

**Additional Authors:** Newberry, Eric & Potnis, Neha

**Department:** Entomology and plant pathology

**College/School:** College of Agriculture

**Description:**

Bacterial leaf spot (BLS), caused by four species of *Xanthomonas*: *X. euvesicatoria*, *X. vesicatoria*, *X. perforans*, and *X. gardneri*, is a serious disease on tomato and pepper worldwide. Although BLS occurs in various commercial farms and farmers in Alabama, no information regarding the pathogen population is available. Since Alabama growers obtain their transplants from neighbouring states, the selection of currently deployed cultivars has been based on information gathered in these states. Thus, pathogen population structure in Alabama can have influence of pathogens brought inside the state on infected transplants from neighbouring states in addition to influence of local adaptation of pathogen. We sampled tomato/pepper fields across Alabama in 2017 season and molecular analyses including BOX-PCR and plasmid profile were used to analyse the genetic diversity within collected isolates. The novelty of this study is that we found at least three variants of the pathogen existing within a single field when compared to the representative strains of four species showing the presence of potential novel subgroups within Alabama tomato/pepper fields. Knowledge of diversity existing within pathogen population structure is important to design and direct resistance based breeding efforts. Control of bacterial spot is based primarily on the use of bactericides and has become more difficult over the years due to widespread resistance. A good example is of copper-based bactericides. Due to their continuous applications over the years, bacterial pathogens have developed tolerance. In the present study, we identified few recently isolated strains from Southeastern US containing copper resistance genes integrated into the chromosome as opposed to be plasmid-borne. Furthermore, we identified these copper

resistance genes to be carried on genomic island. This indicates genome rearrangements in pathogen population in response to continuous use of copper in the fields.

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**Title:** Propargylic C-H oxidation using a Cu(II) 2-quinoxalinol salen catalyst and *tert*-butyl hydroperoxide

**Primary Author (and presenter):** Black, Clayton, C.

**Additional Authors:** Gordon, Anne

**Department:** Chemistry and Biochemistry

**College/School:** College of Science and Mathematics

**Description:**

The synthesis of  $\alpha,\beta$ -acetylenic ketones is of wide interest due to their use as starting materials for the synthesis of heterocycles, nucleosides, aromatic compounds, anticancer agents, and other versatile compounds. While several examples of C-H oxidation reactions exist, very few examples of propargylic oxidations have been reported. Examples reported previously include the use of expensive transition metals such as rhodium, much higher catalyst loading, long reaction times (24 hours), or they may use multiple additives in addition to the catalyst. Herein, we report the oxidation of alkynes to  $\alpha,\beta$ -acetylenic carbonyls using only 1 mol % of an inexpensive Cu(II) 2-quinoxalinol salen catalyst with *tert*-butyl hydroperoxide in 4 hours. These reactions proceed under mild conditions (70 °C) with excellent selectivity, producing yields as high as 78%. The optimized conditions were used on a variety of alkyne substrates to produce the desired  $\alpha,\beta$ -acetylenic ketones. Also, we report the ability to run these reactions in water using a sulfonated version of the 2-quinoxalinol salen with good yields, reducing the need for volatile organic solvents and promoting the concept of “green chemistry”.

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**Title:** Soil respiration in a longleaf pine forest as influenced by throughfall reduction

**Primary Author (and presenter):** Blackstock, Jake C.

**Additional Authors:** Stokes, Tom; Ramirez, Michael; Mendonca, Caren; & Samuelson, Lisa

**Department:** Forestry

**College/School:** School of Forestry and Wildlife Sciences

**Description:**

Longleaf pine (*Pinus palustris*) forests can serve as disturbance-resistant, long-term carbon sinks and net ecosystem productivity of longleaf pine forests has been shown to be sensitive to drought. Soil respiration (Rs) is often the largest component of ecosystem respiration and can be sensitive to drought. The objective of this study is to explore the relationship between drought, imposed by a 40% reduction in throughfall, and temporal variation in Rs. The study site is an 11-year-old longleaf pine plantation established in May 2016 near Columbus, GA. Soil respiration, soil temperature, and soil moisture were measured approximately every three weeks at randomly selected locations within each plot from July 2016 to November 2017. Due to a naturally occurring drought from July to December 2016, we explored treatment effects and relationships during the drought and post-drought. During the drought period, soil moisture and Rs declined to near zero in both the ambient and throughfall reduction treatments during the drought period, and throughfall treatment had no significant effect on Rs and soil moisture. Following the drought (December 2016 through November 2017), throughfall reduction decreased Rs and soil moisture from June through November 2017, with the exception of one measurement date when soil moisture was low. During the drought period, soil moisture explained the majority (53%) of the variability in Rs, and soil temperature and distance to nearest tree accounted for 2% and 4%, respectively. Following the drought, soil temperature explained 47% of the variability in Rs and soil moisture, distance to nearest tree and surrounding tree basal area accounted for 7%, 4% and 1%, respectively. These results suggest that a

40% reduction in throughfall can decrease Rs and soil moisture in longleaf pine forests. In addition to Rs, the spatial variability in fine roots in response to throughfall reduction trays, and heterotrophic respiration was also studied.

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**Title:** Doxorubicin-induced memory deficits are associated with altered hippocampal synaptic plasticity and glutamatergic signalling deficits

**Primary Author (and presenter):** Bloemer, Jenna

**Additional Authors:** Alhowail, Ahmad; Eggert, Matthew; Woodie, Lauren; Jasper, Shanese; Bhattacharya, Subhrajit; Bhattacharya, Dwipayana; Zhang, Yongli; Johnson, Nate; Pinky, Priyanka; Govindarajulu, Manoj; Escobar, Martha; Dhanasekaran, Murali; Smith, Bruce; Arnold, Robert; & Suppiramaniam, Vishnu

**Department:** Drug Discovery and Development

**College/School:** Harrison School of Pharmacy

**Description:**

Doxorubicin (dox) is a widely-used and essential chemotherapy agent used in a variety of cancers including breast cancer. However, doxorubicin and other chemotherapy agents are associated with a phenomenon known as “chemobrain” or “chemofog,” which may occur in up to 75% of patients following chemotherapy. Chemobrain is a term used to describe memory impairments following chemotherapy. For some patients, the cognitive dysfunction may persist up to years past successful treatment of cancer. Currently, the molecular mechanisms underlying chemobrain are unknown. Elucidation of these mechanisms will provide an opportunity for development of novel therapeutic agents to prevent or treat these memory deficits and enhance quality of life in cancer survivors. In the current study, we have utilized a mouse model and administered five weekly tail vein injections of saline or doxorubicin (cumulative dose of 25 mg/kg). Dox treated mice showed deficits in Y-maze indicating deficits in hippocampal-based spatial memory. To investigate synaptic properties which may contribute to memory deficits, we next performed *ex vivo* electrophysiological studies. Dox treated mice displayed synaptic plasticity deficits in the Schaffer collateral pathway of the hippocampus along with altered glutamatergic receptor properties. In conjunction with alterations in glutamatergic receptor properties, we also observed alterations in glutamatergic receptor expression and key downstream signalling molecules such as CAMKII and BDNF. Taken together, this data suggests that doxorubicin impairs hippocampal based memory which may be due to alterations in glutamatergic receptor signalling.

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**Title:** The economic impact on construction and design companies through the Works Progress Administration on Alabama Polytechnic Institute’s campus

**Primary Author (and presenter):** Bobo, Katherine G.

**Additional Authors:** Redden, Lauren

**Department:** McWhorter School of Building Science

**College/School:** College of Architecture, Design and Construction

**Description:**

Franklin D. Roosevelt’s Administration gave birth to a new sense of pride in America during the years following the Great Depression in the 1930s through the Works Progress Administration (WPA) program. Work relief was preferred over public assistance, because it maintained self-respect, reinforced work ethic and kept skill sharp. Alabama Polytechnic Institute (API) greatly benefitted from this government initiative by completing approximately \$1.4 million in construction contracts with WPA allocated financial assistance. The land-grant university’s campus grew exponentially due to this work. These projects not only impacted API’s capacity for teaching, but also provided employment

opportunities to many specialty contractor firms, multiple general contracting firms, and at least one design firm through a devastating economic recession. The primary objective of this study is to construct an informative and comprehensive representation of the WPA funded projects on API's campus by specifically investigating: (1) how each project, contractor and designer was selected; (2) the total number of contracts awarded and funded; (3) how the university was selected as a beneficiary of the funds, including the application process and allocation methods. This study primarily focuses on data analysis of primary sources with supplemental information extracted from secondary literary sources. The primary sources utilized include U.S. National Archives & Records Administration documents acquired for record keeping purposes by the federal government programs office, as well as API's Board of Trustee Meeting Minutes documents and other university archival supporting documents. The findings of this study exhibit how the efforts to construct public educational facilities as part of the WPA program positively impacted the school, the community and the future of the construction industry. After such information has been obtained a project timeline is to be created to aid in the creation of a categorization method.

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**Title:** Conditioned responding and contingency awareness in differential delay eyeblink classical conditioning

**Primary Author (and presenter):** Bolaram, Anudeep

**Additional Authors:** Hurst, Danielle & Cheng, Dominic T.

**Department:** Psychology

**College/School:** College of Liberal Arts

**Description:**

Associative learning is a process by which an individual comes to understand the relationship between two events in the environment. One way to assess this ability is through classical conditioning. In this paradigm, a neutral conditioned stimulus (CS) is repeatedly paired with a biologically significant unconditioned stimulus (US). Following repeated presentations, the CS alone elicits a conditioned response (CR), suggesting an association between the CS and US has been made by the individual. In the case of eyeblink classical conditioning, the CS is a tone, the US is an airpuff to the eye and the CR is a reflexive eyeblink response. A fundamental question that has been debated in the domain of associative learning is whether this type of implicit learning relies on conscious awareness of the relationship between the CS and US. Recent reviews indicate that this type of learning depends on contingency awareness. Manipulating awareness can be achieved by using a number of different procedures. One method is to use two auditory CSs of similar frequencies in a differential delay conditioning where one always followed by an airpuff (CS+) and the other never followed by the airpuff (CS-). The aim of the present study is to determine whether the conditioned responding in aware participants is different from unaware participants. We manipulated awareness by presenting auditory CSs at 2000Hz, 2016Hz and 2026Hz counterbalanced across participants. The US was a 5psi airpuff to the left eye measured at the site of delivery. Pilot data indicated that given the current experimental manipulation, the participants were unable to discriminate between the tones. Future work will include increasing the range between CS frequencies in order to facilitate discrimination.

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**Title:** Mapping enhancer regions for genes associated with neurodegenerative diseases

**Primary Author (and presenter):** Bonner, Andrew

**Additional Authors:** Nguyen, Dan; Cochran, J. Nicholas; Partridge, Christopher; Roberts, Brian; Myers, Richard

**Department:** Myers Lab

**College/School:** HudsonAlpha Institute for Biotechnology

**Description:**

The goal of this study was to nominate possible enhancers (regulatory regions that enhance transcription) for genes that are associated with neurodegenerative diseases. We selected Amyloid Precursor Protein (APP), Progranulin (GRN), LRRK2, and C9orf72 as genes of interest because of their connections to Alzheimer's, Frontotemporal dementia (FTD), Parkinson's, and ALS/FTD, respectively. We nominated enhancers using bioinformatics tools, and tested top candidates with a luciferase assay. Specifically, enhancer regions were nominated based on presence in predicted topologically-associated domains, and the presence of chromatin marks associated with enhancers: H3K27Ac, H3K4Me1, and DNase Hypersensitivity in both the A549 cell line as well as fetal and adult brain tissue. We used a script developed in house to z-score datasets and quantitatively nominate regions with z-score peaks across multiple data types to create a list of possible enhancer regions. Nominated regions were tested in a luciferase assay. Candidate enhancers included nine 500 base pair sequences in proximity to the GRN, APP, LRRK2, and C9orf72 genes. Negative control regions from nearby regions that did not display enhancer characteristics were also selected. Of the 36 regions that were successfully synthesized and cloned, 8 regions showed activity in the luciferase assay in A549 cells, including 2 from APP, 4 from GRN, 0 from LRRK2, and 2 from C9orf72. These results justify further investigation of their possible role as enhancers using orthogonal assay types, such as ablation of the elements in situ using CRISPR/Cas9 and subsequent measurement of transcript levels of the gene of interest using qPCR, experiments that are currently in process. A better understanding of the regulation of the APP, GRN, LRRK2, and C9orf72 will provide new insights into their roles in disease. Furthermore, insights gained from study of the regulation of these genes may reveal new pathways of potential therapeutic relevance.

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**Title:** A developmental comparison of the effects of chronic cannabinoid exposure on impulsive choice in mice

**Primary Author (and presenter):** Boomhower, Steven R.

**Additional Authors:** Johnson, Katelyn R. & Newland, M. Christopher

**Department:** Psychology

**College/School:** College of Liberal Arts

**Description:**

Legalization and recreational use of marijuana and other cannabinoid-based substances continues to increase, but the impact of cannabinoids on the developing brain remains unclear. Adolescents in particular may be especially vulnerable to chronic cannabinoid exposure, given the continued maturation of the cannabinoid neurocircuitry and prefrontal cortex during this time. Using mice, the present study was designed to determine whether chronic administration of WIN55,212-2 (a marijuana-like compound) impaired choice behavior in adolescent and adult mice differentially. Mice were injected with WIN55,212-2 or vehicle control for 21 days in either adolescence (postnatal days 28-49) or adulthood (postnatal days 90-110), producing a 2 (drug) X 2 (age) full-factorial design. Thirty days after exposure, impulsive choice—preference for small, immediate rewards over larger, delayed ones—was assessed using a two-lever choice task in operant chambers. A right-lever press produced access to .01-mL milk immediately and a left-lever press produced access to .04-mL milk after a series of delays. In adult-exposed mice, WIN55,212-2 did not significantly alter impulsive choice relative to vehicle-exposed controls. However, WIN55,212-2 exposure in adolescence increased impulsive choice relative to age-matched controls and adult-exposed animals. These findings suggest the adolescent brain is more susceptible to chronic-cannabinoid exposure than the adult brain, which manifests as impaired impulsive choice. This carries significant implications for public-health policy related to cannabinoid-based drugs.

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**Title:** Probing Surface Defects and Electronic Reconstruction on *Nb*-Doped *SrTiO<sub>3</sub>* Substrates

**Primary Author (and presenter):** Bowers, William, T

**Additional Authors:** Will Bowers, Patrick Gemperline, Miles Blanchet, Uchenna Ubeh, Joe Bersson, Tamara Isaacs-Smith, Michael Bozack, Sarit Dhar, Ryan Comes

**Department:** Department of Physics

**College/School:** College of Science and Mathematics

**Description:**

Dopants and surface termination quality both perform an incredibly important role in the performance and characteristics of thin films. We have studied the properties of *Nb*-doped films of *SrTiO<sub>3</sub>* given different surface and annealing treatments including deionized water and a buffered *HF* etch. As a way to characterize these samples, we have performed atomic force microscopy, Rutherford backscattering spectrometry, X-Ray photoelectron Spectroscopy, electron transport and capacitance-voltage measurements. We found the annealing treatment to have a significant effect on electron transport through the film, and that the chemical termination of the film varied depending on which treatment was applied.

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**Title:** “Creating a tiny home building code to positively effect long-term sustainability.”

**Primary Author:** Boyer, Kara B.

**Department:** McWhorter School of Building Science

**College/School:** College of Architecture, Design, and Construction

**Description:**

The focus of this research will be to create a proposed building code specific to tiny homes. My research will answer the following questions: “What are the current viewpoints on building codes among The Tiny Home Movement community and government officials?” and “Can the current codes be combined and standardized to create a building code designed for use throughout the US?”.

The Tiny Home Movement has gained notoriety over the last ten years due to increased costs of living and a desire for increased financial freedom. Tiny homes have been viewed as potential sources to solve many economic, environmental, and social problems plaguing the US including homelessness, affordable housing, land scarcity, sustainable living, and increased financial support needed from government agencies. One of the main aversion to the movement has been the resistance by local and state officials to allow tiny homes to be developed in their communities due to lack of regulations. Previous research has not addressed how establishing regulations through a code would impact the development of tiny homes.

I am in the early stages of research but will be completed with my thesis by December 2018. My research methods will include quantitative and qualitative data research. I will gather information on building codes by contacting building officials and tiny home experts that are currently working to establish a tiny home building code known as “Appendix Q”. I am also going to collect inputs from tiny home owners, developers, realtors, and investment institutions throughout the US. I will be able to collect data through interviews and surveys to establish a proposed standardized code for my research; then analyse the potential effects.

The results of my research will establish five building standards that can be incorporate in “Appendix Q”. My research can then be incorporated into “Appendix Q” and used as documented support of “Appendix Q” as the official tiny home building code once legalized.

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**Title:** The Frontier Apocalypse: How Indian slave raiding created and destroyed empires in the Colonial Southeast

**Primary Author (and presenter):** Boyle, Christopher M.

**Department:** History

**College/School:** College of Liberal Arts

**Description:**

The 1704 Moore Raid on the Apalachee Missions in Spanish Florida is often regarded by histories of the region as a pivotal moment in the history of the Southeast. Not only did Moore's raiders (composed of a small contingent of British colonists and hundreds of Creek and other Indian allies) effectively destroy the Spanish colonial Empire in the Southeast, but enslaved hundreds of Apalachee Indians, and as such historians often cite this moment as definitive of the "Indian slave trade" in the Southeast. What these histories typically fail to mention, however, is much of the background information for the trade in Indian slaves. The purpose my paper is to investigate and codify the earlier raids and establish the context of the Moore raid. My research yielded a fascinating, if often violent, history of the Southeast between 1670 and 1704. The research for this project was conducted over a three month period from the end of August to early November 2017. Sources were acquired both online and from the Ralph Brown Draughon Library. Print sources that were used were primarily secondary sources, although Boyd, Smith, and Griffin's *Here They Once Stood – The Tragic End of the Apalachee Missions* proved to be an invaluable for its collection of primary sources (in the form of Spanish letters from the period). Secondary sources not only provided crucial information for the paper, but sources such as John Hann's works on the Apalachee Indians also directed me to helpful primary sources as well. The development of the Indian slave trade was a process that would ultimately shape the history of the Southeast. The complex relationships between Indian, English, and Spaniard shaped and were shaped by a system that brought down old empires in the Southeast and left new ones in their place. Under this light, the Moore raid is no longer a singular event in the region's history, but an endpoint of sorts in a long developing system of trade in guns, goods, and people.

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**Title:** Development of a hybrid motor to test combustion instabilities

**Primary Author (and presenter):** Boyle, Sadie M.

**Department:** Aerospace Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

As exploration of the solar system continues all types of propulsion systems must be analysed to meet the needs of new missions. Traditionally solid and liquid propulsion systems are used for launch vehicle and in space propulsion but solids lack the ability to throttle and liquids are complex and often require two cryogenic elements. Hybrid propulsion technology blends the simplicity of solids, the performance characteristics of liquids, and are safer and lower cost than both. Because of this, hybrids are continually being considered for future missions such as the Mars Assent Vehicle. Solid and liquid propulsion systems have a long flight heritage that hybrids do not have therefore there is a need to better understand the performance characteristics of hybrids. This is particularly true for combustion instabilities and the conditions that cause these instabilities. The goal of this project is to design and build a hybrid motor and test stand that can measure combustion instabilities for multiple configurations. The motor has been designed and initial testing consist of conducting a sequence of instrumented hot fire tests, noting observations, and examining the resulting oscillations. The goal of initial testing is to determine natural instabilities of the motor. Future testing will include testing different fuels and using acoustic forcing to force the motor unstable. This will contribute to a better understanding of the conditions that cause the motor to become unstable and the resulting performance. The results of these experiments will aid in a better understanding of the reliability and suitability of hybrids for future space missions.

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**Title:** Lithium acylphosphinate as a photoinitiator for use in tissue engineering

**Primary Author (and presenter):** Bradley, Gabi C.

**Additional Authors:** Finklea, Ferdous & Lipke, Elizabeth

**Department:** Chemical Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Hydrogels are hydrophilic polymer-based materials that have physical characteristics that resemble the native extracellular matrix which can be crosslinked using a variety of methods, including photoinitiation. Previously in our lab, Eosin Y has been used for photocrosslinking of biomaterials for the formation of hydrogels. This project investigates the ability to use lithium acylphosphinate (LAP), for crosslinking of hydrogels. The crosslinking efficiency of 10% (w/v) PEGDA hydrogels was tested using varying concentrations of LAP with different crosslinking times. Human fibroblasts were encapsulated within a PEG-fibrinogen hydrogel. The polymer precursor solution was prepared by mixing 2.5 mM LAP with PEG-fibrinogen and then crosslinked for 60 seconds using a 365-nm UV light. The viability was assessed using a Live/Dead Viability/Cytotoxicity kit. A Microsquisher parallel compression system was used to test the mechanical stiffness of hydrogels without cells as well as tissues with encapsulated fibroblasts from four different time points. PEG-fibrinogen and PEGDA hydrogels made with LAP successfully photocrosslinked. A high percentage of fibroblasts survived 48 hours after encapsulation. There was no significant difference in elastic modulus between LAP and Eosin Y hydrogels. These results show that biomaterials PEG-fibrinogen and PEGDA were both able to successfully crosslink when combined with the photoinitiator LAP; therefore, LAP has the potential to be leveraged for our system for the production of hydrogels. Fibroblasts survive encapsulation within PEG-fibrinogen that is crosslinked using the photoinitiator, LAP. LAP is also comparable to Eosin Y in terms of mechanical stiffness. Due to these results, LAP has the possibility to be used for encapsulation of other cell types including cancer cells and human induced pluripotent stem cells for differentiation to cardiomyocytes.

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**Title:** Rapid Prototyping of Electronics Cooling Nozzle Arrays

**Primary Author (and presenter):** Brannon, William, D

**Additional Authors:** Knight, Roy; Bhavnani, Sushil

**Department:** Mechanical Engineering

**College/School:** College of Engineering

**Description:**

Traditional air cooling methods no longer suffice for the small electronics in modern vehicles. This has created a demand for superior cooling strategies, one of which involves liquid cooling. It is desirable to incorporate the electronics into the radiator flow loop due to the engine coolant that is already present. Though not currently done, it would be most ideal for the liquid coolant to come into direct contact with the heat spreader via an array of jets.

A current constraint in evaluating this system is the time required to manufacture nozzle arrays. With the advent of 3-D printers, prototypes can be fabricated in hours instead of days. By utilizing Computer Aided Design and transferring that information to a 3-D printer, these modules can be designed, built and tested, yielding an enhanced understanding of the physics of fluid flow and heat transfer in jet arrays. This results in improved electronics cooling system design.

Because there are numerous variables affecting the heat transfer and pressure drop of the system, it is necessary to develop a tool with the purpose of rapid modification of prototypes. An effective means of creating a 3-D CAD model in a swift manner involves the production of a Graphic User Interface; several GUIs have been developed using SolidWorks API coding software to fulfil this purpose. These allow the user to select the desired number and orientation of nozzles, whether that be inline or staggered, and enter the desired parameters of the array, the most important of these being distance between nozzles and angle of the confining wall. However, the GUIs allow the user to go further and adjust parameters such as diameter and thickness of the nozzles, and distance of nozzle extrusion below the confining wall. This, along with 3-D printing, results in quick sampling of prototypes, and ultimately shortens the time needed to begin a series of testing cycles.

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**Title:** The effect of different UV-cured hydrogel structures on viscoelastic behavior

**Primary Author (and presenter):** Breaux, Steven, M.

**Additional Authors:** Joshi, Prutha; Auad, Maria

**Department:** Polymer and Fiber Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Hydrogels are hydrophilic polymeric networks able swell and absorb water without dissolving, provided that chemical or physical crosslinks exist among the macromolecular chains. Because of their resulting water content and mechanical properties, hydrogels have interesting applications in the medical field and tissue engineering. This research aimed to synthesize and characterize ultraviolet light (UV)-curable hydrogel systems for applications in tissue engineering. In this study, poly (ethylene glycol) (PEG) was modified with methacrylic anhydride via microwave synthesis to yield poly (ethylene glycol) diacrylate (PEGDA). Similarly, gelatin was modified with methacrylic anhydride to synthesize GelMA. The resulting modified polymers, PEGDA and GelMA, have UV-curable functionality, which enable them to crosslink under UV radiation and the presence of a photo-initiator.

The morphology and mechanical properties of these cured hydrogels were studied by performing tensile, compression, rheological, and water uptake testing.

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**Title:** Understanding locomotor adaptation in persons with essential tremor

**Primary Author (and presenter):** Brinkerhoff, Sarah, A.

**Additional Authors:** Roper, Jaimie; Harrison, Benjamin; Hass, Chris

**Department:** Kinesiology

**College/School:** College of Education

**Description:**

Essential tremor (ET) is one of the most prevalent movement disorders, yet little is known about its effect on gait adaptation. As ET is difficult to discern from movement disorders with similar clinical signs, the locomotor adaptation capabilities of a person with ET may help create a diagnostic tool. To evaluate locomotor adaptation, persons with ET and healthy older adults (HOA) walked on a split-belt treadmill (SBT) – a treadmill enabling one leg to move faster than the other leg. This paradigm provides a novel perturbation to normal walking. The participants' ability to adapt to, learn, and transfer the novel walking pattern was evaluated through step length, stride length, and single support time asymmetry. To further understand step length asymmetry (SLA), the spatial, temporal, and velocity contributions of SLA were analysed. HOA demonstrated typical SLA adaptation from early to late adaptation phases; conversely, the SLA of persons with ET did not change from early to late adaptation, suggesting a lack of adaptation. However, both groups demonstrated a difference in SLA between the first and second SBT exposure, indicating that both groups learned the new pattern. Stride length asymmetry was different in HOA from baseline treadmill walking to overground gait after walking on the SBT, indicating a transfer of the new gait pattern – no such effect was found in persons with ET. Persons with ET adapted the spatial, temporal, and velocity components of SLA to a lesser extent than did HOA across the adaptation session. Our results suggest that persons with ET exhibit a decreased locomotor adaptation and storage of the locomotor pattern. Further, the reduction in SLA adaptation in persons with ET can be derived from all components of SLA. We postulate that persons with ET may be capable of adapting their walking pattern but need more practice to adapt and store the new pattern than do HOA.

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**Title:** Swing mechanics of the offside forehand in professional female polo athletes

**Primary Author (and presenter):** Brittain, Abigail

**Additional Authors:** Gilmer, Gabrielle; Barfield, Jeff; Washington, Jessica; Oliver, Gretchen

**Department:** School of Kinesiology

**College/School:** College of Education

**Description:**

The sport of polo is gaining popularity, especially amongst youth. With increased participation, there is a need for fundamental instructional programs. However, to establish appropriate fundamentals, a greater understanding of the polo swing is warranted. The offside forehand swing is most common, and it is often described as 360° of dynamic motion of the upper extremity. Thus, the purpose of this study was to describe the kinematics of the offside forehand polo swing; specifically, trunk (flexion, lateral flexion, rotation) and upper extremity (shoulder abduction, elevation, and elbow flexion) as well as upper extremity segmental velocities. Ten female professional polo athletes ( $33.0 \pm 10.4$  yrs.;  $66.87 \pm 9.29$  kg;  $107.37 \pm 22.07$  cm) participated. Kinematic data were collected at 100 Hz using an electromagnetic tracking system synced with The Motion Monitor®. Each participant executed three maximum effort offside forehand swings. Kinematic data were averaged across the three trials of the offside forehand polo swing at three swing events: take away, top of back swing (TOB), and ball contact. Results revealed the greatest forward and lateral flexion of the trunk occurred at ball contact ( $30^\circ \pm 12^\circ$ ,  $52^\circ \pm 14^\circ$  respectively), while the greatest trunk rotation occurred at TOB ( $64^\circ \pm 18^\circ$ ). Elbow flexion was greatest at take away ( $94^\circ \pm 26^\circ$ ). Shoulder abduction and elevation were greatest at TOB ( $70^\circ \pm 34^\circ$ ,  $90^\circ \pm 26^\circ$  respectively). Segmental velocities of the humerus, forearm, and hand remained steady from swing take away to TOB, and then continued to increase with the hand displaying the greatest velocity at ball contact. The current

study is one of the first attempt to describe trunk and upper extremity kinematics of the offside forehand polo swing. Because these data describe the movements of professional athletes, they can be applied to youth to identify injury susceptible mechanics. Further investigation can be developed in attempt to assist with developing instructional programs.

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**Title:** Computational studies of the air oxidation mechanism of dinoflagellate luciferin

**Primary Author (and presenter):** Brown, Thomas

**Additional Authors:** Channell, Kirsta G.; Donnan, Patrick H.; Mansoorabadi, Steven O.

**Department:** Department of Chemistry and Biochemistry

**College/School:** College of Sciences and Mathematics

**Description:**

In the bioluminescence reaction of dinoflagellates, the enzyme luciferase acts on the substrate luciferin in a photochemical reaction that emits light. Purified luciferin is extremely sensitive to oxidation and will oxidize if exposed to atmospheric oxygen concentrations. The product of the air oxidation of luciferin is distinct from that of the enzymatic reaction and is formed without the emission of light. The reaction mechanism for the air oxidation of luciferin is currently unknown. An investigation into this process may give insight into the way in which luciferase suppresses the air oxidation reaction and tunes the reactivity of luciferin towards bioluminescence. Using the Gaussian 16 software package, we have performed density functional theory (DFT) calculations of possible intermediates along proposed reaction coordinates. These calculations, combined with transition state analyses, will provide insight into the kinetics and thermodynamics of these competing reactions of luciferin.

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**Title:** Quantitative analysis of sprayer cleaning efficacy following 2,4-D and dicamba applications

**Primary Author (and presenter):** Browne, Frances B.

**Additional Authors:** Li, Steve & Price, Katilyn

**Department:** Crop, Soil and Environmental Sciences

**College/School:** College of Agriculture

**Description:**

Commercialization of 2,4-D and dicamba-tolerant crops has led to concerns of tank contamination causing non-target exposure of sensitive crops to harmful herbicide residues. To test retention of 2,4-D and dicamba in commercial sprayers following common tank cleaning procedures, field and laboratory experiments were conducted in 2017. Three commercial sprayers were used to apply 2,4-D at 1.06 kg ai ha<sup>-1</sup> and dicamba at 1.12 kg ai ha<sup>-1</sup>. Following applications, sprayer tanks were cleaned using four protocols. One cleaning method was triple rinse with water and the remaining three included a first rinse of 3% v/v ammonium, a third rinse of water and second rinses were either glyphosate, Fimco, or Protank detergent at 5.11 kg ai, 0.90 kg, and 0.95 L per 378 L water, respectively. 2,4-D and dicamba residual concentrations after completion of any cleaning protocols tested ranged from 1-2 ppm. Meanwhile, different doses of 2,4-D and dicamba (6.84 g ai ha<sup>-1</sup>, 35.07 g ai ha<sup>-1</sup>, and 140.00 g ai ha<sup>-1</sup>) were applied to cotton and soybean to evaluate resulting crop injury. Leaf tissues were collected at 1, 7, and 21 days after treatment (DAT) for analysis of foliage concentrations. Results suggest foliage concentrations were only 1-3% at 21 DAT compared to those observed at 1 DAT for all doses, indicating majority of 2,4-D and dicamba absorbed by foliage has been metabolized. Cotton injury resulted from 2,4-D was less severe than soybean response to dicamba. At 21 DAT, cotton visual injury after exposure to 140.00 g ai ha<sup>-1</sup> of 2,4-D was 50% while soybean exposed to 140.00 g ai ha<sup>-1</sup> of dicamba resulted in 90% visual injury. In summary, cleaning performance of triple rinse with water is comparable to protocols with glyphosate and commercial detergents and not likely to result in crop injury. Prevention of

non-target exposure will be critical as exposure to higher rates of 2,4-D and dicamba may result greater concentration in crop foliage, thus leading to more injury and yield loss.

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**Title:** The flawed candidacy of George McClellan

**Primary Author (and presenter):** Buford Jr., Barry L.

**Department:** History and World Languages and Cultures

**College/ School:** College of Arts and Sciences- Auburn University at Montgomery

**Description:**

As commander of the Army of Potomac, the Union's largest army, Major General George McClellan frustrated many of President Lincoln's expectations and primary objectives—particularly fighting the Confederacy aggressively—by his overly cautious and circumspect approach. McClellan's arrogance, signature delays, and paranoia help explain some of the General's military shortcomings. As a Presidential candidate, McClellan did not fare much better. Nonetheless, the 1864 Presidential Election was a compelling political contest. While American history justifiably reveres Abraham Lincoln for the perseverance he embodied during the Civil War, and for the emancipation policies the President championed, persons interested in political history may perhaps be surprised that, for all Lincoln's accomplishments, the President was quite unpopular in 1864. The Civil War had become a grinding, bloody series of never-ending battles. The inability of Lincoln to end the war, coupled with the President's forceful social agenda regarding slavery, dissatisfied many voters. McClellan, the Democratic Party nominee, offered voters in the twenty-five Union states an alternative to the status quo. Democrats attempted to challenge the Lincoln administration by alleging constitutional violations and proclaiming the war a failure. The language of the Democratic platform communicated peaceful negotiations with the Confederacy. However, McClellan's acceptance speech at the Democratic National Convention signaled more conflict. The paradoxical message left many voters, soldiers, and news writers wondering exactly where the Democrats stood on the war. Slavery was omitted from the Democratic platform altogether. Nevertheless, the peace plank of the Democratic platform damaged McClellan's electability more than any single variable. My research identifies the various challenges confronting the Democratic Party in 1864, specifically regarding the divisive candidacy of McClellan.

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**Title:** Combining biological and chemical controls to combat toxic cyanobacterial blooms

**Primary Author:** Buley, Riley P.

**Additional Authors:** Wilson, Alan & Yang, Zhen

**Department:** Fisheries, Aquaculture, and Aquatic Sciences

**College/School:** College of Agriculture

**Description:**

Toxic cyanobacterial blooms degrade water quality and produce secondary metabolites toxic to both humans and animals, making bloom events a prominent issue of concern in drinking water reservoirs and aquaculture ponds. Because of these issues, resource managers have employed multiple approaches to reduce the occurrence and severity of bloom events, including methods of biological, physical, and chemical control. Previous research on control methods has produced promising results, but research combining control method types has rarely been seen. In this study, we assessed the effectiveness of hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>), a chemical control, in combination with *Daphnia pulex* possessing cyanobacteria-sensitive or cyanobacteria-tolerant genotypes, a biological control. Study objectives strive to find combinations of both control types to first reduce bloom density with H<sub>2</sub>O<sub>2</sub>, and then prevent bloom reoccurrence using the grazing abilities of *D. pulex*. We hope that study findings will provide

resource managers a novel, effective methodology to control toxic cyanobacterial blooms while also reducing the amount of chemical additions into aquatic habitats.

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**Title:** Voices to be heard: A qualitative analysis of teacher success and longevity in the agriscience classroom.

**Primary Author (and presenter):** Burgess, K.A.

**Additional Authors:** Clemons, C.A.; Lindner, J.L.

**Department:** Curriculum and Teaching

**College/School:** College of Education

**Description:**

This study investigated the longevity of successful agriscience education teachers in the United States and their rationale for remaining in the agricultural classroom. A qualitative analysis of attitudes and perceptions related to teacher success in the classroom was conducted. The survey instrument consisted of three defining categories: characteristics of climate and culture of the employer, professional development as an FFA advisor, personal characteristics of self, family, and peers. Statements related to teacher matriculation, pre-service teacher perceptions and attitudes of agricultural education, participant interviews, two pilot groups, and one pilot test were conducted. Cochran's Analysis was used to determine the appropriate sample for reliability of the data. Agriscience education teachers were contacted through email and mailed surveys. Salary, benefits, and the expectations of administration should be an indication of teacher longevity. When teachers are happy with their financial and workplace environment their ability to focus on other aspects of a successful career are identified. Teachers also indicated the need to develop their time management skills as an FFA advisor and attaining personal and professional goals as measures of longevity. Findings indicated a need for self-fulfillment that can only be obtained by the teacher when they feel supported and comfortable in their position. Teachers need to be challenged and set measurable and attainable goals. These measures provided motivation and "feel good" emotions which reinforce feelings of happiness. Participants strongly regarded the blending of family and career while managing stress and anxiety indicating a vital component of remaining in agricultural education.

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**Title:** Dysbiosis caused by antibiotic use leads to an increase susceptibility to bacterial infection in Zebrafish (*Danio rerio*)

**Primary Author (and presenter):** Burgos, Francisca A.

**Additional Authors:** Wenlong, Cai; Arias, Cova; & Bullard, Stephen

**Department:** Fisheries, Aquaculture, and Aquatic Sciences

**College/School:** College of Agriculture

**Description:**

The gut microbiome of fish is composed of a complex community of bacteria living in a mutualistic relationship with their host. When this balance is disturbed, i.e. dysbiosis, bacterial diversity tends to decrease while opportunistic pathogens increase leading the host to be more susceptible to bacterial infections. In aquaculture, Florfenicol (FFC, commercially known as AQUAFLO) is a broad-spectrum antibiotic widely used to control bacterial infections. This study evaluated the effect of FFC-medicated feed on the gut microbiome of healthy adult zebrafish to determine i) if complete doses of FFC-medicated feed induce dysbiosis, and ii) if fish with an altered gut microbiome were more susceptible to a common opportunistic bacterial pathogen, *Aeromonas hydrophila*. Four treatments were compared in this study: a) System control (Normal feed); b) Treatment I (Normal feed & bacteria challenged); c) Treatment II (FFC-medicated feed & challenged) and Treatment III (FFC-medicated feed

& not challenged). Fish were fed with FFC-medicated feed for 10 days and allowed 15 days to recover before being challenged. Across the study, the gut microbiome was analysed using High-throughput Illumina Miseq DNA sequencing of the V4 domain of the 16S rRNA gene. Quantitative-PCR was used on specific genes, CCL20, IL1 $\beta$ , IL-8, and TNF $\alpha$  that have been associated with pro-inflammatory activities to understand the effect of the medicated feed on intestinal inflammation and homeostasis. Zebrafish, fed with antibiotics, exhibited dysbiosis that resulted in an observed decrease in bacterial diversity accompanied with a bloom of Proteobacteria and a drastic reduction of *Mycoplasma* and *Cetobacterium*. Moreover, antibiotic-treated fish exhibited a significantly higher mortality rate when they were exposed to the opportunistic pathogen. No significant differences were found in gene expression among all genes tested.

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**Title:** Language style matching and older adult's marital satisfaction

**Primary Author (and Presenter):** Burke, Benjamin M.

**Additional Authors:** Rauer, Amy

**Department:** Human Development and Family Studies

**College/School:** College of Human Sciences

**Description:**

Poor marital communication is a leading reason that couples seek therapy. Because of its importance in marriage, marital communication is one of the most studied aspects of relational functioning. In fact, recent works have demonstrated that even similarity in function word use (e.g., articles, prepositions) is associated with relationship initiation and short term stability in younger couples. This function word similarity (called language style matching; LSM) has yet to be examined in older relationships. Given the unique developmental challenges and opportunities in later adulthood (e.g., couples may have more health challenges but experience greater levels of emotional closeness), the current study was conducted to see if LSM had similar associations in a sample of 64 older adult, heterosexual married couples. Utilizing transcripts from two different conversational tasks (reminiscence and problem-solving), we calculated the rate of LSM between spouses during each conversation task and then averaged these rates to create an overall couple LSM rating. Hierarchical linear regressions revealed that overall LSM was related to marital satisfaction, but only for wives. A similar link between context specific LSM and wives' satisfaction was also found, but only during reminiscence. The results ultimately suggest that LSM still plays a role in the communication of older couples, one of particular importance for wives during reminiscence. Therefore, clinicians working with older adults may benefit from utilizing behaviorally focused interventions targeting couples' language use during reminiscence.

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**Title:** Urban mapping in Auburn, AL using sUAS

**Primary Author (and presenter):** Bush, Austin

**Additional Authors:** Rogers, Stephanie

**Department:** Geosciences

**College/School:** College of Sciences and Mathematics

**Description:**

In contemporary research involving remote sensing and geographic information systems (GIS) technology, there is often an emphasis on using data acquired via satellites or aircraft. Generally, LiDAR has been the relatively new and innovative approach to creating high resolution data sets, but even it has some drawbacks that contrast its benefits. LiDAR tends to be a costly approach to generating point cloud data and oftentimes not every region has access to its necessary equipment. Obviously larger cities with more funding can afford to acquire this data with relatively little problems, however, what about the little

towns that have less funding for such research endeavors? When faced with this problem of feasible affordability and accessibility, professionals are sometimes left without the data they require to conduct their work. Recognizing this dilemma of real-world accessibility to high-resolution data sets, it brings to question, is there an alternative approach for acquiring aerial imagery in a cost-effective (and time-effective) manner? Fortunately, in the decade that we live in, there is a rapidly growing market for Small Unmanned Aircraft Systems (sUAS) that is aggressively branding its products for the real-world researcher/consumer that lack the funds for conventional data acquisition methods. This paper details the steps and methods used to create an orthomosaic map and 3D model of an urban location within Auburn, Alabama. Due to regulatory obstacles, there is a struggle to use sUAS in urban environments, so this paper aims to address some of those obstacles and propose how they can be managed. The anticipated results of this project will act as a template for using sUAS in urban research for the City of Auburn, which can be further expanded on as the City develops its own policies integrating the use of sUAS in their projects.

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**Title:** A Code for the Unpublished: Creation of a TEI XML Style Guide and Learning Module for the 18th-Century Manuscript Fiction Database

**Primary Author (and presenter):** Butgereit, Mary C

**Additional Authors:** N/A

**Department:** English

**College/School:** College of Liberal Arts

**Description:**

This year I have created a TEI XML style guide for Dr. Emily Friedman's Manuscript Fiction Database. This style guide establishes the coding expectations for the project and serves as an introduction to TEI XML for those unfamiliar with the markup language. The guide not only expedites future encoding efforts, it is an educational resource. As part of this work, I have collected, transcribed, and encoded 18th-century manuscripts of the sort that will populate the database.

My goals for the style guide is that it appeals and is useful to students at all levels of coding, especially those that have not encountered TEI XML before. The current iteration focuses on the basics of structural coding – i.e., coding for indents, paragraphs, line breaks, etc. As I have transcribed manuscripts using TextWrangler and encoded them in Oxygen XML Editor, I have explored what basic code tags it requires and recorded them. My next steps will be to format them and conduct usability tests to ensure their usefulness with students.

Simultaneously, we have been conducting research on one of the manuscripts, held at Duke University. Originally believed to be connected to Jane Austen, we have found that the novel was published in the London Magazine by an unknown author fifty years prior to the creation of the manuscript. Moreover, the story bears strong similarities to Samuel Richardson's important early novel Pamela. We are now creating an edition of the work that shows the differences between the periodical and the manuscript versions.

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**Title:** The Effects of Hormone Signalling on *Drosophila* Behaviour and Physiology

**Primary Author (and presenter):** Byers, Alexandra, P

**Additional Authors:** Graze, Dr. Rita; Howard, Tiffany

**Department:** Biological Sciences

**College/School:** College of Biological Sciences

**Description:**

Insulin signalling plays a role in multiple adult behaviours, including locomotion, sleeping, stress behaviors, aggression, feeding, mating, ethanol sensitivity and olfactory behavior. The aim of this project is to develop the insulin signalling pathway as a model for an improved understanding of the relationship between differential expression, and behavior. Ultimately this will lay the groundwork for understanding how sex differences in regulation of the insulin signalling pathway contribute to variability and shape evolution of sex differences in complex behavioral traits. The first objective is to understand how sex differences in this pathway modifies associated phenotypes like stress response and behaviour. The second objective is to determine how sex differences in EcR connect to other hormone signaling pathways. The final objective is to determine how hormone signalling pathways regulate expression differently in males and females Two experimental setups were used: the first experimental cross was Act5c-GAL4. Switch/TM6B X UAS.EcR. B1DN1.1 to overexpress the B1 isoform and the second experimental cross was Act5c-GAL4. Switch/TM6B X UAS.EcR. B2DN1.1 to overexpress the B2 isoform. In this study, the InR pathway is blocked by activation of a dominant negative form of the protein using a gene-switch which allows expression to be turned on in the presence of Mifepristone. This allows the pathway to be shut down in the adult (and not during development), enabling us to study the effects of the pathway on gene expression in males and females. Completion of these experiments will allow scientists to adapt how we think about variation and evolution of sex differences in gene regulation. This will lay the groundwork for future research to mechanistically connect sex determination genes, such as doublesex, with sex-differential expression in IIS/Tor pathway genes and their effects on behavioural dimorphism.

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**Title:** A peek inside the black box: Genetic basis for attenuation of a live vaccine against columnaris disease in fish

**Primary Author (and presenter):** Cai, Wenlong

**Additional Authors:** Arias, Cova

**Department:** Fisheries, Aquaculture, and Aquatic Science

**College/School:** College of Agriculture

**Description:**

Bacterial diseases continue to be one of the top priorities for the aquaculture industry. Channel catfish is the main aquaculture species in the USA and farmers are in desperate need of new technologies to control infectious diseases. Our group has patented a modified-live vaccine (a rifampin-resistant mutant) against columnaris disease. We have proved that our vaccine is stable, safe, and effective but the mechanisms that resulted in attenuation remained uncharacterized. To understand the molecular basis for attenuation, we conducted a comparative genomics analysis to identify the specific point mutations. The mutant vaccine strain (Fc1723) and parent virulent strain (FcB27) were sequenced using PacBio RS long-read sequencing platform. *De novo* genome assembly of filtered reads was performed using PacBio PBcR HGAP 2.3 pipeline with default settings, which yield 8 and 16 contigs with 169 X and 109 X coverage, respectively. For function annotation and comparative genomic analysis, we used the Rapid Annotation with Subsystem Technology (RAST; version 2.0). Sequence-based genome comparison identified 16 single nucleotide polymorphisms (SNP) unique to the mutant. Genes that contained mutations were involved in gliding motility, DNA transcription, toxin secretion, and extracellular protease synthesis. Rifampin is a potent, broad-spectrum antibiotic that functions by inhibiting the  $\beta$ -subunit of prokaryotic DNA-dependent RNA polymerase (RNAP). Comparative genomic analysis of the vaccine strain Fc1723 revealed two SNPs in the RNAP gene as compared to the parent strain. Understanding the genetic mechanism in the live virulent-attenuated vaccine leads to the identification of those features related to attenuation, mutant stability, and its safety (regarding potential reversion to virulence).

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**Title:** The effects of socio-hydrology on the rebuilding of Biloxi, Mississippi

**Primary Author (and presenter):** Calhoun, Jessica L.

**Additional Authors:** O'Donnell, Frances & Burton, Christopher

**Department:** Civil Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

In August 2005, Hurricane Katrina ripped through the Gulf Coast of the United States causing billions in damage. The storm cost the City of Biloxi, Mississippi \$355 million in infrastructure repair, which is being constructed with funding from the Federal Emergency Management Agency (FEMA). Approximately thirty percent of the city's storm systems including water and sewer pipes, storm drains, bridges and culverts are being replaced and updated utilizing FEMA Hazard Mitigation funding to lessen the impact of future natural disasters. This study uses a dynamic model created by G. Di Baldassarre et al. (2013) with modifications to correlate the replacement and construction of new sewer pipes and socio-economic processes. The results will be used to assess Baldassarre et al. feedback loop finding that raising flood protection increases flood levels and therefore requires a higher level of flood protection. The results will also be evaluated to create a tool for the City of Biloxi to improve their resilience from future hurricanes and storm surge events.

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**Title:** Task-Based Learning: a Pedagogical Approach to Second Language Acquisition

**Primary Author (and presenter):** <sup>1</sup>Camp, Peyton, N.

**Additional Authors:** <sup>2</sup>Gutiérrez, Jana; **Department:** Foreign Languages

**College/School:** Liberal Arts

**Description:**

This study presents a model of Task-Based Learning, a pedagogical approach to Second Language Acquisition theoretically under the Communicative Language Teaching frame. While controversial to traditionalists due to the lack of emphasis on explicit grammar instruction and rote vocabulary memorization, CLT increases true proficiency; thus, providing a practical grounding of Applied Linguistics theory.

The American Council on the Teaching of Foreign Languages (ACTFL) promotes standards for effective pedagogy: communication in a variety of authentic situations, cultural fluency, interdisciplinary competence, sociolinguistic awareness, and global integration. This experiment, embodying such principles through a concrete task, has implications for learner autonomy beyond the classroom.

This task required creating an original business that highlights the diverse Spanish-speaking community. *Cocina Latina* (Latin Kitchen) is a U.S.-based food-subscription service devoted to delivering meals to be prepared by home-chefs using fresh ingredients from pan-Hispanic vendors. The student entrepreneur researched similar companies such as *Blue Apron* as well as investigating traditional Latino recipes and familiarizing herself with international business practices such as marketing and distribution. She pitched her original business plan (*Shark Tank* style) entirely in Spanish to a group of potential investors and followed this oral presentation with a reflective written statement in Spanish. This task provided an impetus for increasing familiarity with specialized jargon, complex cultural norms, professional practices as well as the ultimate goal of increasing second-language multi-skill proficiency. Thus, the project exemplifies the credibility of Bill Van Patton's ideology: "Tasks are the quintessential communicative event in contemporary language teaching."

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**Title:** Attributing cause to others' workplace relationships: The case for external relational attributions

**Primary Author (and presenter):** Carson, Jack E.

**Department:** Business- Management  
**College/School:** Raymond J. Harbert College of Business

**Description:**

Individuals' awareness of others' relationships has not yet been fully explored in organizational attribution research. I posit individuals are aware of others' relationships in the workplace, and identify these relationships as potential causal sources of experienced and observed events. A theoretical argument is presented distinguishing external relational attributions from single-other external attributions and relational attributions. I draw upon existing theory to propose situational antecedents and behavioral outcomes of external relational attributions. An empirical approach to examining dimensionality of external relational attributions is presented, as well as considerations for measure development. The paper concludes by highlighting the utility of external relational attributions in more clearly determining how employees understand and react to workplace situations and events.

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**Title:** Purification of an exceptionally resilient and long-lived orange fluorescent protein from the Gulf anemone *Calliactis tricolor*

**Primary Author (and presenter):** Carson, Kendra M. H.

**Additional Authors:** Lawson, Rose; Boggio, Daniel; Flurry, Hanna; Helbert, Kendall; & Moss, Anthony

**Department:** Biological Sciences

**College/School:** College of Science and Mathematics

**Description:**

GFP was one of the most useful discoveries of the 20<sup>th</sup> Century, due to its subsequent use in cell and molecular tagging applications, resulting in three Nobel Prizes in 2008. GFP and similar proteins, including anthozoan fluorescent proteins, have been used in numerous research efforts to probe cellular structure and function since its introduction. We have discovered a similar protein in a variant of the common anemone, *Calliactis tricolor*, from the Alabama Gulf Coast, which, unlike other anthozoan fluorescent proteins, is extraordinarily long-lived and resilient. In February 2014 and 2015, anemones were collected by trawling at a depth of 8 to 20 m south of the Mobile Bay Entrance. The anemone's mouth and mesenteries produce intense orange fluorescence, peak emission at 510 nm and 570 nm when illuminated by blue light at 500 nm and 540 nm. Illumination at 490 nm gives the perception of brilliant orange fluorescence. The protein appears to be freely associated with the cytoplasmic space of mesentery cells; purification of the protein from a cleared cytosolic homogenate by 5-20% sucrose gradient rate-zonal centrifugation yields a ~10S trimeric quaternary complex with three bands at 31, 25 and 10 kDa as revealed by SDS-PAGE. LC-MS/MS reveals that the fluorescence moiety is novel and has effectively no homology to any previously known fluorescent protein; moreover the fluorescent group is found only in the largest subunit. Ongoing whole genome analysis and differential transcriptomic analyses seek to reveal genome organization and appropriate regulatory elements and should provide data for future incorporation of this group into cellular probes. Our work reveals that this is a very easy to purify, resilient and easily handled protein, albeit limited currently by availability of the host, which has been impacted by heavy rainfall in the collection area.

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**Title:** Developing a fire-based control method for restoring hardwood forests invaded by Chinese privet

**Primary Author (and presenter):** Cash, James S.

**Additional Authors:** Stiles, Jimmy & Anderson, Christopher

**Department:** Natural Resources

**College/School:** School of Forestry and Wildlife Sciences

**Description:**

Chinese privet (*Ligustrum sinense*) is a non-native invasive shrub that is widely distributed across millions of acres of the Southeastern United States. There are many negative ecological consequences of privet invasions, including reduced native biodiversity and limited forest regeneration. Herbicides are a commonly employed control method; however there are rising concerns regarding possible negative effects on human and environmental health. This has led some managers and landowners to seek a non-herbicide alternative control method. Our goal is to develop a fire-based control method that is effective, efficient, and environmentally friendly. Privet is a tenacious re-sprouter, so we hypothesize that a successive combination of mechanical cutting, prescribed fire, and directed fire will be required. The objectives of this study are to provide proof of concept for this technique, develop guidelines for efficient implementation, and evaluate effects on wildlife habitat components. We are currently conducting field trials within replicated 20x20m plots at our field site on the Black Warrior River in western Alabama. Mechanical cutting treatments were applied on 22 plots during Fall 2017. Prescribed fire treatments were conducted January-March 2018 and directed fire treatments are planned to start in May 2018 and continue through the 2018 growing season. Plans are in place to utilize 2ha treatment areas in 2019 to test the scalability of the method and its effects on wildlife habitat. If our fire-based control method proves successful we will develop technical guidance resources for the public through collaboration with the Alabama Cooperative Extension System.

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**Title:** Ecology of human West Nile prevalence in Atlanta, Georgia

**Primary Author (and presenter):** Castaneda, Nicole, J.

**Department:** Natural Resources

**College/School:** School of Forestry and Wildlife Science

**Description:**

West Nile Virus (WNV) has caused hundreds of human deaths and has cost the U.S. more than \$778 million (\$56 million per year) in health care payments since its first emergence in 1999. To understand the ecology of human West Nile prevalence, we will test several hypotheses affecting either mosquito habitats or avian habitat. This study is based on *Lockaby et al.* 2016; their preliminary data was used to establish some of the hypotheses. Our first hypothesis states that an increase of avian diversity will decrease the risk for WN in an area. This is due to the *Dilution Effect*, which states that higher biodiversity will lessen the chance for viral outbreaks. If a forest patch has mainly only corvids species, then there would be a higher chance for a mosquito to infect the bird. However, if the forest patch had a larger variety of bird species, then there would be less of a chance for a mosquito to find a corvid to continue the cycle and allow more infection. Our second hypothesis looks into whether or not forest patches made of more deciduous trees will provide more breeding habitats for mosquitoes. Our third hypothesis states that neighborhoods with older houses will have a higher risk for West Nile because they have older sewer systems that create problems such as combined sewer overflow (CSOs). Often these discharges end up creating stagnant pools of dirty water that the mosquitoes need to reproduce. In addition to having older sewage systems, low-income neighborhoods also tend also to have tires and empty pots that also provide the habitat needed for mosquito reproduction. The goal of this study will improve our understanding of the West Nile Virus, and we will use outreach programs to educate the public on the importance of avian diversity, mosquitoes ecology, and urban green space.

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**Title:** An evolutionary strategies method to optimize compressor and turbine blades

**Primary Author (and presenter):** Cervantes, Noel

**Additional Authors:** Hartfield, Roy

**Department:** Aerospace Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

As of 2013, the DOD bought 73.32 million barrels of jet fuel at a cost of \$12.21 billion and from trends in fuel price, they typically increase every year and amount to a high percentage of costs for commercial and military industries alike. This has led to a significant amount of work towards improving individual components for many engine types. The goal of this study is to improve a 2D optimization scheme for turbine and compressor blades, specifically by improving the overall efficiency of each blade row with respect to objective and penalty functions. The study will utilize the NASA Energy Efficient Engine high pressure turbine stage 1 and NASA Compressor Rotor 37. Both have numerous amounts of experimental and computational fluid dynamic studies. Optimization of compressor and turbine blades utilizing a range of advanced learning techniques such as Genetic Algorithms, Evolutionary Strategies, and Neural Networks, have been the subject of numerous studies. This research uses Evolutionary Strategies since it has applicable characteristics which promote speed, reliability, and simplicity of implementation as compared to Genetic Algorithms or Neural Networks. To drive the solution to an optimal solution, objective and penalty functions will be utilized and discussed as they are used to evaluate each offspring and ensure the optimum solution has the desired flow characteristics. While optimization is critically important for improving the efficiency of the compressor and turbine; of equal or greater importance is the modeling approach used for predicting performance. One element of modeling discussed in this work is the previous use of Bezier Curves and its inability to generate the entire blade, specifically at the leading and trailing edge. An improved method for modeling the blades utilizing Shape Functions will be discussed as they are useful for controlling the curvature of the leading and trailing edges and still provide the same continuity as Bezier Curves.

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**Title:** Neotifacts: An exploratory study of the cultural infusion in symbolic artifacts and its impact on fashion jewellery

**Primary author (and presenter):** Chakraborty, Swagata

**Additional Author:** Roy Anannya, Deb

**Department:** Consumer and Design Sciences

**College/ School:** College of Human Science

**Description:**

With the fast globalization and exposure of the consumers to a range of global products, the chances of cultural hybridization have increased. While cultural hybridization is leading to the dilution of the original cultural dimensions, the present study proposed the concepts of quasi ethnocentrism and neotifacts as a result of cultural hybridization. This study suggests that quasi ethnocentrism is a phenomenon where individuals of a particular culture will be able to connect to the symbolisms of another culture, while still connected to their own culture. The research further suggested that quasi ethnocentrism leads to the formation of neotifacts. Neotifacts are described as artifacts which endue components of two or more hybridizing cultures, giving rise to newer form of artifacts. Given the growing potential for cultural hybridization, formation of neotifacts are inevitable, especially in a country like India, which already entails great cultural diversity. The present research followed a quantitative research to classify the consumers of jewellery in Kolkata, West Bengal, according to their quasi ethnocentrism by conducting surveys with 100 respondents. Furthermore, the research identified the group of consumers that will have the greatest potential of accepting neotifacts (e.g., jewellery from other cultures) and buying them in future. Also, the research studied whether or not there is any significant difference in these consumers' behavioural patterns according to their demographic characteristics (i.e., gender, educational qualification, and per annum household income). The findings of the study have both academic and managerial implications. For example, strategic marketing decisions are suggested

following the classification of the consumers of jewellery in Kolkata and their behavioural patterns toward accepting neotifacts.

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**Title:** Parasite ecology of invasive species

**Primary Author (and presenter):** Chalkowski, Kayleigh, A.

**Additional Authors:** Zohdy, Sarah & Lepczyk, Christopher

**Department:** Wildlife Science

**College/School:** School of Forestry and Wildlife Science

**Description:**

A hierarchical delineation of relationships between introduced species and their parasites including enemy release; biological packages/spillover; and spillback of native parasites into introduced hosts is presented for the first time. Spillback is refined to “spillback suppression” where parasites hinder the invasive ability of the introduced host. A new term for introduced species as “disease facilitators” that increase transmission or prevalence of a parasite already on the landscape of their naturalized range is defined. Disease facilitators can act on ecosystems as a new vector, new reservoir, or by changing the biological/abiotic structure and possibilities for future research quantifying introduced species as disease facilitators is described.

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**Title:** Investigating how *TP53* p.Pro47Ser contributes towards African American hereditary breast cancer

**Primary Author (and presenter):** Chandler, Madison R.

**Additional Authors:** Huskey, Anna; Omeler, Sophonie; & Merner, Nancy.

**Department:** Drug Discovery and Development

**College/School:** Harrison School of Pharmacy

**Description:**

Inherited protein-truncating and missense variants in *TP53*, which are responsible for Li-Fraumeni syndrome, have been associated with a high-risk of breast cancer (BC). Interestingly, more common, missense *TP53* variants have been associated with a low-risk of BC. Common variants in *TP53* remain to be fully explored for their conferred level of BC risk, and even fewer studies have addressed such variant associations within African American (AA) populations. Recently, Murphey et al. (2017) identified a common missense *TP53* variant, p.Pro47Ser, associated with low-risk of pre-menopausal BC in AAs (p-value of 0.023). Therefore, 49 BC-affected AAs from the Alabama hereditary BC cohort were screened using a custom-designed gene panel and next-generation sequencing. Sequencing data was then processed using a bioinformatics pipeline to identify the *TP53* variant. Interestingly, p.Pro47Ser was identified in two BC-affected AAs (4.1%) which is more common when compared to controls (1.5%); however, due to our small cohort size, we were unable to achieve a statistically significant p-value. In order to explore the role of polygenic risk, the theory that multiple variants interact together to confer a high-risk of BC, additional variants identified in these two BC-affected AAs were investigated. Variants classified as pathogenic in ClinVar (a database that reports clinically relevant variants), and predicted to be pathogenic by PolyPhen (a tool used to predict functional effects) or truncate the protein were identified in the first (1, 2, and 7, respectively) and second (1, 6, and 2, respectively) individual. Noteworthy, one common protein-truncating variant in a gene previously reported to harbor an intronic variant associated with triple-negative BC, was identified. Thus, continued investigation of combinations of low-risk common variants is warranted to further evaluate the role of polygenic risk towards BC in AAs.

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**Title:** Effects of leaching on anaerobic digestion of poultry litter

**Primary Author (and presenter):** Chaump, Kristin R.

**Additional Authors:** Higgins, Brendan

**Department:** Department of Biosystems Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Poultry litter is a nutrient and energy dense by-product of the poultry industry, primarily composed of manure, bedding material, and feathers found in poultry houses. It can be anaerobically digested to produce biogas and the mineralized digestate can serve as a fertilizer substitute. Poultry litter bedding has a high lignocellulose content, which causes difficulty during digestion for biogas production and nutrient recovery. To find a possible solution for this, we explored leaching the litter to remove soluble organic and mineral nutrients from the solid bedding material. Our goal was to understand the impact of leaching on partitioning of nutrients and carbon-containing compounds. We also investigated biogas production from digestion of leachates compared to whole litter. We studied leachates prepared from litter freshly collected from inside a poultry house (fresh litter) to litter that had been stored outdoors in a pile (stored litter). Leachates of each litter type were prepared at four different solid loadings. Batch digestion and measurement of biogas production was performed. From digestion, we learned that the fresh litter tended to have more steady biogas production over thirty days, whereas biogas from stored litter tended to slow more rapidly. A panel of analyses was performed on raw and digested leachate, including volatile and total solids, volatile fatty acids, chemical oxygen demand, nutrient analyses, and CHNS analyses. Overall, it appears that nutrients from poultry litter are leached more effectively at lower solids loading. We also found that stored litter contained significant volatile fatty acids, suggesting that it was already degrading prior to anaerobic digestion. From here, heavy metal analysis on the soluble fraction of the litter, as well as more research into ways to digest the lignocellulose in litter need to be further investigated.

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**Title:** Selecting a laboratory mixture aging protocol for asphalt pavement top-down cracking experiments

**Primary Author (and presenter):** Chen, Chen

**Additional Authors:** Yin, Fan & West, Randy

**Department:** Civil Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Top-down cracking (TDC) is a common type of distress in asphalt pavements that is affected by oxidation and volatilization (i.e. aging) of the asphalt binder in the paving mixture. The National Center for Asphalt Technology (NCAT) is working on a TDC study to investigate the correlations between laboratory test results and measured cracking in real pavements using real loading conditions. To assess the effects of aging on TDC, a laboratory aging protocol is needed for both laboratory-mixed and plant-mixed asphalt mixtures as part of specimen preparation. In this study, field aging of asphalt mixtures was characterized using the cumulative degree-days (CDD) concept. Performance data from a number of existing pavements across the U.S. showed that TDC typically initiates after approximately 70,000 CDD. A laboratory experiment was then conducted to select an aging protocol that was representative of this critical CDD using materials from five projects in Michigan, Washington, and Alabama. Four asphalt mixture aging protocols were evaluated in terms of their effects on the rheological and oxidation properties of asphalt binders. Results from the dynamic shear rheometer (DSR), bending beam rheometer (BBR), and Fourier Transform Infrared Spectroscopy (FT-IR) tests showed that the 24-hour/135°C loose mix aging protocol yielded the highest level of asphalt aging, followed by the 12-hour/135°C protocol, the 5-day/95°C protocol, and finally, the 6-hour/135°C protocol. No significant difference in the oxidation-hardening relationship of asphalt binders was observed for mixes aged at 95°C versus 135°C.

Among the four aging protocols, the 5-day/95°C protocol was most representative of 70,000 CDD of field aging. Finally, DSR and FT-IR results indicated that the 8-hour/135°C and 5-day/95°C protocols were likely to achieve an equivalent aging level; thus, the 8-hour/135°C protocol was recommended as an alternative protocol to simulate 70,000 CDD of field aging.

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**Title:** Repellent reception in mosquitoes and bed bugs

**Primary Author (and presenter):** Chen, Zhou

**Additional Authors:** Liu, Feng & Liu, Nannan

**Department:** Entomology and Plant Pathology

**College/School:** College of Agriculture

**Description:**

Despite the adverse effects caused on human health, mosquitoes and bed bugs exhibit divergent environmental preferences. Nevertheless, whether and how mosquitoes and bed bugs differentially discriminate among odors remains largely unknown. To answer this question, the current study examined the response profiles of olfactory receptor neurons (ORNs) housed in different types of antennal olfactory sensilla to 45 compounds in the mosquito *Aedes aegypti*. Extracellular recordings showed that *Ae. aegypti* ORNs from different types of sensilla evoked remarkable distinct responses to the repellents tested. Characterization of ORNs in *Ae. aegypti* permitted a comparison with those in another mosquito species *Culex quinquefasciatus* and the common bed bug *Cimex lectularius*, which have been tested against the same panel of repellents using the same method. Comparison of the distribution of repellents in the odor spaces among the three species indicated the biased investment in sensing odors in mosquitoes and bed bugs, suggesting the effect of environmental preference on insect olfactory systems. This study and future study of functional characterization of OR repertoires in mosquitoes and bed bugs may help explore the differential biological processes of odor perception and environmental preferences among these species.

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**Title:** Physicians' perceived awareness of patients' medications: A cross-sectional survey

**Primary Author (and presenter):** Cheng, Ning

**Additional Authors:** Hohmann, Natalie; Hastings, Tessa; Li, Chao; Qian, Jingjing; Chou, Chiahung; & Hansen, Richard

**Department:** Health Outcomes Research & Policy

**College/School:** Harrison School of Pharmacy

**Description:**

To evaluate physicians' perceived awareness of patients' medication lists, and explore factors associated with their perceived awareness. A cross-sectional, anonymous survey was performed online through Qualtrics in May 2017. A total of 150 physicians involved in patient care at least two days per week across the United States were recruited, out of which 145 completely responded to the survey (50 Primary Care Physicians, 47 Psychiatrists, and 48 Oncologists). Physicians' demographic information, practice characteristics, and communication methods were collected. Themes in an open-ended survey question were identified using thematic analysis. Predictors of physicians' degree of confidence (low vs. high) in being aware of all of the patients' prescriptions were determined using logistic regression. Of 145 respondents, 24% had <16 practice years. Only 15% of physicians (n=22) frequently changed patients' prescriptions ordered by another physician. Forty-eight percent of physicians had low confidence in being aware of all their patients' medications. Three themes were identified by thematic analysis: the importance and barriers to obtaining patients' full list of medications, concerns about drug-drug interactions, as well as the importance and barriers for communication/coordination. After controlling demographic and practice setting factors, physicians who had more years of practice (odds ratio

(OR)=3.00, 95% CI=1.41-6.38) and who frequently communicated with other providers (OR=3.12, 95% CI=1.01-9.59) had a higher degree of confidence in being aware of their patient's complete medication lists compared to their counterparts. This study found that physicians' frequency of communicating is a critical factor to physicians' awareness of patients' complete medication lists. Interventions are needed to enhance provider communication or create better tools for ensuring accurate and complete medication profiles.

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**Title:** Improving patient outcomes through type 2 diabetes self-management education taught by registered dietitians in a family practice clinic in North Alabama

**Primary Author (and presenter):** Chester, Brittannie H.

**Secondary Author:** Thangiah, Geetha

**Department:** Nutrition, Dietetics, and Hospitality Management

**College/School:** College of Human Sciences

**Description:**

Diabetes self-management education and support (DSMES) and medical nutrition therapy (MNT) have been proven to improve patient outcomes. However, many patients rely on their physician solely for diabetes education despite referrals for diabetes education outside of the physician's office. Our aim was to optimize type 2 diabetes management in a family practice clinic by providing patients with individualized DSMES and MNT by a Registered Dietitian inside of the family practice clinic. A random sample of 40 charts was chosen from the electronic medical records of patients with type 2 diabetes completing DSMES and individualized MNT with a Registered Dietitian. Data was extracted from a retrospective chart review on Hemoglobin A1C levels before and after appointments with the Registered Dietitian in the family practice clinic from September 2015 - November 2015. Analyses were used to assess frequency of patients decreasing their hemoglobin A1C levels, which reveals good glycemic control. A paired sample t test was performed (n=40). The results revealed that post DSMES and MNT Hemoglobin A1C values (M = 6.84%, SD = 1.0) were significantly lower than the pre DSMES and MNT Hemoglobin A1C values (M = 7.17%, SD = 1.3),  $t(40) = 2.89$ ,  $p < .006$ . Many healthcare professionals can give dietary advice to patients, but Registered Dietitians are trained to provide individualized nutrition therapy to patients. Combining the knowledge of the physician and Registered Dietitian can help patients to reach optimal diabetes control in order to prevent or minimize complications. Research has demonstrated a 1% decrease in Hemoglobin A1C levels result in a 21% reduction in diabetes associated mortality, a 14% reduction in myocardial infarction, and a 37% reduction in microvascular complications.

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**Title:** Improving performance of broilers receiving coccidiosis vaccination through increasing dietary amino acid density and the duration of the starter diet

**Primary Author (and presenter):** Cloft, Sara E.

**Additional Authors:** Rochell, Samuel; Macklin, Ken; & Dozier, William

**Department:** Poultry Science

**College/School:** College of Agriculture

**Description:**

Coccidiosis vaccination provides immunity to parasitic infection caused by *Eimeria spp.*, which is regarded as the largest economic impact to poultry production. However, the vaccination itself causes a mild intestinal challenge that reduces broiler growth. This problem is amplified by the increasing antibiotic free market which limits options for prevention. Many have turned to using vaccines regardless of the lost performance out of necessity. A study was conducted to determine if increasing digestible (dig) amino acid (AA) density, or the amount of starter feed can counter the negative effects of vaccination.

Sixteen hundred Ross × Ross 708 male broilers were placed into 64 floor pens (0.08m<sup>2</sup>/bird) with each pen assigned to 1 of 8 treatments representing a 2 × 3 factorial arrangement of dig AA density [Moderate (1.15% dig Lys) and High (1.25% dig Lys)] and starter feed allotment (0.45, 0.73, and 1.0 kg/bird) with 2 positive controls, and 8 replicates per treatment. All broilers except the positive control pens received Coccivac®- B52 prior to placement. Positive control pens received diets containing Diclazuril to prevent infection. Following consumption of the starter allotment pens were given common diets. At 21 d, intestinal lesion scoring was conducted on 4 birds per pen to confirm vaccine efficacy. At 42 d, 12 birds per pen were processed for measurement of carcass attributes. Throughout the trial broilers receiving the high AA density diet had higher body weight gain ( $P < 0.05$ ) and heavier carcass weights ( $P \leq 0.005$ ) than those fed the moderate AA diet. A starter allotment of 1.0 kg/bird produced heavier broiler carcass weights than did lower allotments ( $P \leq 0.006$ ). Additionally, broilers fed the high AA diet exhibited less growth depression and received lower lesion scores ( $P > 0.05$ ). Results from this study indicated that feeding a high AA diet during the starter period for an increased time period improved the overall growth of the bird.

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**Title:** Lumped parameter modelling of hemodynamics in the cardiovascular system

**Primary Author (and presenter):** Compher, Tyler, R

**Additional Authors:** Raghav, Vrishank

**Department:** Aerospace Engineering

**College/School:** Samuel Ginn College of Engineering, Auburn University

**Description:**

Cardiovascular disease is the leading cause of death in the United States, killing approximately 17.9 million people in 2015. This results in huge socio-economic burden on the US with over \$500 billion spent annually. While, human and animal model studies yield the best results, computer models of the cardiovascular system provide researchers with a simpler alternative to study hemodynamics in order to better understand and treat cardiovascular disease.

The goal of my research was to develop a validated cardiovascular computer model that would reproduce physiologically accurate pressures and flowrates in arterial segments. An analog of an electrical circuit, the Windkessel model, was used to simulate blood flow. The flowrates and pressures calculated using this model were then compared to clinical measurements to validate the model. The model used in this research included the combination of several degrees of Windkessel models to represent different blood vessels. Simulations were run using physiological cardiac output and heart rate. The resulting pressures and flow rates matched those that are measured clinically, and it was determined that the use of Windkessel models is a valid way to characterize hemodynamics.

The development of this model provides a method for future studies of the cardiovascular system. Changes can be made to parameters of arterial segments in order to simulate specific cardiovascular diseases such as coronary artery disease, aortic stenosis, or other diseases. Such a validated model would allow for more in depth analysis on the effect of diseases throughout the cardiovascular system, aiding better diagnosis and treatment options for clinicians.

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**Title:** The interactive effect of cognitive fusion and experiential avoidance on generalized anxiety and social anxiety disorders

**Primary Author (and presenter):** Conboy, Natalie E.

**Additional Authors:** Benfer, Natasha; Bardeen, Joseph

**Department:** Department of Psychology

**College/School:** Auburn University

**Description:**

Cognitive fusion (CF) and experiential avoidance (EA) have been identified as risk factors for a wide variety of negative psychological outcomes. CF occurs when people believe the literal meaning of their thoughts instead of viewing them as transient internal experiences. EA is a general unwillingness to experience uncomfortable internal states (e.g., emotions, memories). CF and EA have been shown to interact to predict trait anxiety and depressive symptoms such that the association between CF and these outcomes is significantly stronger at higher levels of EA (Bardeen & Fergus, 2017). The purpose of the present study was to further examine the transdiagnostic status of this interactive effect on different forms of anxiety (i.e., generalized and social anxiety symptoms). We predicted that the relationship between CF and both outcomes would be significantly stronger at higher, versus lower, levels of EA.

Adult participants ( $N = 504$ ) completed questionnaires for payment through Amazon's MTurk. CF, EA, and social and generalized anxiety symptoms were assessed. The proposed interaction effect was examined via two hierarchical regression models. As predicted, the interaction term (CF x EA) significantly predicted generalized ( $\beta = .17, p < .001$ ) and social anxiety ( $\beta = .08, p = .02$ ). Simple slopes analysis revealed that the positive association between CF and generalized and social anxiety was significantly stronger at high EA ( $\beta = .80, \beta = .57$ , respectively,  $ps < .001$ ) compared to low EA ( $\beta = .49, \beta = .42$ , respectively,  $ps < .001$ ).

These findings support a growing body of evidence which suggests that individuals with high CF and EA may be particularly prone to experiencing negative psychological outcomes of a wide variety. Preemptive efforts (i.e., brief interventions) to reduce EA may be beneficial among individuals prone to CF.

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**Title:** Online disclosures of suicidality: The role of communicated risk severity and characteristics of network members in eliciting support

**Primary Author (and presenter):** Corbitt-Hall, Darcy J.

**Additional Authors:** Troop-Gordon, Wendy & Gordon, Kathryn H.

**Department:** Human Development and Family Studies

**College/School:** College of Human Sciences

**Description:**

Online peer support provides a promising direction for suicide prevention efforts. To identify factors predictive of providing peer support, young adults ( $N = 566, M_{\text{age}} = 19.01, SD = 1.79$ ) interacted with an *in vivo* Facebook newsfeed where they viewed one disclosure of clinically severe suicidality and one disclosure of clinically moderate suicidality. Support-giving was assessed through the option of sending a private message to the poster of the suicide disclosure. Participants also completed measures of empathic concern, personal distress at other's suffering, attitudes toward suicide, current mental health, and previous experience with a loved-one's suicidality. Binary logistic regressions indicated that the impact of content severity on the likelihood of eliciting support was reduced when the severe-risk disclosure was viewed second. The likelihood of giving support was positively associated with empathic concern and personal distress in response to others' negative affect, and with previous experience with a loved one's suicide attempt. Support giving was negatively associated with holding stigmatizing views of suicide. These findings underscore the need to understand the efficacy of support-seeking behaviors and the characteristics of those who intervene in order to maximize online suicide prevention efforts.

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**Title:** Effects of interaction-mediated dispersal on the persistence of a population

**Primary Author (and presenter):** Cosgrove, Emily

**Additional Authors:** Lindsey, Eddie L.

**Department:** Department of Mathematics & Computer Science

**College/School:** Auburn University Montgomery/College of Arts & Sciences

**Description:**

Dispersal of an organism plays an important role in its individual fitness, population dynamics, and species distribution. In the literature, dispersal is loosely applied to movement over different spatial scales, e.g. movement between habitat patches separated in space from other areas. Recently, ecologists have found that interacting organisms can affect one another's dispersal, a phenomenon known as interaction-mediated dispersal. Little is known regarding the patch-level consequences of habitat fragmentation of interacting species in the presence of interaction-mediated dispersal. In this talk, we will explore effects of habitat fragmentation and interaction-mediated dispersal on patch-level population dynamics through development and study of a model built on the reaction diffusion framework. The focal point of our results will be concerned with a one-dimensional patch and relies upon adaptation of methods from nonlinear analysis such as time map analysis (quadrature method). In particular, we will elaborate on the biological importance of these results.

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**Title:** Improving cardiovascular disease medication adherence through text-messaging

**Primary Author (and presenter):** Cox, Courtney, M.

**Department:** Nursing

**College/School:** School of Nursing

**Description:**

Evidence supports that decreased adherence to medication increases the risk of adverse events occurring from cardiovascular disease. Adverse events include: stroke, myocardial infarction, and/or congestive heart failure. Evidence-based research recommends text messaging as an intervention to increase medication adherence. The purpose of this project is to implement text messaging to remind patients when to take their prescribed medications. Patients self-reported medication adherence following text messaging was evaluated. Target population included adults (35yrs and older) with cardiovascular disease prescribed antihypertensives, anticoagulants, or antihyperlipidemics. Following informed consent, participants completed a self-adherence questionnaire (Morisky, Green, and Levine [MGL]) and had blood pressure measured. Patients received one text message per day for three weeks. Afterwards, the patient returned to the clinic for a follow-up blood pressure and to re-take the MGL questionnaire. Descriptive statistics were used to describe the patient population, medication types, and patient adherence. Among patients taking medications, the pre-post questionnaire responses were compared with paired t-tests. X consented to participate, mean age of X (sd) yrs, (% males). X% prescribed antihypertensives, X% anticoagulants, X% antihyperlipidemics. Follow-up indicated that systolic BP improved from pre- (mean, sd) to post (mean,sd) and the mean MGL scores improved from pre- (mean,sd) to post (mean,sd) significantly ( $p < 0.05$ ). Utilizing text messaging for patients with cardiovascular disease improved medication adherence and decreased systolic blood pressure. Improving medication adherence can decrease the prevalence of adverse events occurring among these patients resulting in improved quality of life and decreased deaths due to cardiovascular disease. Further implementation of the project for a longer time frame is warranted.

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**Title:** Theoretical framework of oil spills in the Niger Delta region of Nigeria

**Primary Author (and presenter):** Crayton, Mac-Jane M.

**Department:** Political Science

**College/School:** College of Liberal Arts

**Description:**

Nigeria, a country in West Africa is endowed with a huge deposit of crude oil. A large portion of this deposit is found in the Niger Delta region. This has inevitably attracted the presence of multinational companies. However, the Niger-Delta region of Nigeria has suffered oil spill hazards caused by the activities of Multinational oil companies in the region. This paper attempts to explain the nature of the oil spills in the Niger-Delta region and the public policies adopted. This paper assesses three public policy theories that explain the various stages of the oil spill issue. Using agenda setting, social construction and implementation theories, this paper analyses and explains how oil spill became a national problem, gained agenda status and what the federal government is doing to resolve the issue.

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**Title:** Leaf physiological responses to 40% throughfall reduction in a longleaf pine plantation

**Primary Author (and presenter):** Custodio Mendonca, Caren

**Additional Authors:** Samuelson, Lisa; Stokes, Thomas; Ramirez, Michael; & Blackstock, Jake

**Department:** Forestry

**College/School:** School of Forest and Wildlife Sciences

**Description:**

Longleaf pine (*Pinus palustris* Mill.) forests are an important forest ecosystem that once occupied millions of acres in the southern U.S., but currently only occur in a small part of the original range, making this ecosystem one of the most threatened ecosystems in the U.S. Longleaf pine restoration has become a point of focus because of its potential resilience and adaptability to changing climate conditions such as drought. Future climate change predictions include increased evaporative demand and decreased soil water availability in the southeastern U.S. The objective of this research is to examine the drought effects on longleaf pine physiological function and productivity to better understand potential drought adaptation and resilience of this species. The impact of a 40% reduction in throughfall versus ambient throughfall on the leaf physiology of 12-year-old longleaf pine was studied over one year. Leaf physiological processes measured included stomatal conductance ( $g_s$ ), net photosynthesis ( $A$ ), transpiration, water use efficiency (WUE) and leaf water potential ( $\Psi_L$ ). Measurements were made on upper canopy foliage approximately every three weeks. Preliminary analyses indicate that throughfall reduction reduced  $A$  by 8%,  $g_s$  by 25% and transpiration by 26%. WUE was described by the ratio of  $A$  to  $g_s$ . Plants tend to increase WUE as a response to better tolerate drought conditions. WUE was improved on average by 15% in response to throughfall reduction. Additionally, a trend for a reduction in mean predawn  $\Psi_L$  for trees exposed to throughfall reduction ( $p$ -value = 0.0642) was observed, but midday  $\Psi_L$  was similar between treatments, suggesting that improved WUE limited plant water stress. These results show a significant impact of drought on leaf-level water use of longleaf pine. These results will be used to define longleaf pine drought adaptive capacity and resilience and to better understand the potential impact of increased drought on southern forests.

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**Title:** Small changes, Big impact: Development of a research-based infographic with cost-effective interior design solutions for senior living communities in the state of Alabama

**Primary Author (and presenter):** Cutler, Kathryn P.

**Additional Authors:** Martin, K.

**Department:** Consumer and Design Sciences

**College/School:** College of Human Sciences

**Description:**

Baby boomers are aging, changing the senior living industry as they do so. The number of Americans aged 65 and older will double by 2060 and the number of Americans with dementia is projected to triple from 5 million in 2013 to 14 million by 2030 (Population Reference Bureau, 2016).

Because of this, options for retirement homes and assisted living communities are becoming more crucial to healthcare in the United States than ever before. However, it is not simply about offering enough places for seniors to live; the quality of these spaces is also of utmost importance. Now more than ever, facility owners are seeking evidence-based design solutions to make the interior design of these facilities more capable of extending and enhancing seniors' quality of life. As facility owners and designers seek to address this new growth, an increasingly important question of cost and affordability emerges. How can communities implement design elements that are healing and competitive in the market, but at a price affordable to the average senior? In keeping with the land-grant mission of Auburn University, this study seeks to identify best practices for the interior design of senior living communities in the state of Alabama through a three-step research based process, (1) reviewing current interior design recommendations for senior living facilities, (2) identifying design components commonly lacking in senior living communities in Alabama, and (3) developing a research-based infographic that could be made available to assist senior living facilities in the state of Alabama, sharing cost-effective, easily implementable interior design ideas to enhance quality of life. Design suggestions would be presented in the context of making small, affordable changes that may help Alabama facilities compete with cutting edge facilities around the country while also enhancing quality of life for residents.

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**Title:** Low-cost and secure firmware obfuscation method to prevent cloning

**Primary Author (and presenter):** Cyr, Benjamin A.

**Additional Authors:** Mahmood, Jubayer & Guin, Ujjwal

**Department:** Electrical and Computer Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Device cloning poses a severe threat to our critical infrastructure that uses the Internet to transmit secret information, as cloned devices can steal information and cause reliability concerns. It also creates an obstacle to the research and development, as a company may lose revenue and their reputation. It is thus extremely important to protect these electronic devices from cloning. An efficient way preventing a device being cloned is to obfuscate the firmware. In this project, we present a novel obfuscation method without encrypting the entire memory. The firmware is instead obfuscated by reordering a set of instructions in non-volatile memory. The hardware then reconstructs the original program at runtime with a unique key. Without the correct key, the hardware will execute the instructions in the wrong order, and the device will not function correctly. Our proposed solution requires only a small amount of overhead to reorder the instructions, allows the firmware to be updated, and provides a robust way of obfuscating the firmware to prevent cloning.

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**Title:** Those who expect to teach a motor skill cannot perform better under high pressure

**Primary Author (and presenter):** Daou, Marcos

**Additional Authors:** Jence, Rhoads; Bacelar, Mariane; Zach, Hutchison; Lohse, Keith; & Miller, Matthew

**Department:** Kinesiology

**College/School:** College of Education

**Description:**

When learners practice a motor skill expecting to teach it to another person, they show superior motor learning (posttest performance). Yet, learners also show an increase in declarative knowledge about the skill, which is associated with worse performance under pressure. Thus, it is possible the advantage of expecting to teach is lost when performing the skill under high pressure, due to increased reliance on declarative knowledge. To test this hypothesis, we had 82 participants perform a golf putting pretest,

followed by an acquisition phase where participants either practiced with the expectation of teaching another participant (teach group) or practiced with the expectation of being tested on their putting (test group). The next day, participants performed low and high pressure posttests in a counterbalanced order. Participants were instructed to “do their best” on the low pressure test, whereas in the high pressure test they were told that the top-five most accurate putters would receive a monetary reward and that they were being video-recorded for analysis by a professional golfer. After the final posttest, participants reported any declarative knowledge about putting concepts they recalled, and what concepts they were using during posttests. Results revealed the teach group exhibited superior putting accuracy in the low pressure posttest, but not the high pressure posttest. This was due to the teach group performing worse under high pressure than low pressure (i.e., choking under pressure). Further, the teach group recalled more putting concepts after posttest, indicating superior declarative knowledge, but they did not report greater usage of these concepts during posttests. The increase in declarative knowledge did not mediate the choking effect. Taken together, results suggest practicing a motor skill with the expectation of teaching benefits learning, but this advantage is lost when performing under high pressure.

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**Title:** Physiologically based pharmacokinetic modelling of caffeine in pregnancy

**Primary Author (and presenter):** Darakjian, Lucy I.

**Additional Authors:** Kaddoumi, Amal

**Department:** Drug Discovery and Development

**College/School:** Harrison School of Pharmacy

**Description:**

Caffeine has been used all around the world over centuries and it is one of the most ingested substances in the world. It is found in many beverages such as coffee, tea, soft drinks and chocolate at different concentrations. Caffeine is catalysed by CYP1A2. It is estimated that 70-80% of pregnant women utilize some caffeine daily. The average daily caffeine consumption was estimated around 106-170 mg per day for adults and 58 mg per day for pregnant women. In pregnancy, CYP1A2 activity is decreased throughout pregnancy by 32.8% in first trimester, 48.1% in second trimester and 65.2% in the third trimester, suggesting caffeine clearance is prolonged in pregnant women. Caffeine intake has been reported to increase the risk of miscarriage; however, the mechanism is not clear. It is usually unpractical and unethical to conduct PK studies on pregnant women, therefore, a pregnancy physiological based pharmacokinetic/pharmacodynamic (PBPk/PD) model are usually developed for such studies. The objectives of this study is to evaluate PK changes of caffeine across the three trimesters of pregnancy and the PD effects of caffeine on epinephrine and related proteins (phosphodiesterase, PDE; cAMP), and to validate and predict the mechanism of miscarriage reported with caffeine. We successfully developed and validated a PBPk/PD model that considers the physiochemical, PK of caffeine, physiologic and metabolic changes that occur normally during pregnancy. Prediction showed that pregnant women whose caffeine intake is more than 200 mg per day has a much greater risk of miscarriage among those who consume less than that and it was consistent with the literature. Using the software, we were also able to predict the decrease in PDE, increase in cAMP, which lead to increase in epinephrine levels at high caffeine blood concentrations may be the mechanism by which the miscarriage occurs in pregnancy.

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**Title:** The effect of heat treatment on the microstructure and fatigue behavior of additively manufactured 17-4 PH stainless steel

**Primary Author (and presenter):** Dastranjy Nezhadfar, Pooriya

**Additional Authors:** Shamsaei, Nima & Shrestha, Rakish

**Department:** Mechanical Engineering

**College/School:** Samuel Ginn College of Engineering

**Descriptions:**

The need to create near net shaped parts steered developers to introduce a new set of technologies for fabrication so-called Additive Manufacturing (AM). Pursuing an improvement in mechanical properties of AM metallic materials introduced the post processing procedures as one of the efficacious solutions. In this study, the effects of heat treatment on the microstructural evolution and consequent mechanical properties of AM 17-4 precipitation hardening (PH) stainless steel (SS) was investigated under tensile and uniaxial fully-reversed ( $R_e = -1$ ) loading. To this end, five different types of heat treatment conditions were designed specifically for additively manufactured 17-4 PH SS to compare with the as-built condition. Phase diagrams of each heat treatment conditions were generated by Thermo-Calc. software to predict the presence of various phases. X-ray diffraction and microstructure characterizations results were consistent with the thermodynamic predictions. Results also indicated significant improvement in both tensile and fatigue properties of AM 17-4 PH SS utilizing those specially-designed heat treatment conditions. Fracture surfaces were examined by scanning electron microscope to elucidate the failure mechanisms. Eventually, this study will provide a protocol for prescribing the appropriate heat treatment procedure for additively manufactured 17-4 PH SS parts based on their application.

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**Title:** Assessment of Drug Diffusion of Sulfathiazole and Metronidazole from Polyurethane Films

**Primary Author (and presenter):** Davis, Montoia P

**Additional Authors:** Barde, Mehul; Auad, Maria L; Mendis, Hajeewaka C; De La Fuente, Leonardo

**Department:** Chemical Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Urinary and cardiac catheters are used in patients for extended periods of time, leaving the catheter vulnerable to contaminants that lead to infections by microorganisms such as *Escherichia coli* and *Candida* spp. A catheter-compatible polymer that can prevent the development of these microbes would be an ideal solution to this problem. The purpose of this experiment is to develop a polymer that contains an antimicrobial that can act as an infection prophylactic.

Polyurethane is a preferred material for catheter production due to its flexibility and biocompatibility. Sulfathiazole and metronidazole have a history of being prescribed for various infections, including urinary tract infections. Both pharmaceuticals are soluble in water, an important factor for analyzing the concentration of drug releasing from the polyurethane.

Sample films were made by solvent casting. Polyurethane/sulfathiazole then polyurethane/metronidazole were dissolved in a solution of dimethylformamide and tetrahydrofuran. The resultant solution was mixed for 24 hours, poured into molds, and then placed in an oven at 37°C for 24 hours. The dried films were stored in a desiccator. In order to confirm drug diffusion from the polyurethane, a precisely weighed portion of the drug-loaded film was immersed in constantly stirred distilled water for 8 hours. Every hour, 5 mL aliquot was taken out and tested with a spectrophotometer to measure the absorbance at 270 nm (sulfathiazole) and 319.5 nm (metronidazole). The concentrations of aliquots collected were calculated from the absorbance values and the calibration curve made with standard aqueous solutions of each drug with different concentrations, ranging from 1.25 µg/mL to 100 µg/mL.

The films were made with two concentrations of sulfathiazole, 0.3 wt/wt% and 1.5 wt/wt%, and one concentration of metronidazole, 1.5wt/wt%. Both drugs, independent of concentration, show release mechanisms which follow the Korsmeyer-Peppas kinetic model of diffusion.

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**Title:** Fighting cancer with community: using community based research to examine carcinogenic exposures in Cleburne County, Alabama.

**Primary Author (and presenter):** Defler, Kenzley, R

**Additional Authors:** Dr. Loka Ashwood (Department of Agricultural Economics and Rural Sociology), Dr. Ming-Kuo Lee (Department of Geosciences)

**Department:** Department of Crop, Soil, and Environmental Science

**College/School:** College of Agriculture

**Description:**

In the fall of 2016, community members in the small town of Fruithurst, Alabama began to worry when learning of four young boys who had all been recently diagnosed with cancer. This initial sickness led to collaborative research efforts from community members and a team from Auburn University. Work began in search of causes for the extremely high number of leukemia, lymphoma, and other types of cancer found in the area. Data shows that in one census block of Cleburne County, the cancer rate is almost forty times higher than expected when compared to a yearly average over the past five years. In attempt to pinpoint causes, with the main goal being remediation and avoidance of future sickness, several methods have been used. Patient interviews were conducted to examine occupational and environmental exposures common among affected families; maps were made to geographically scope the land; soil and water samples were taken to test the surrounding environment for carcinogenic contaminants; and community meetings were held to educate the town and get input throughout the process. To date, chemicals including radon, zinc, mercury, and arsenic have been found in levels above EPA limits in the well-water of many Fruithurst residents. Steps are being taken to help these families get access to clean drinking water. An in-depth survey is also being developed to more fully understand the scope of sickness and potential exposures in a larger area including almost 700 families. This would enable more remedial action, all in hopes of a healthy future for the community in Cleburne County.

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**Title:** Fashion, forward! A practice-led exploration into the confluence of traditional techniques and contemporary technologies in fashion and making

**Primary Author (and presenter):** DuPuis, Jenny Leigh

**Department:** Consumer and Design Sciences

**College/School:** College of Human Sciences

**Description:**

This research is a combination of practice-led design research and phenomenological qualitative study into the incorporation of traditional handcraft techniques such as garment construction and couture beading embellishments, with contemporary technologies and materials such as 3D printing, wearable electronics, and digital printing. The purpose of the research is to address the gap in literature and skill-based knowledge in making in the combination of tradition and technology. The objectives of the design research are: to explore the design and making processes in the integration of traditional techniques with contemporary technologies, to create artefacts as a means of skill building and technique exploration, to document the process, and to present all findings in a gallery exhibit attended by a sample of expert artisans who will then participate in the phenomenological research portion of the study. Physical artefacts created during the research include: a high-fashion, couture-style gown; technique samples including dyeing, fabric manipulation, and beading; mood boards, sketches, a design journal, step-by-step technique tutorials, and a video reel of the process. The research is expected to impact the Maker community, fashion designers and students, theatrical technicians, and wearable technology engineers, as well as wearable technology component designers and traditionally-trained artisans seeking to complement their existing practice with contemporary technologies.

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**Title:** Evaluating the dopaminergic neurotoxicity of chemotherapeutics

**Primary Author (and presenter):** Desai, D.<sup>1</sup>

**Additional Authors:** Majrashi, M.<sup>1</sup>; Almagrabhi, M.<sup>1</sup>; Abbott, K.<sup>2</sup>; Pondugula, S.<sup>2</sup>; & Dhanasekaran, M.<sup>1</sup>

**Departments:** <sup>1</sup>Drug Discovery and Development; <sup>2</sup>Anatomy, Physiology, and Pharmacology

**College/ School:** <sup>1</sup>Harrison School of Pharmacy; <sup>2</sup>College of Veterinary Science

**Description:**

Cancer survivors undergoing chemotherapy, complain about problems with memory retrieval, learning & concentration, which may persevere even post-treatment or never fully resolve. Role of chemotherapeutics in hippocampal neurotoxicity/cognitive deficit is well established & is referred as chemobrain/chemofog. Thus, chemotherapy-induced contraindications can adversely affect the clinical care of these patients. However, there are very few reports on the effects of chemotherapeutics on dopaminergic neurons. Hence, in this study we investigated the neurotoxic effects of doxorubicin and cyclophosphamide in N27 dopaminergic neurons. N27 cells have been well established in the studies associated with dopamine biosynthesis, neurotoxicity & are used as an *in vitro* model for studies on dopaminergic pathway. The neurotoxic effects of doxorubicin and cyclophosphamide were studied on the markers of oxidative stress and mitochondrial functions. All data were expressed as Mean  $\pm$  SEM. Statistical analyses were performed using one-way analysis of variance (ANOVA) followed by an appropriate post-hoc test including Tukey's and Dunnett's method ( $p < 0.05$ ) was considered to indicate statistical significance). Doxorubicin induced oxidative stress and significantly induced dose dependent neuronal death. Thus, if cautious patient care measures are not taken with cancer survivors exposed to doxorubicin and cyclophosphamide immediately, it can considerably increase the risk for several movement disorders.

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**Title:** Analysis of harmonic impedance calculations

**Primary Author (and presenter):** Devore, Elizabeth A.

**Additional Authors:** Halpin, S. Mark

**Department:** Electrical and Computer Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Harmonic impedance measurements help to assess the quality of power lines and the risk of resonance between the system and loads. A reputable tool for measuring and calculating harmonic impedance in power systems has not yet been established. In order to develop such a system will require, preferably, a non-invasive method to measure and calculate harmonic impedances. Achieving such a system will require reliable computation of the harmonic impedance based on measured phase voltages and currents. In this work, voltage and current measurements are used to calculate harmonic impedance using symmetrical components. These results show that symmetrical components are not a reliable form for calculating harmonic impedance. Further consideration is given to calculations using alpha, beta, and zero components.

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**Title:** The Prevalence of *Toxoplasma gondii* in Resident and Migratory Songbirds in the Southeastern United States

**Primary Author (and presenter):** Diamond, Alisia, L.

**Additional Authors:** Lepczyk, Christopher; Zohdy, Sarah; Hill, Geoffrey

**Department:** Forestry and Wildlife Sciences

**College/School:** Forestry and Wildlife Sciences

**Description:**

*Toxoplasma gondii* is a parasite found throughout the world, infecting nearly every warm blooded species on Earth, including humans. Felid species are the definitive hosts, where reproduction takes place, and are responsible for shedding oocysts through feces. These oocysts can then be ingested by intermediate hosts, with a variety of consequences to the host. Notably, different strains of *T. gondii* throughout the world lead to different health outcomes in the host species. Because birds have the unique ability to migrate across continents, and have the potential to carry different strains of *T. gondii*, it is important to understand what species of birds may carry the parasite as well as which strains. We hypothesized that song birds can be carriers of the parasite *T. gondii* and that migratory birds over one year of age are more likely to be infected with foreign strains of *T. gondii* than resident birds. We opportunistically collected 30 deceased birds from around Auburn, AL. Tissue samples were taken from the birds, including the heart, kidney, and the brain. These tissues were then analyzed for *T. gondii* genetic markers via PCR. We were able to age 10 individuals either through plumage or by looking at the skull ossification. Among the 30 individuals, one Purple Finch (*Haemorrhous purpureus*) tested positive for *T. gondii*. Using a Binomial equation, we determined that the rate of infection is 3.3% in songbirds with a confidence interval of 0.08% to 17.22%. Although our sample size was small, we were able to find that songbirds are carriers of the parasite. This may have important implications for the spread of *T. gondii* on both a large and small scales.

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**Title:** Receptor binding profile of piperazine designer drugs: 2- trifluoromethyl benzyl phenylpiperazine (2-TFMBzPP), 3- trifluoromethyl benzyl phenylpiperazine (3-TFMBzPP), 4- trifluoromethyl benzyl phenylpiperazine (4-TFMBzPP), and benzyl phenylpiperazine (BzPP)

**Primary Author (and presenter):** Dickenson, Julia, G

**Additional Authors:** Almaghrabi, Mohammed; Ramesh, Renu; Majrashi, Mohammed; Desai, Darshini; Fujihashi, Ayaka; Moore, Tim; Clark, C. Randall; Deruiter, Jack; Dhanasekaran, Murali

**Department:** Drug Discovery and Development

**School:** Harrison School of Pharmacy

**Description:**

Receptor binding assays are used to measure interactions between a chemical or molecules (such as a protein or a nucleic acid). These assays are excellent tools to study receptor-ligand interactions, which can help in elucidating the mechanisms of actions of medicines, substances of abuse and designer drugs like Tri-Fluoro-Methyl-Phenyl-Piperazine derivatives. In this study, we elucidated the receptor/pump binding profile of Piperazine derived designer drugs. It was shown that TFMBzPP Piperazine derivatives had significant binding on the serotonergic, adrenergic (alpha prominently and beta less significantly), dopaminergic and histaminic, muscarinic and opioid receptors. Additionally, these designer drugs also had binding affinity to Norepinephrine and serotonin reuptake pump. The major mechanisms of action attributed towards the addictive and abusive effects of TFMBzPP derivatives may be due to its effect on monoaminergic neurotransmission.

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**Title:** Transcriptome profiles in peripheral white blood cells at the time of artificial insemination discriminate beef heifers with different fertility potential

**Primary Author (and presenter):** Dickinson, Sarah E.

**Additional Authors:** Biase, Fernando H.

**Department:** Animal Sciences

**College/School:** College of Agriculture

**Description:**

Infertility is a longstanding limitation in livestock production with important economic impact for the cattle industry. Female reproductive traits are polygenic and lowly heritable in nature, thus selection for fertility is challenging. Beef cattle operations leverage estrous synchronization in combination with artificial insemination (AI) to breed heifers and benefit from an early and uniform calving season. Following AI, heifers are exposed to bulls for natural breeding (NB), but they may also not become pregnant during this time period. Focusing on beef heifers in their first breeding season, we hypothesized that at the time of AI, the transcriptome of peripheral white blood cells (PWBC) differs between heifers that become pregnant to AI and heifers that become pregnant late in the breeding season by NB or do not become pregnant during the breeding season. We generated RNA-sequencing data from 23 heifers from two locations (A: six AI-pregnant and five NB-pregnant; and B: six AI-pregnant and six non-pregnant). After filtering out lowly expressed genes, we quantified transcript abundance for 12,538 genes. The comparison of gene expression levels between AI-pregnant and NB-pregnant heifers yielded 18 differentially expressed genes (DEGs) (ADAM20, ALDH5A1, ANG, BOLA-DQB, DMBT1, FCER1A, GSTM3, KIR3DL1, LOC107131247, LOC618633, LYZ, MNS1, P2RY12, PPP1R1B, SIGLEC14, TPPP, TTLL1, UGT8,  $eFDR \leq 0.02$ ). We identified significant enrichment ( $FDR \leq 0.002$ ) for the GO biological process “metabolic process” (ALDH5A1, GSTM3, LYZ, UGT8). The comparison of gene expression levels between AI-pregnant and non-pregnant heifers yielded six DEGs (ALAS2, CNKSR3, LOC522763, SAXO2, TAC3, TFF2,  $eFDR \leq 0.05$ ). In conclusion, the transcriptome profile in PWBC, at the time of AI, is associated with the fertility potential of beef heifers. Transcript levels of specific genes may be further explored as potential classifiers, and thus selection tools, of heifer fertility.

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**Title:** Ultrasound elastography as a measure of whole-body therapy for Sandhoff disease

**Primary Author (and presenter):** Diffie, Elise B.

**Additional Authors:** Cole, Robert; Gray-Edwards, Heather; Sena-Esteves, Miguel; & Martin, Douglas

**Department:** Anatomy, Physiology, and Pharmacology

**College/School:** College of Veterinary Medicine

**Description:**

Sandhoff disease (SD) is a lysosomal storage disorder that, due to a deficiency in the heterodimeric enzyme Hexosaminidase (Hex), causes fatal neurologic disease in children. There is no efficacious therapy for this disease, but preclinical adeno-associated viral (AAV) gene therapy experiments in mouse and feline models of SD have shown promise. Ultrasound shear wave elastography (SWE) is a relatively new diagnostic imaging technique that maps the elastic properties of soft tissue, or tissue stiffness, using propagation of shear waves (SW) induced by acoustic radiation force impulse (ARFI). The aim of this study is to determine the effectiveness of this imaging modality for peripheral organ evaluation as a measure of whole-body therapy in cats with SD. Three cohorts of cats were used: normal adult cats (age 9 months-3 years), normal kittens (age 2-4 months), and SD untreated kittens (age 3.5-4 months). Blood work (complete blood count and serum chemistry) was performed at the time of SWE; normal cats were excluded from the study if liver enzyme values or total white blood cell counts were increased above reference range. Six measurements of elasticity (kPa) were averaged from three regions of interest in each target organ. There was a significant difference ( $p < 0.001$ ) between the liver values obtained from normal adults and each kitten group. A significant difference ( $p < 0.05$ ) was noted between liver values of normal kittens and the SD kittens. For the spleen, a significant difference ( $p < 0.05$ ) was observed between normal adults and each kitten group. There was a significant difference ( $p < 0.05$ ) between the skeletal muscle values obtained from normal adults and normal kittens. Based on these results, SWE can potentially be used to monitor the effectiveness of whole-body gene therapy for SD in the liver. Further development will explore the utility of this approach for other organs.

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**Title:** Expression of the INK4AB/ARF tumor suppressor transcription factor MSK1 in canine breast cancer

**Primary Author (and presenter):** Dismukes, Jonathan E.

**Additional Authors:** Deinnocentes, Patricia; Bird, R. Curtis

**Department:** Department of Pathobiology

**College/School:** Auburn University College of Veterinary Medicine

**Description:**

Canine and human mammary cancers have many similarities, allowing canine samples to be used as effective models of human disease. As cancer is a heterogeneous disease, the ability to determine the precise mechanisms promoting neoplasia would allow for the advancement of therapeutic strategies to combat cancer directly. Mitogen- and stress-activated kinase 1 (MSK1) is a gene investigated for its downstream regulation of crucial tumor-suppressor proteins p15 and p16, and is therefore upregulated during oncogenic stress resulting in suppressed cell proliferation. Due to its regulation of a pro-survival pathway, MSK1 is of great interest as a target for cancer vaccine therapy.

Six established canine mammary tumor (CMT) cell lines and one primary canine mammary epithelial cell culture (CMEC) were grown in Alpha-MEM supplemented medium with fetal bovine serum, penicillin, and streptomycin in a 5% CO<sub>2</sub> 100% humidity atmosphere at 37°C. Total cellular RNA was extracted from the cell cultures using an isolation kit. RNA product was amplified by polymerase chain reaction (PCR) creating complementary DNA (cDNA) which was analyzed using a quantitative reverse transcriptase PCR (QrtPCR) with a SYBR Green fluorescent marker.

In previous study of these CMT cell lines and CMEC cultures, the MSK1 PCR DNA product was detected on 2% ethidium bromide-stained agarose gels revealing the predicted 450 base pair amplicons and integrity was confirmed by DNA sequencing. The amounts of amplicon recovered suggested enhancement of MSK1 expression in neoplastic cells. The Qrt-PCR assays confirmed this result, demonstrating increased expression in CMT cell lines in comparison to normal CMEC cells. Enhanced expression of MSK1 in neoplastic cells confirmed the attempts by these cells to suppress proliferation but then fail in this effort. To our knowledge, there are no studies that have analyzed the expression of MSK1 in canine mammary tumors or to access its value as a therapeutic target.

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**Title:** Complex Solute Transport through the Polymeric Anion Exchange Membrane, Nafion

**Primary Author (and presenter):** Dobyns, Breanna, M.

**Additional Authors:** Beckingham, Bryan, S.

**Department:** Chemical Engineering

**College/School:** Auburn University

**Description:**

Polymeric membranes are utilized for a wide variety of applications, from dialysis to water treatment to hydrogen fuel cells. Unfortunately, the transport phenomenon within dense polymers is poorly understood, with many theories attempting to explain membrane transport. This is true of neutrally charged polymer membranes used for passive separations as well as more complex anion and cation exchange membranes used in solid-state batteries, fuel cells and desalination. An important property of a particular membrane is the ability to selectively permeate components at different rates which gives rise to the potential for chemical or ionic separations. For separating multiple species, the membrane selectivity is the ratio of the membrane permeability of each component. Measurement of membrane permeability is thereby crucial for properly selecting membranes for a desired separation. Historically, permeability has been measured via aliquotic sampling at defined intervals of single-component diffusion cell experiments with *ex situ* analysis of the downstream concentration. These aliquotic techniques are arduous, open to a large range of user error, and require either a constantly changing downstream volume or manipulation of the downstream concentration during sampling, making calculations problematic. In this study, an *in situ* Attenuated Total Reflectance (ATR) Fourier Transform Infrared (FTIR)

Spectrometer is utilized with custom-made diffusion cells, facilitating the time-resolved monitoring of downstream concentration without laborious aliquotic sampling. We determined the permeability of Nafion 117™ to acetone, ethanol, methanol, and n-propanol with one, two, three, and four component upstream mixtures. Through this novel, advantageous technique, transport phenomena through polymeric membranes can be quantified accurately, regardless of solute extent.

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**Title:** A hybrid experimental-numerical study of crack initiation and growth in transparent bilayers using digital gradient sensing and cohesive zone modelling

**Primary Author (and presenter):** Dondeti, Sivareddy

**Additional Authors:** Tippur, Hareesh

**Department:** Mechanical Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Transparent layered structures are of importance to both the military and civilian communities. The introduction of adhesive interlayers is a low-cost approach for developing mechanically resilient multilayered lightweight structures. However, a rigorous mechanics based design of such architectures requires tailoring interfaces (layer thickness, adhesive properties, interface location, etc.). In order to get more insight into mechanics, Sundaram and Tippur (2016) reported dynamic crack-interface interactions related to crack penetration vs. crack branching at a weak interface when the interface was oriented perpendicular to the incoming mode-I crack in an otherwise homogeneous bilayer. A major finding of this work was that a slowly growing crack with a lower stress intensity factor penetrated the interface. On the contrary, a fast growing high stress intensity factor crack nucleated a tensile interface disbond before its arrival and hence branched into the interface upon arrival. In order to exploit this observation and gain further insight into crack growth in multilayered structures, a hybrid experimental-numerical approach that mimics the complexities observed in the bilayer experiments is attempted. This includes a detailed optical measurement of the force histories imposed on the bilayer during impact loading of a V-notched PMMA sample impacted by a long-rod with wedge shaped tip matching the notch. Digital Gradient Sensing (DGS) method has been utilized in conjunction with ultrahigh speed photography followed by optical data analysis to visualize and quantify the force histories. The measured force histories along with other previously determined interface and PMMA characteristics are used as input parameters into a finite element model that includes cohesive elements to benchmark the experiments. Thus validated computational model will be used to investigate a variety of parameters far too complex to emulate experimentally in multilayer architectures.

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**Title:** Dynamic model of a ternary pumped storage hydropower plant

**Primary Author (and presenter):** Dong, Zerui

**Additional Authors:** Nelms, Robert; Muljadi, Eduard; Tan, Jin; Gevorgian, Vahan; & Jacobson, Mark

**Department:** Electrical and Computer Engineering

**College/School:** Samuel Ginn School of Engineering

**Description:**

Hydropower is the largest source of renewable energy in the United States. Pumped storage hydropower (PSH) is a hydropower plant that can generate power when it operates as a hydro turbine, and it can absorb power from the electric grid when it is pumping water from the lower reservoir to the upper reservoir. The conventional role of PSH is as an energy arbitrage: it sells power when the price of electricity is high (i.e., during peak hours of energy demand), and it is operated as a pump during times when the price of electricity is low (e.g., midnight to dawn). PSH is an important part in hydropower

generation. Currently, the total installed capacity is approximately 22 GW. Recently, a new type of PSH was developed, called ternary PSH (T-PSH). T-PSH is a type of advanced PSH that is different from conventional PSH and adjusted-speed PSH. T-PSH uses a single generator rotating in one direction with two different runners connected to the same shaft (i.e., one is for pumping water, and the other is for generating power as a turbine). This paper presents the development of a dynamic model of T-PSH for power system analysis. T-PSH can be operated in three different modes: generating mode, pumping mode, and hydraulic short-circuit (HSC) mode. The three modes of operation will be presented in this paper. A new combined governor is developed to represent the HSC operation mode, which is a special mode for T-PSH. The power command is divided into two parts, and a distribution coefficient is introduced to regulate the transitions from one mode to the other. Simulation and validation results are presented to verify the performance of the governor model and the characteristics of T-PSH.

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**Title:** Computational studies of the pH regulation mechanism of dinoflagellate luciferase

**Primary Author (and presenter):** Donnan, Patrick H.

**Additional Authors:** Ngo, Phong D. & Mansoorabadi, Steven O.

**Department:** Chemistry and Biochemistry

**College/School:** College of Sciences and Mathematics

**Description:**

Dinoflagellates are marine microorganisms capable of performing bioluminescence. The bioluminescence reaction is an oxidation reaction of an open-chain tetrapyrrole, luciferin, and is catalyzed by the enzyme dinoflagellate luciferase. Prior work has shown that dinoflagellate luciferase is regulated by pH, displaying inactivity at pH ~8 and optimal activity at pH ~6, with the protonation of four intramolecularly conserved histidine residues thought to drive the conformational shift. However, the structure of the active conformation of the enzyme at pH ~6 is currently unknown. In order to study the conformational shift from the inactive to the active state, constant pH accelerated molecular dynamics simulations were employed. A large-scale conformational shift from pH 8 to pH 6 was observed, displaying greatly increased access to the presumed active site of the enzyme. Residues whose protonation state differs significantly between pH 6 and pH 8, including the four histidine residues, were identified as potentially necessary in driving the conformational change.

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**Title:** Sub-seasonal hydrologic forecasts based on WRF-hydro model and Sub-X climate forecast in the ACT Basin

**Primary Author (and presenter):** Duan, Yanan

**Additional Authors:** Tian, Di

**Department:** Crop, Soil and Environmental Sciences

**College/School:** College of Agriculture

**Description:**

Sub-seasonal river inflow forecasts are essential for weekly water resources planning and management in a river basin. Sub-seasonal climate forecast provides week-3 and week-4 forecasts, which fills the gap between seasonal climate prediction and medium-range weather forecast. It can be combined with a physical-based hydrologic model to produce sub-seasonal hydrologic forecasts and contribute to a seamless and effective drought and flooding forecasts 3-4 weeks ahead at a weekly time step. The ultimate goal of this study is to develop a basin-scale sub-seasonal reservoir inflow forecasts based on the sub-X sub-seasonal daily climate forecast and WRF-Hydro model hydrologic simulation module. As a step towards this goal, the WRF-hydro model is calibrated and tested in the ACT river basin with the USGS streamflow gauges. The model is forced with the North American Land Data Assimilation System Phase 2

(NLDAS-2) forcing dataset for calibration. The initial states of the forecast were produced by running the calibrated model over the past 17 years, from 2000 to 2016. The Sub-X ensemble forecast is downscaled and bias corrected and then used as input into the calibrated WRF-Hydro model to produce retrospective sub-seasonal streamflow forecasts over the same period. The performance of the forecasts is evaluated using different metrics. This work fills the forecasting gap and advances the sub-seasonal hydrologic forecasting that is highly relevant for mid-term water resources planning and management.

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**Title:** Pollinator pathways

**Primary Author (and presenter):** Dunavant, Erika H.

**Department:** Environmental Design

**College/School:** College of Architecture Design and Construction

**Description:**

Looking at The Village landscape on Auburn's campus, I chose to research the existing landscape and how it functions on a daily basis. After weeks of observing the space and monitoring movement of animals and humans, I began creating a proposal for a more productive landscape. By researching plant and bee species, storm water management practices and migratory patterns of our region's pollinators, I feel confident that The Village and Auburn University's campus as a whole would greatly benefit from creating Pollinator Pathways. These pathways create organic, native gardens that provide habitats, food, and protection for pollinators in our area. We all know the importance of pollinators and that without them, the human race cannot survive. Auburn University already has Bee initiatives in play on campus, and my proposal of Pollinator Pathways would compliment those initiatives nicely. From partnering with Tiger Dining's Farm to Table initiative, to increasing regional pollinator populations, the benefits of creating gardens for pollinators will create a ripple effect throughout our campus, our community, and our region.

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**Title:** Decreasing residential food waste in America via a stylish, efficient, effortless product system

**Primary Author (and presenter):** Duncan, Kathryn, E.

**Additional Authors:** none

**Department:** Industrial Design

**College/School:** College of Architecture, Design and Construction

**Description:**

The "TUMBL" composting system is a project focused on effectively conquering America's excessive food waste. Its inception, research, development, and refinement occurred over the course of the Fall 2017 semester. The design objective put forth was to design a product or system that frees the individual from the prevailing societal systems and that aids them in moving from dependency and inefficiency toward independence, efficiency, and sustainability. Composting seems to me an obvious solution to our nation's general lack of effective and efficient food waste disposal and utilization; however, there are not many economically feasible, aesthetically-pleasing products on the market. Through market research, interviewing Auburn University's sustainability director, Auburn City's recycling representative, several citizens of Auburn who already compost, and surveying the composting habits (or lack thereof) of numerous online survey-takers, the need for proper solution to our food waste problem was evident. The "TUMBL" compost system is a two-part collector/composter set that makes food scrap gathering and nutrient-rich soil generation for your yard or garden as effortless and clean as possible. "TUMBL" is designed to make composting fit seamlessly into any lifestyle, and yet still be an engaging experience that is effective, efficient and elegant.

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**Title:** The investigation of plasma derived growth factors focused on the treatment of the blood brain barrier in 5xFAD mice

**Primary Author (and presenter):** Duong, Quoc-Viet A.

**Additional Authors:** Kaddoumi, Amal

**Department:** Drug Development and Research

**College/School:** Harrison School of Pharmacy

**Description:**

Alzheimer's disease (AD) is a crippling neurodegenerative disease known for its hallmark features such as dementia correlated with increased amyloid-beta ( $A\beta$ ) deposition. Cerebral vascular dysfunction constitutes an important feature of AD as well, which may impede the clearance of  $A\beta$  across the blood-brain barrier (BBB). However, the mechanisms of AD is still relatively unknown and no cure has been found. In the search of potential therapeutic agents that may enhance or maintain the BBB integrity and function, in this study, endogenous growth factors derived from activated human platelets were evaluated. Endogenous growth factors (GFs) include vascular endothelial growth factor (VEGF), insulin like growth factors (IGF-1), and tumor growth factor- $\beta$  (TGF- $\beta$ ) among others. Initial in-vitro investigational studies of their efficacy included utilizing a mouse bEnd<sub>3</sub> BBB model. After 24 hour treatment, Lucifer Yellow (LY) permeation across the cell monolayer was measured to monitor the integrity of the model. Afterwards, these GFs were analyzed for their effect on BBB model function by western blot analysis for the transporter proteins P-gp and LRP-1, and the tight junction proteins ZO-1, Occludin, and Claudin-5. Lastly  $A\beta$  transport study was conducted to measure the effect on  $A\beta$  transport across the BBB model monolayer. After promising results, an in-vivo study was pursued utilizing the 5xFAD mouse model to correlate with in-vitro results. In our study, experimental evidence showed that GFs positively modulated the integrity and function of the BBB through the expression of the transporter and tight junction proteins, but with this narrow scope, more information is necessary to understand the overall effect of GFs on AD pathology in 5xFAD mice.

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**Title:** The response of soil microbial biomass to inoculation due to plant pathogenic fungus, *Leptographium terebrantis* in loblolly pine stand

**Primary Author (and presenter):** Duwadi, Shrijana

**Additional Authors:** Nadel, Ryan; Feng, Yucheng; & Eckhardt, Lori

**Department:** Forestry

**College/School:** School of Forestry and Wildlife Sciences

**Description:**

Loblolly pine is the dominant tree species found across most of the intensively managed commercial forests of southeastern United States. Varieties of abiotic and biotic stressors, including pathogenic ophiostomatoid fungi, are considered to be associated with loblolly pine decline by limiting water and carbon to underground plant part. In the forest ecosystem, soil microbial biomass (MB) plays a significant role in plant residue decomposition and subsequent release of plant nutrients to the soil. Our research goal was to analyze the role of fungal root infection and its interaction with water, nutrient, and carbon relations of plantation trees to determine the effect to MB by decline process. This study was based on the hypothesis that inoculation of loblolly pine trees with *Leptographium terebrantis* will significantly affect the microbial community due to the blockage of vascular bundles, resin soaking of roots and death of fine roots which will affect the transportation of carbon and exudates from roots into the soil. After field sampling and sieving the soil samples with 2mm mesh size sieve, microbial biomass carbon (MB-C) and microbial biomass nitrogen (MB-N) at the depth of 0-10 cm were determined by soil fumigation with alcohol-free chloroform ( $CHCl_3$ ) and extraction with 0.5M  $K_2SO_4$ . We found that MB-N was significantly affected by inoculation treatment while MB-C was significantly affected by sampling season. MB-C was found to be significantly affected when the average SMC was  $\leq 0.12$  g/g while MB-N

was significantly affected when the average SMC was  $\leq 0.16$  g/g. The study showed that MB-N is more sensitive to change in SMC than MB-C in loblolly pine stand. A measurement of MB shall provide an indication as to the changes in total soil carbon and forest productivity which will enable forest-dependent industrialist, managers, and researchers to formulate appropriate soil management decisions on commercial stands that are affected by decline.

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**Title:** Analysis of the Effects of Transition Modeling in CFD

**Primary Author (and presenter):** Eagan, Griffin D.

**Additional Authors:** Nichols, D. Stephen, Ph.D.

**Department:** Department of Aerospace Engineering

**College/School:** College of Engineering

**Description:**

Transition modelling is a relatively new concept within the field of computational fluid dynamics (CFD). Various transition treatments can be applied to existing turbulence models to control how and at what point turbulent flow transition occurs. Through the brief history of transition modelling within CFD, it has shown great promise for improving the accuracy of existing simulation methods. The purpose of this research is to assess the effects of two models, the Coder and Langtry-Menter transition models, as applied to the Spalart-Allmaras (SA) and Shear Stress Transport (SST) turbulence models respectively.

Three levels of mesh refinement were created enveloping a NASA NLF-0416 airfoil using PointWise mesh generation software. The University of Tennessee – Chattanooga's TENASI CFD code was used to produce steady-state simulations on the Auburn University Hopper High Performance Computing Cluster. These geometries were analyzed at zero degrees angle of attack, and then rotated to both positive and negative angles of attack.

Through this research it has been shown that these two transition models do produce significant improvements in the accuracy of existing simulation techniques, with the medium grid refinement, Spalart-Allmaras-Coder model producing the nearest match to existing experimental data. Because the medium grid refinement produced better results than the fine grid refinement, this suggest that there is a quantifiable dependence on grid quality as it pertains to the accuracy of these simulations.

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**Title:** Insulin resistant adipocytes increase proliferation of canine melanoma and breast cancer cells

**Primary Author (and presenter):** Eastwold, Martin

**Additional Authors:** O'Neill, Ann Marie; Ahmed, Bulbul.

**Department:** Department of Biology

**College/School:** College of Arts and Sciences, Auburn University at Montgomery

**Description:**

Obesity has been linked to a number of adverse health conditions, including increased growth of a number of cancers. Insulin resistance is a condition that often accompanies obesity. In this study, we sought to further investigate the effects of conditioned media obtained from insulin resistant adipocytes on the growth of cancer cells.

The cell line 3T3-L1 was differentiated and rendered insulin resistant by the addition of TNF alpha and subjecting the cells to hypoxic conditions and media collected after 24 hours. Canine melanoma and mammary tumor cell lines were used for cell growth and proliferation studies. To assess the effects of insulin resistance on cancer cell growth, cells were incubated in the presence of conditioned media (CM) obtained from normal adipocyte cultures and insulin resistant adipocyte cultures. After 24 and 48 hours, cell viability was assessed and quantitative PCR performed to determine expression of Ki67 and PCNA.

In the presence of CM from normal adipocytes, there was a modest effect seen on cell proliferation all three cell lines. In the presence of conditioned media from insulin resistant adipocytes, this proliferation was even more pronounced. Initial data suggests that Ki67 (a marker of proliferation) was upregulated in cells cultured with CM from insulin resistant adipocytes versus normal adipocytes in the CMT28 and CML10 cell lines.

These results indicated that secretion from insulin resistant adipocytes may contribute to increased tumor cell proliferation in both canine breast cancer and melanoma.

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**Title:** Exploring applications of GPR methodology and uses in determining floodplain function of restored streams in the Gulf Coastal Plain, Alabama

**Primary Author (and presenter):** Eckes, Samantha W.

**Additional Author:** Shepherd, Stephanie L.

**Department:** Geosciences

**College/School:** College of Sciences and Mathematics

**Description:**

Accurately characterizing subsurface structure and function of remediated floodplains is indispensable in understanding the success of stream restoration projects. Although many of these projects are designed to address increased storm water runoff due to urbanization, long term monitoring and assessment are often limited in scope and methodology. Common monitoring practices include geomorphic surveys, stream discharge, and suspended sediment loads. These data are comprehensive for stream monitoring but they do not address floodplain function in terms of infiltration and through flow. Developing noninvasive methods for monitoring floodplain moisture transfer and distribution will aid in current and future stream restoration endeavors. Ground penetrating radar (GPR) has been successfully used in other physiographic regions for noninvasive and continuous monitoring of (1) natural geomorphic environments including subsurface structure and landform change and (2) soil and turf management to monitor subsurface moisture content. We are testing the viability of these existing methods to expand upon the broad capabilities of GPR. Determining suitability will be done in three parts using GPR to (1) find known buried objects of typical materials used in remediation at measured depths, (2) understand GPR functionality in varying soil moisture content thresholds on turf plots, and (3) model reference, remediated, and impacted floodplains in a case study in the D'Olive Creek watershed located in Baldwin County, Alabama. We hypothesize that these methods will allow us to characterize moisture transfer from precipitation and runoff to the floodplain which is a direct function of floodplain health. The need for a methodology to monitor floodplains is widespread and with increased resolution and mobility, expanding GPR applications may help streamline remediation and monitoring practices.

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**Title:** Increasing eye contact in children and adolescents with autism and related disabilities

**Primary Author (and presenter):** Edgemon, Anna Kate

**Additional Authors:** Rapp, John & Bardeen, Joseph

**Department:** Psychology

**College/School:** College of Liberal Arts

**Description:**

In humans, eye contact is one of the most important nonverbal communicative behaviors. However, deficits in eye contact are characteristic of Autism Spectrum Disorder (ASD) and other neurodevelopmental disabilities. Previous research has used a variety of procedures to increase eye contact in this population with limited success and has been dependent on human resources. Thus, the purpose of the present research was to evaluate the effect of eye tracking software on increasing eye

contact in individuals with developmental disabilities using a nonconcurrent multiple baseline across participants design. This intervention included the following conditions: contingent video, contingent praise, manual acceptance, gesture prompts, stimulus prompts, and increased reinforcer access. The primary dependent variable was percentage of trials with eye contact across sessions. The secondary dependent variable was mean latency to eye contact (in seconds) across sessions. For two participants, data indicate an increasing trend in percentage of trials across sessions. For one participant, mean latency to eye contact decreased across sessions. Generalization assessments were conducted before and after intervention to assess generalization of eye contact across settings and over time. Limitations of this intervention are discussed along with suggestions for future research on the use of eye tracking software for increasing eye contact in individuals with developmental disabilities.

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**Title:** Analysis of Cognitive and Motor Abilities in Children with Disabilities after a Bicycle Training Program

**Primary Author (and presenter):** Edwards, Madison A.

**Additional Authors:** Pangelinan, Melissa

**Department:** Kinesiology

**College/School:** College of Education

**Description:**

Many studies have suggested that changes in motor abilities lead to changes in cognition including executive function (Diamond, 2000; Kantomma et al., 2013; Pangelinan et al., 2011; Piek et al., 2008). Recent studies have also suggested that movement difficulties observed in individuals with developmental disabilities may affect cognitive or academic abilities (Harman et al., 2010; Westendorp et al., 2011) but benefit from motor skill interventions. This study aims to systematically examine changes in both motor and cognitive function resulting from learning to ride a bicycle in a one-week program through iCanShine, a non-profit organization that runs adapted bicycle training programs in the US and Canada. A total of 13 children ranging from the age of 8-15 years with developmental disabilities (e.g., Autism Spectrum Disorder, Cerebral Palsy, Down Syndrome, Global Delays, etc.) participated in the motor skill intervention. Data collection included administration of the Brockport Fitness Test, body composition, and cognitive assessments using NIH Toolbox Cognitive Battery. The children also participated in a nutrition program that focused on the importance of eating healthy and creating a balanced meal. By the end of the 5-day training program 10 out of the 13 kids were able to learn to ride a bike. However, there were no changes in motor function, cognition, and body composition from pre- to post-test ( $p > 0.05$  for all variables). However, there were several limitations with respect to the sample and testing protocols that may have obscured changes resulting from the bicycle program. In addition, there may be long-term changes in motor skills, cognitive functions, and body composition that are only observable after a longer period of sustained bicycle riding following the program.

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**Title:** Superparamagnetic iron oxide nanoparticles for prostate cancer detection

**Primary Author (and presenter):** El-Kattan, Kareem Y.

**Additional Authors:** Anani, Tareq & David, Allan

**Department:** Chemical Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

In their lifetime, around one in every seven men will get prostate cancer. This disease can be very serious, however if diagnosed can be treated. The goal of this project was to develop bioprocess-sensitive “smart” magnetic nanoparticles (MNP) which respond to overexpressed protease activity in the tumor

microenvironment – and thus to tumor aggressiveness – and which can be monitored and quantified non-invasively over the entire tumor volume. This was done by using a conjugated fluorescent marker that's rate of release correlated with the activity of an enzyme linked to cancer aggressiveness. The expression of matrix metalloproteinase-2 (MMP-2), an important tumor-associated protease, has been correlated with increasing metastatic potential in prostate cancer and is therefore an attractive target for MNP targeting. We successfully conjugated a near-infrared fluorescent marker via an MMP-2 cleavable peptide linker through a series of steps, first we attached a MMP-2 cleavable peptide with a fluorescent marker on the surface of aminated magnetic nanoparticles through NHS-amine chemistry. Thereafter, we exposed the resulting probe to various proteases of the MMP-family, mainly MMP-2, 7 and 13. The experimental data revealed that our probe demonstrated significantly higher selectivity towards MMP-2, as measured by the fluorescent intensity of the cleaved fluorescent marker. The response to different MMP proteases indicated were recorded in order to observe the sensitivity of the nanoparticle to MMP-2, the fluorescent response of each proteases was measured over time. The fluorescence was then measured using a microplate reader set at excitation/emission wavelengths of 495/525 nm and then set to take measurements every two minutes. The results seem to affirm that the correct conjugation of the peptide linker was found for fluorescence and the nano-particles seem to now can differentiate the MMP-2 specifically.

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**Title:** Preliminary research on air pocket entrapments caused by shear-flow instabilities in rapid-filling pipes

**Primary Author (and presenter):** Eldayih, Yasemin

**Additional Authors:** Vasconcelos, Jose G.

**Department:** Civil Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

The understanding of the behaviour of air-water interactions in closed conduits is important for many existing urban water systems present these two fluids simultaneously. Among different mechanisms for air pocket appearance in closed conduits, shear flow instability is one that has significant capability to capture large volumes of air. Upon capture, air can impact surging and, upon uncontrolled release, lead to issues such as manhole cover displacement and/or geysering. This work presents results from ongoing experimental and numerical research on air pocket entrapment based on shear flow instabilities. A fully-filled horizontal water pipe is partially opened at the downstream end and creates a cavity flow. After some advance within the pipe, a second valve is maneuvered at the upstream end, enabling pressurized flows from the upstream end. The pipe-filling bore that is created pushes air in high velocity over the air cavity. In some cases, air pocket entrapment follows and leads to interesting peaks of pressure that seem to be a characteristic of this type of these entrapments.

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**Title:** Identifying active tectonics in the New Madrid Seismic Zone using LiDAR and geophysical data

**Primary Author (and presenter):** Eldridge, Caleb M.

**Additional Authors:** Wolf, Lorraine

**Department:** Geosciences

**College/School:** College of Sciences and Mathematics

**Description:**

The New Madrid Seismic Zone is located in parts of Tennessee, Arkansas, and Missouri and is the most seismically active fault zone east of the Rockies. In 1811-1812, a series of three  $M > 7$  earthquakes occurred causing widespread soil liquefaction. Paleoliquefaction studies have provided

evidence for three major earthquake sequences, suggesting a recurrence interval of ~500 years. For this reason, it is important for researchers to locate potential seismic sources. This information is critical for hazard assessments of nearby cities such as St. Louis and Memphis. In this study, we use high-resolution Light Detection and Ranging (LiDAR) data to create bare earth models in the vicinity of a paleoliquefaction site in Dyer County, Tennessee. The data show prominent earthquake-induced liquefaction features, such as sand blows and sand fissures, aligned similarly to the orientation of mapped faults in the area. LiDAR data also show linear ridges sub-parallel to the sand blow features that may suggest deformation from buried faults. The features observed on the LiDAR data are compared with aeromagnetic data covering the same area. Wavelength separation methods are used to enhance near-surface structures that may reflect deep-seated faults. Some areas with high gradients are believed to be related to igneous plutons. These plutons may act to concentrate regional crustal strain responsible for some of the observed seismicity.

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**Title:** The effects of fluid type and structural design on PLA degradation

**Primary Author (and presenter):** Elliott, Peyton, K

**Additional Authors:** LeGrand, Craige; Celestine, Asha-Dee

**Department:** Aerospace Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Degradable plastics are important materials for sustainable engineering. it and dictate its life span. This research focused on ways to control and manipulate the degradation of 3D printed Polylactic Acid (PLA). Of interest were the effects of different types of water on the moisture absorption and degradation. PLA specimens were first conditioned for 24 hours before testing to remove any moisture. Then, specimens were immersed in four types of water and placed in an oven held at 70 degrees Celsius. The three types of water used were deionized (DI), water, sea water, river water, and rain water. The specimens were monitored and weighed periodically over the course of several weeks and their change in mass was recorded. Experiments were stopped when the specimens began to disintegrate. PLA specimens containing unique channel patterns were also printed and tested in DI water. The effect of increased surface exposure on PLA degradation in the channel specimens was investigated. The results showed that river water and sea water caused the most degradation, with about 3-5 % more degradation than the rain water. The results in the channel study revealed that the specimens with 3 channels (1 Horizontal and 2 Vertical) had faster total degradation; about 2-3% more of the specimens degraded compared to the other specimen types. These results will help us to understand the time and conditions needed for PLA to degrade completely and will allow us to develop new ways to shorten or enhance the life span of the PLA and other similar materials.

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**Title:** Examining the role of tissue geometry on functionality in 3D engineered cardiac tissues

**Primary Author (and presenter):** Ellis, Morgan E.

**Additional Authors:** Harris, Bryanna & Lipke, Elizabeth

**Department:** Chemical Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Heart disease remains the leading cause of death worldwide in both men and women and nearly all ethnicities, due to the limited regenerative capacity in damaged or diseased tissue. There is a large demand for creating a tissue engineered product that accurately recapitulates the native cardiac environment and can be used for both tissue regeneration and development of new therapeutics.

Previously in our lab, we have shown the ability to encapsulate human induced pluripotent stem cells (hiPSCs) in the biomaterial, poly (ethylene glycol) fibrinogen (PEG-Fb) and directly differentiate to form 3D human engineered cardiac tissues (3D-hECTs). While this process was highly successful, further experiments are being conducted to improve tissue functionality. In this study, I examined the role of tissue geometry in improving cardiomyocyte functionality. Current literature shows that anisotropic alignment of cardiomyocytes is important for action potential propagation and maturation. The previous microisland tissue geometry resulted in circular contractile motion, which is not indicative of the native myocardium. Therefore, I have designed two new tissue geometries, square and rectangle, with the hope of providing a straight edge for the cardiomyocytes to align against. Preliminary encapsulations have shown that hiPSCs survived the encapsulation process and proliferate in the 3D hydrogel matrix. These tissues showed onset of spontaneous contraction on day 8 of differentiation with contractions becoming more synchronous over time. Video analysis was performed to quantify the contractile motion of the tissues. This analysis showed more uniform contractions in both the square and rectangle tissue geometries with a large variation in the microisland geometry. Overall, experiments involving calcium handling and immunostaining need to be performed to determine which tissue geometry drives cardiac maturation.

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**Title:** Function and properties of the enzyme heterodisulfide reductase

**Primary Author (and presenter):** Engel, Carly B.

**Additional Authors:** Duin, Evert; Yan, Zhan; & Ferry, Greg

**Department:** Chemistry and Biochemistry

**College/School:** College of Sciences and Mathematics

**Description:**

Methane is a greenhouse gas and more potent than carbon dioxide. Although the atmospheric concentration is still low, human activities (i.e. rice production and husbandry) drive up the concentration. Understanding the metabolic pathways of methane production in organisms, such as methanogens, would result in the development of specific inhibitors or the engineering of organisms to produce a type of biofuel. Methyl-coenzyme M reductase (MCR) is directly involved in the reversible production of methane capture while heterodisulfide reductase (HDR) is central to the energy balance. HDR replenishes the MCR substrate and provides reduced ferredoxin for important cellular processes. HDR is a complex enzyme that contains multiple iron-sulfur clusters and flavin. To understand the electron flow through this system, redox titrations and kinetic studies were performed in combination with detection of the cofactor signal in electron paramagnetic resonance spectroscopy. To simplify the system, individual subunits were expressed, purified and characterized. Here, the assignment of the different signals discovered will be discussed. Signals have been found that can be assigned to a new type of non-cuboidal iron-sulfur cluster and a probable reaction intermediate.

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**Title:** “Don’t Stop Believin’”: Music style’s effect on physiological and psychological functions

**Primary Author (and presenter):** Epperson, Allison E

**Additional Authors:** Calhoun, Emily; Locker, Will; Mastando, Nick; Cho, Ken

**Department:** Music Department

**College/School:** College of Liberal Arts

**Description:**

There has not been much research performed concerning how music affects the body’s physiological functions. Most of the research done in this field is involving participants with certain medical problems as their defining variable. The purpose of this experiment was to measure the heart

rates and blood oxygen levels of participants to determine whether music can affect these functions when they are the only changing variables. In this experiment, forty college-level students were monitored while listening to three different versions of Journey's "Don't Stop Believin'." Using a pulse oximeter connected to an iPhone through Bluetooth, the participants' blood oxygen levels and pulses were monitored and data was logged every thirty seconds in an almost identical environment and manner. The collected data showed an average fluctuation of heart rates unique for each song. A significant finding of the experiment was that volunteers who identified as musicians had more extreme fluctuation in heart rates than non-musicians. This research gives an unbiased view into how music affects the body in normal situations, how music affects musicians uniquely, and how music could further benefit multiple health fields.

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**Title:** Variations in screening mammography utilization by age and geographic region among female Medicare beneficiaries and beneficiaries with breast cancer in 2002-2012

**Primary Author (and presenter):** Fahim, Shahariar Mohammed

**Additional Authors:** Huo, Nan; Li, Chao; & Qian, Jingjing

**Department:** Health Outcomes Research and Policy

**College/School:** Harrison School of Pharmacy

**Description:**

Screening mammography accounts for the greatest contribution to early detection and decrease in breast cancer mortality. Recent evidence showed a decline in screening rate among the Medicare population, but it is unknown if the mammography use varies by beneficiary characteristics. This study examined the annual screening mammography utilization trends among female Medicare beneficiaries as well as female beneficiaries with breast cancer, overall and by beneficiary characteristics. A serial cross-sectional study was conducted using the Medicare Current Beneficiary Survey (MCBS) Cost and Use data in 2002-2012. Self-reported mammography utilization was identified using the survey questions. Annual trends in the proportion of screening mammography use were examined using simple linear regression models, overall and by beneficiary's age, race, and geographic region. Statistical significance was determined using  $P < 0.05$  and results were weighted to represent national estimates. A total of 40,176 Fee-for-service female beneficiaries resided in community and completed the MCBS survey in 2002-2012 (weighted  $n=148,122,665$ ), among whom 3,398 (weighted  $n=12,879,411$ ) reported having breast cancer. Overall, the utilization trends were stable for both female beneficiaries and those with breast cancer (all  $P > 0.05$ ). Stable trends were observed in all races and different age subgroups among female beneficiaries with breast cancer, but trends declined in female beneficiaries  $\geq 65$  (trend  $P=0.0082$ ) and rose in beneficiaries  $< 65$  ( $P=0.0342$ ). Variances in geographic regions were observed: for female beneficiaries, trends declined in the Northeast and Midwest, rose in the West, and remained stable in the South region. Among beneficiaries with breast cancer, trends declined in the South ( $P=0.0381$ ) but remained stable in all other regions. In 2002-2012, the overall trends in screening mammography use remained stable while variations observed in different age and geographic region subgroups.

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**Title:** Effects of SIRT3 on posttranslational modification in the mitochondria of diabetic hearts

**Primary Author (and presenter):** Fang, Amanda H.

**Additional Authors:** Patel, Nikhil; Ghanei, Nila; Wei, Lan; & Amin, Rajesh

**Department:** Drug Discovery and Development

**College/School:** Harrison School of Pharmacy

**Description**

The leading cause of mortality and morbidity associated with diabetes occurs from congestive heart failure triggered by myocardial ischemic injury. Recently, the role mitochondrial dysfunction has become a major area of research in the areas of diabetes and myocardial energy regulation. We have observed that mitochondrial proteins from diabetic myocardial mitochondria become hyperacetylated leading towards altered myocardial energy dysregulation. The silent information regulator of transcription (SIRT) family of proteins are class III NAD<sup>+</sup>-dependent histone deacetylases involved in gene silencing. Importantly, SIRT-mediated protein deacetylation has emerged as an important post-translational modification involved in signaling in several cell compartments. However, the role of SIRT 3 in modulating in the diabetic heart is less clear. Sirtuin 3 (SIRT3) is a deacetylase that regulates mitochondrial protein acetylation which then affects intermediates of cellular respiration. The goal of the current research project is to understand the role of SIRT 3 plays in protecting the mitochondria from diabetic stress. Recent studies in our lab have observed that a novel target site for deacetylation, frataxin, an iron sulfur biogenesis protein, is postrationally modified in diabetes, resulting in mitochondrial accumulation of free iron. Activated SIRT3 deacetylates lysine residues on frataxin (FXN) a mitochondrial protein involved in Fe-S biosynthesis, to allow it to sequester free iron and induce Fe-S formation, an important intermediate of the electron transport chain. We observed increased FXN acetylation using the SIRT3 antagonist 4-bromo-resveratrol in western analysis techniques. The acetylation was attenuated in high glucose, phenylephrine treated cells with the SIRT3 agonist Honokiol. The results suggest that the SIRT3 agonist ameliorates mitochondrial hyperacetylation patterns in diabetogenic stressed cardiomyocytes and increase healthy cellular respiration.

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**Title:** Differential effects of niacin on high-fat diet-induced adipose tissue inflammation and non-alcoholic fatty liver disease in C57BL6/J and B6129SF2/J mice

**Primary Author (and presenter):** Fang, Han

**Additional Authors:** Graff, Emily; Li, Zhuoyue; & Judd, Robert

**Department:** Anatomy, Physiology and Pharmacology

**College/School:** College of Veterinary Medicine

### **Description:**

Pharmacological doses of niacin improve adipose tissue (AT) inflammation and non-alcoholic fatty liver disease (NAFLD) in rodents chronically fed a high-fat diet (HFD). However, recent mouse studies have demonstrated significant metabolic changes in different strains of mice fed a HFD. Therefore, the aim of this study was to assess the effect of niacin on both AT inflammation and liver steatosis in two mouse strains, C57BL6/J (B6) and B6129SF2/J (B6129), under HFD feeding. Thirty-two male B6 and 32 male B6129 mice were randomized into four groups: Chow/Vehicle (CV), Chow/Niacin (CN), HFD/Vehicle (HV), and HFD/Niacin (HN). They were fed either a chow (10% fat) or HFD (60% fat) for 20 weeks. Niacin (360 mg/kg/day) or vehicle was added to the drinking water from week 5 until the end of the study. As expected, HFD-fed mice gained more weight than chow-fed mice in both strains, with no difference in weight gain between strains. Crown-like structure (CLS) number, a hallmark of AT inflammation, was increased in HV mice of both strains compared to CV mice. In addition, HV B6 mice had higher CLS number than HV B6129 mice. In B6129 mice, niacin decreased CLS number in HN compared to HV mice, while this decrease was not observed in B6 mice. Liver weight to body weight (L/B) ratio, liver triglyceride (TG) content and NASH score was increased in HV compared to CV B6 mice. In contrast, in B6129 mice, only NASH score was increased in HV compared to CV controls. Niacin had no impact on L/B ratio, TG content, or NASH score in B6 mice. However, in B6129 mice, niacin increased all three parameters in HN compared to HV mice. In conclusion, there are strain differential effects on AT inflammation and NAFLD induced by HFD feeding. Interestingly, liver steatosis is significantly increased in HFD-fed B6129 mice treated with niacin. This increase is potentially due to methyl deficiency, as niacin is a potent hepatic methyl consumer and 129 mice are more sensitive to methyl deficiency.

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**Title:** The design and efficacy of video models for adapted tennis instruction in adults with disabilities

**Primary Author (and presenter):** Favoretto, Loriane

**Additional Authors:** Pangelinan, M. Melissa

**Department:** Kinesiology

**College/School:** College of Education

**Description:**

Autism Spectrum Disorder (ASD) is defined as a social communication disorder by the Diagnostic and Statistical Manual of Mental Disorders 5<sup>th</sup> Edition, movement difficulties have been well-documented in this population. Therefore, it is essential that adapted physical activity and physical education programs are available to improve movement difficulties and reduce obesity-related problems in individuals with ASD. Individuals with ASD benefit from the use of visual supports, which directs attention to relevant stimuli and facilitate successful task completion. This allows the learner to observe the behavior multiple times without requiring another person to repetitively model that behavior. Although a meta-analysis of these single subjects studies have revealed a positive effect of video modeling across a broad range of children and adults with ASD, there is a great need to systematically evaluate the effects of video modeling on motor skill learning in larger groups of individuals with ASD. The purpose of this study is to provide quantitatively measurements to evaluate changes in tennis skill resulting from an adapted program for adults with disabilities. Pre- and post-test tennis skill assessments will be conducted the within first 2 weeks before and after the 8-week program. In addition, participants will wear an accelerometer on the dominant wrist during the tennis clinics and during the pre/post-tests. The device measures how many forehands, backhands, serves, and volleys the participant performed during the lesson. Participants will have access to the IKKOS app throughout the lessons to guide and help them perform the tennis skills. We will assess the use of the IKKOS app and visual supports and will receive feedback about the user experience of the visual supports based on questionnaires completed during the post-test. Importantly, we will evaluate the extent to which using the IKKOS app influences the improvements in tennis skills across our participants.

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**Title:** Kinetic prediction from kinematic data during running trials on different surfaces

**Primary Author (and presenter):** Fawcett, Randall T.

**Additional Authors:** Weimar, Wendi; Decoux, Brandi; Wilburn, Christopher

**Department:** Kinesiology

**College/School:** College of Education

**Description:**

The ultimate goal of this study was to derive a model to predict how individuals of different body types move on different surfaces, and develop a device that employs this model in order to provide a rapid testing solution that mimics human running kinetics. Participants were recruited to run a 5-10-5 drill (running 5 meters right, 10 meters left, then a full sprint to the right of 5 meters) on a variety of surfaces. Through the use of inertial sensors, the resultant angle between the sacrum and heel during direction change and the acceleration of the foot during take-off and landing were recorded in order to assist in creating the predictive model. This model was then applied to a custom turf testing device in order to assess the relationship between the physical properties of a surface and the physiological limits that a person must operate within to avoid lower extremity injuries. The turf testing device also allowed for the exploration of how the turf fatigues after repeated loading and the contact interface between a soccer ball and surfaces of varying properties.

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**Title:** A systematic review of the use and effectiveness of concussion education programs in youth sport

**Primary Author (and presenter):** Feiss, Robyn S.

**Additional Authors:** Lutz, Molly; Moody, Justin; & Pangelinan, Melissa

**Department:** Kinesiology

**College/School:** College of Education

**Description:**

Each year an estimated 300,000 youth sport-related concussions are reported. However as many as 50% of concussions may go unreported and the American Medical Society for Sports Medicine estimates the number could be as high as 3.8 million. Concussion education for coaches and parents of youth athletes may influence the reporting and monitoring of concussed athletes. The aim of this review was to determine the current knowledge gaps regarding concussion for parents and coaches of youth athletes, the efficacy of concussion education programs on coach and parent knowledge, and the influence of concussion education programs on health outcomes for athletes. A systematic review was conducted using six databases according to the PRISMA guidelines. A total of 21 articles met inclusion criteria. Parents and coaches are generally able to recognize and identify common signs and symptoms of concussion (e.g. headache), but have more difficulty with the less common symptoms (e.g. emotional irregularity). Providing education for parents and coaches may increase knowledge as well as influence beliefs and attitudes regarding concussion (e.g., seriousness of the injury, necessity of clinical assessment, etc.). However, coaches have less knowledge regarding proper concussion management and return to play protocols, compared to recognizing signs and symptoms. Furthermore, providing coaches with concussion education appears to influence health outcomes for athletes (e.g., incidence). Future studies are needed to replicate and extend this research across different sports, as the majority of studies focused on football. Lastly, many coaches were unaware of differences in concussions for adults versus youth athletes (e.g., differences in recovery time or symptoms). Therefore, future research should evaluate concussion knowledge for coaches and parents of youth athletes and how this knowledge may translate into better health outcomes in that population.

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**Title:** Characterization of carboxylesterases in pyrethroid resistant house flies, *Musca domestica*

**Primary Author (and presenter):** Feng, Xuechun

**Additional Authors:** Liu, Nannan

**Department:** Entomology and Plant Pathology

**College/School:** College of Agriculture

**Description:**

Carboxylesterase-mediated metabolism is attributed as a major component in insecticide resistant machineries of insects. Our previous study had revealed two carboxylesterase genes, Md $\alpha$ E7 and Md $\beta$ E2, were not only up-regulated in a pyrethroid resistant house fly strain ALHF, but also can be induced to a higher expression level by permethrin in different house fly strains. In this study, Md $\alpha$ E7 and Md $\beta$ E2 were expressed in insect *Spodoptera frugiperda* (Sf9) cells using baculovirus-mediated expression system and their hydrolytic activities toward different esterase substrates and permethrin were characterized. Our results indicated that these two carboxylesterases were more efficiently hydrolyze  $\alpha$ -naphthyl acetate than  $\beta$ -naphthyl acetate and both of them could metabolize permethrin *in vitro*. A cell-based MTT (3-[4,5-dimethylthiazol-2-yl]-2,5-diphenyltetrazolium cytotoxicity assay revealed that Sf9 cells expressing Md $\alpha$ E7 and Md $\beta$ E2 increased the tolerance to permethrin, suggesting the important roles of these two carboxylesterases genes in metabolizing permethrin. The functions of carboxylesterases were further characterized by constructing the Md $\alpha$ E7 and Md $\beta$ E2 transgenic *Drosophila melanogaster* lines, bioassay results from which indicated that the permethrin sensitivity was significantly decreased of transgenic drosophila lines compared to that of non-transgenic lines, demonstrating the importance of these two

carboxylesterases in metabolizing permethrin in house flies. This conclusion was further confirmed via modeling and permethrin docking analysis.

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**Title:** Effects of light, temperature, and carbon source on cyanotoxin and off-flavor compound production

**Primary Author (and presenter):** Fernandez-Figueroa, Edna

**Additional Authors:** Wilson, Alan E.

**Department:** Fisheries, Aquaculture, and Aquatic Sciences

**College/School:** College of Agriculture

**Description:**

Off-flavor compounds, such as geosmin and 2-Methylisborneol (MIB), are secondary metabolites that cause drinking water to have an earthy or musty taste and odor. Even though these compounds have no known negative health effects, they have extremely low odor detection thresholds (10 and 30 ng/L for MIB and geosmin, respectively) and their presence in drinking water and farmed fish causes consumer distrust and creates a large economic burden for drinking water and aquaculture industries worldwide. Cyanobacteria and actinobacteria are considered the primary producers of off-flavors in freshwater environments, and while off-flavor compounds pose no threat to human health, some cyanobacteria are capable of producing toxins that can poison drinking water sources. Off-flavor events are found worldwide, yet the biological, physical, and chemical drivers for the production of these compounds are not well understood. Our research focuses on the individual and combined effects of temperature, light and carbon source on the growth and production of secondary metabolites (i.e. geosmin, MIB, and cyanotoxins) by cyanobacteria and actinobacteria. The study includes 6 species of actinobacteria and 5 species of cyanobacteria, which could be key for identifying interspecific variations in the production of these compounds. Additionally, monitoring the growth and production of multiple secondary metabolites could be useful for identifying any potential energetic trade-offs in the production of these compounds.

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**Title:** Production of cardiac tissue spheroids from hydrogel encapsulated hiPSCs using a novel microfluidic system

**Primary Author (and presenter):** Finklea, Ferdous B.

**Additional Authors:** Kerscher, Petra; Seeto, Wen; Tian, Yuan; & Lipke, Elizabeth

**Department:** Chemical Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Tissue engineering holds promise for regenerating the failing heart. Currently, cardiovascular disease is the number one cause of death in the world due in part to the heart's inability for self-healing following damage. The goal of tissue engineering is to regenerate function and structure to the damaged tissue by delivering engineered cardiac tissues, produced by combining cells with biomaterials, to the site of injury. Because adult cardiomyocytes (CMs) cannot be cultured long-term *in vitro*, another cell source must be employed. For this project, human induced pluripotent stem cells (hiPSCs) were directly differentiated in a biomaterial, PEG-fibrinogen, to form cardiac tissue spheroids. A spheroidal platform is beneficial for use in tissue engineering because it can be used in suspension culture, which is vital for biomanufacturing, and for direct injection. Building on prior work in our laboratory, here, we present a rapid, scalable, and single-cell handling approach to manufacture 3D functional cardiac tissue spheroids using a novel cell-encapsulation technique. This system enables rapid fabrication of highly uniform spheroids with high cell density (25 million cells/mL) and a crosslinking time around 1 second using a modified oil-and-water emulsion technique. Following encapsulation, the cells remain viable and continue to grow within the hydrogel matrix. Spontaneous contractions initiated on day 8, and the

spheroids supported efficient cardiac differentiation, containing over 70% CMs. Resulting CMs had appropriate temporal changes in gene expression, responded to both a  $\beta$ -adrenergic agonist and antagonist, and exhibited a 1:1 capture up to 6.0 Hz when electrically paced. This novel microfluidic technique provides tight control over size and circularity of the spheroids, supports high efficiency cardiac differentiation, and has the potential to be leveraged for production in a bioreactor.

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**Title:** Stable isotope analysis of the food web ecology of endemic freshwater mussels (Unionidae) in central Texas

**Primary Author (and presenter):** Fogelman, Kaelyn Jorden

**Additional Authors:** Helms, Brian & Stoeckel, Jim

**Department:** Fisheries, Aquaculture and Aquatic Sciences

**College/School:** College of Agriculture

**Description:**

Unionid mussel populations are declining as a result of various anthropogenic stressors. The increased awareness of their ecological function and their imperiled status has driven greater concern for mussel conservation. Although it is widely accepted that mussels are filter-feeders, still much is unknown regarding their food and feeding relationships. Understanding their feeding ecology is necessary to further understand their role in ecosystem processes, the causes of their decline and to aid in propagation and relocation programs. This study aims to assess potential food resources including fine particulate organic matter associated with benthic sediments (FPOM), suspended particulate organic matter (SPOM), aquatic plants, and coarse detrital organic matter (CPOM). Three endemic Texas species (*Cyclonais petrina*, *Cyclonais houstonensis* and *Lampsilis bracteata*) and their potential food sources were sampled seasonally across four basins using stable isotope analysis ( $\delta^{13}\text{C}$ ,  $\delta^{15}\text{N}$ ). Mussel  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  values suggest that all three mussels are feeding similarly and that the majority of the carbon assimilated is derived from detrital CPOM. Stable isotope data suggests that SPOM and FPOM play a minor role in the contribution to dietary carbon compared to CPOM.

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**Title:** Variations in bone quality with reproductive performance in house mice.

**Primary Author (and presenter):** Frey, Kayla L.

**Additional Authors:** Hood, Wendy R.

**Department:** Biological Sciences

**College/School:** Auburn University

**Description:**

In nearly all mammals examined today, females mobilize bone during lactation. These females must retain enough of their bone mineral to maintain skeletal integrity and ensure survival, as well as continue future reproduction. If too much bone content is lost, bone quality will be compromised and females could experience bone fragility and increased mortality rate. Because of this, females must prevent distributing too much bone mineral during reproduction. The goal of my research is to evaluate how number of reproductive bouts and total number of young produced impacts bone quality in female mice. I will quantify variation in morphology and the mineral composition of femurs collected from approximately 30 age-matched mice that had the opportunity to breed from reproductive maturity at 2 months until they were 10 months of age. I will clean, weigh, photograph, and then take morphological measurements of the bone collected from each of these mice. I will then send one set of femurs to the University of Alabama at Birmingham to quantify the 3D structure of the bones, including cortical thickness, trabeculae thickness, and trabeculae density by microcomputed tomography. After this, I will conduct strength testing to measure the relative strengths of the bones. In the second set of femurs, I will

quantify the total mineral and calcium content of the bone by incineration and inductively coupled plasma spectrophotometry. I will then use regression analysis to evaluate the relationship between bone quality and reproductive rates. Our first test measured the relationship between bone mass, total number of litters to females aged up to 1 year, average litter size at birth and at weaning, and total number of pups throughout life. Using regression analysis, no significant relationship was shown between these variables and bone mass. The same variables were tested against ash content, or the total mineral amount. Using regression analysis, no significant relationship was shown between these variables and ash content. Overall, no significant relationships were established between bone mass and parity or mineral content of bone for females that had between zero to seven litters, and that vary between weaning 0-44 offspring. This suggests that female house mice are adept at maintaining bone mineral content and mass throughout their reproductive cycle. Further data is pending on bone morphology, bone strength, and calcium and phosphorus content. The final results of this study will improve our understanding of bone loss as a cost of reproduction in female mammals.

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**Title:** Assessing the neurotoxic effects of prenatal alcohol and nicotine exposure in hippocampus and cortex of rodents

**Primary Author (and presenter):** Fujihashi, Ayaka

**Additional Authors:** Bhattacharya, Dwipan; Dunaway, Elizabeth; Bloemer, Jenna; Bhattacharya, Subhrajit; Majrashi, Mohammed; Almaghrabi, Mohammed; Ramesh, Sindhu; Escobar, Martha; Suppiramaniam, Vishnu; & Dhanasekaran, Muralikrishnan

**Department:** Drug Discovery and Development

**College/School:** Harrison School of Pharmacy

**Description:**

Hippocampus and cortex are associated with short and long-term memory. Prenatal alcohol (ethanol) and smoking (nicotine) exposure can have extensive adverse effects on the offspring. However, the molecular mechanisms associated with neurotoxic effects of alcohol and nicotine exposure in hippocampus and cortex are not well elucidated. Therefore, in our study, we used a Sprague Dawley rat model exposed to alcohol (mixed with water) and nicotine (subcutaneous-mini osmotic pump) during gestation. We assessed the effects of alcohol and nicotine exposure on the behavioral (Y-maze), electrophysiological (LTP), and neurological changes (expression of ILK & PSD-95, markers of oxidative stress, mitochondrial function). Prenatal alcohol exposure induced significant deficits in spatial memory tasks as compared to the control. Alcohol and nicotine exposure showed significant deficit in LTP as compared to the control. There was an increase in the hippocampal PSD-95 expression and no change in ILK expression in the alcohol and nicotine treated group as compared to alcohol alone or the control. There was no change in the cortical glutathione content. Thus, nicotine can potentiate the neurotoxic effects of alcohol exposure during pregnancy.

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**Title:** Long-term co-culture of equine synovial membrane and articular cartilage explants as an *in vitro* model of osteoarthritis

**Primary Author (and presenter):** Fuller, Joseph M.<sup>1</sup>

**Additional Authors:** Lindsey H. Boone, Lindsey H.<sup>2</sup>

**Department:** <sup>1</sup>Anatomy, Physiology and Pharmacology; <sup>2</sup>Clinical Sciences

**College/ School:** College of Veterinary Medicine

**Description:**

Osteoarthritis (OA) is the leading cause of musculoskeletal pain worldwide and is the most common cause of reduced or lost performance in horses Current treatment for OA are designed to modify

the symptoms of disease through reduction of inflammation via corticosteroids or viscosupplementation. However, newer therapies are becoming available that target OA through disease modification by limiting disease progression. Historically, in vitro experiments evaluating OA treatments have evaluated the effect of treatments on one type of articular tissue or cultured cell. However, cross-talk between tissues such as the synovium, articular cartilage, and subchondral bone is integral in the progression of OA. Therefore, the objective of this study is to establish an in vitro co-culture model of OA that will allow cross talk between synovial membrane and articular cartilage to more accurately evaluate the anabolic effects of OA treatments. Articular cartilage and synovial membrane were aseptically harvested from the stifle joints of fresh equine cadavers. Synovial membrane and articular cartilage were aseptically harvested and 4 mm explants were obtained from tissues using 4 mm diameter biopsy punch. Synovial membrane alone, articular cartilage alone and synovial membrane co-cultured with articular cartilage using 0.4mm transwell inserts cultured in either Dulbecco's modified culture medium containing 5% fetal bovine serum and 1% penicillin/streptomycin or serum free media with 1% penicillin/streptomycin. Tissues were cultured at 37°C, 5% CO<sub>2</sub> and maintained for 3, 7 and 14 days. Media will be harvested and snap frozen on days 3, 7, and 14 for assessment of prostaglandin E<sub>2</sub> (PGE<sub>2</sub>) and Hyaluronan (HA). Cellular viability will be assessed at days 0, 3, 7, and 14 days using LIVE/DEAD viability/cytotoxicity kits and images were obtained via confocal microscopy and counted with Image J software.

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**Title:** The Impact of Street Design on Pedestrians' Perceptions and Commuting Patterns

**Primary Author (and presenter):** Garcia, Max, R

**Additional Authors:** 2<sup>nd</sup> Author Last name, First name; 3<sup>rd</sup> Author Last name, First name; and so on

**Department:** School of Architecture, Planning, and Landscape Architecture

**College/School:** College of Architecture, Design, and Construction

**Description:**

Design and construction professionals are entrusted to design a built environment that assures physical and psychological health. A sense of public safety is a mostly constructed trait because it is a culmination of cultural practices from a variety of personal backgrounds. In the public university setting, cultural diversity is a sustained component for the sake of conducting research and the pursuit of knowledge. With these differences in mind the physical development and planning of its city must be concerned with the livability of their home to be host to international visitation. This set of characteristics makes Auburn an interesting setting for pedestrian research. An analysis will answer the following: What kinds of street conditions impact the pedestrian? How do these conditions alter the emotional elements? How does that result in changing commute patterns? The study area will remain on the peripheral streets of Auburn University in the city of Auburn. This is primarily West/East Magnolia Ave as well as the central business district. The research design consists of three stages: context and survey, fieldwork study, and qualitative analysis. The results and literature review have shown that the relationship between parcel frontage, time of day, and proximity to the central business district are major contributors to the pedestrian perception. The investigation reveals that organization of inclusive space and crime prevention must occur through the design of streets, alongside the human-scale perspective.

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**Title:** Systemic induced resistance to *Meloidogyne incognita* caused by *Bacillus* spp.

**Primary Author (and presenter):** Gattoni, Kaitlin, M.

**Additional Authors:** Xiang, Ni; Lawrence, Kathy S.

**Department:** Entomology and Plant Pathology

**College/School:** College of Agriculture

**Description:**

Biological control agents are one management strategy that can be utilized to control populations of the southern root knot nematodes, *Meloidogyne incognita*, in upland cotton, *Gossypium hirsutum*. Successful implementation of biological control agents requires knowledge of how each agent affects its target pathogen. Biological control agents can directly or indirectly antagonize a pathogen. Indirect antagonism of a pathogen by a biological control agent is called systemic induced resistance (SIR). The objective of this research is to determine if three *Bacillus* strains can generate SIR in a cotton system and subsequently decrease *M. incognita* populations. A greenhouse pot test, in vitro assay and split root assay were used. The greenhouse pot test indicated that all three *Bacillus* strains had potential as biocontrol agents of *M. incognita*. The results of the split root assay showed that *B. firmus* I-1582 and *B. subtilis* QST713 may produce SIR to *M. incognita* in cotton. Further testing will be necessary to confirm these results. If the results are confirmed, the method of application of these *Bacillus* strains to cotton can be adjusted accordingly.

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**Title:** Copper influence on *Xylella fastidiosa* virulence *in planta*

**Primary Author (and presenter):** Ge, Qing

**Additional Authors:** Cobine, Paul & De La Fuente, Leonardo

**Department:** Entomology and Plant Pathology

**College/School:** College of Agriculture

**Description:**

*Xylella fastidiosa* (Xf) is a gram negative, xylem-limited plant pathogenic bacteria that causes disease in many economically important crops worldwide. Copper is a widely-used antimicrobial agent on Xf hosts. While the effects of copper have been extensively studied for foliar pathogen control, it is unknown what affect it has on a xylem-colonized pathogen. Previous results from our group showed that concentrations of CuSO<sub>4</sub> between 5-200 μM increase biofilm formation in vitro, while high concentrations (>200μM) of CuSO<sub>4</sub> inhibited biofilm formation. In this study, we focused on *in planta* experiments to unveil the influence of copper in Xf-caused diseases using tobacco as a model for infection. Xf-infected and non-infected plants were watered with tap water, and water supplemented with 4mM and 8mM CuSO<sub>4</sub>. Symptom progression was observed, and sap and leaf ionome analysis was performed by inductively coupled plasma optical emission spectroscopy. Uptake of Cu was confirmed by increased concentrations of Cu in sap of plants treated with CuSO<sub>4</sub>-amended water. In independent experiments sap copper concentrations for 4 mM supplementation ranged from 10-50 μM, while 8 mM supplementation resulted in 50-100 μM Cu. In vitro this concentration range resulted in enhanced biofilm formation. The symptoms of leaf scorch in the Cu-supplemented plants showed a trend towards more severe at later timepoints. Based on the results, we proposed that the plant copper homeostasis machinery controls the level of copper in xylem preventing it from becoming elevated to a level that that would lead to bacterial inhibition. Further study will focus on how bacteria population and colonization *in planta* is influenced by copper.

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**Title:** Computational fluid dynamics simulation of dam-break scenarios using an unstructured multi-phase approach

**Primary Author (and presenter):** Ghossein, Anthony Y.

**Additional Authors:** Nichols, D. Stephen

**Department:** Aerospace Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Numerical simulation of catastrophic failures of man-made containment vessels aids in understanding the environmental and infrastructural ramifications of such an event occurring. In this work, computational analyses of dam-break scenarios focus on the hydrodynamic interactions of an incompressible, high density fluid interacting with obstacles in the flow path. Two specific dam-break experiments found in literature are computationally analyzed. For the first case, a thin rectangular domain with an integrated, triangular, wedge-shaped block is modeled, and for the second experiment, a three-dimensional cubic volume containing a small block is constructed. Consistent with both experiments, a small portion of the interior domain is initialized with water, and the numerical simulations focus on both the unsteady motion of the water once it is released and the water's interaction with the interior obstacles. To perform these studies, Dassault SolidWorks was utilized to construct digital, solid model representations of the experimental structures, and using these solid models, Pointwise mesh generation software was employed to produce unstructured grids for each case. Care was taken during the grid generation process to segregate the high-density water-filled region from the downstream air-filled region to produce the dam-break scenarios. These dam-break simulations were performed with the UT-Chattanooga TENASI computational fluid dynamics (CFD) software package. Furthermore, a multi-phase surface capturing algorithm was coupled with a Scale-Adaptive Scheme (SAS) turbulence model to simulate the unsteady dam-break flow behavior. All computations were performed on Auburn University's Hopper Supercomputer. Computed results compare well with the experiment.

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**Title:** Design and development of a low temperature tube calorimeter for ammonia refrigerant

**Primary Author (and presenter):** Gibbes, Ford, D.

**Additional Authors:**

**Department:** Mechanical Engineering

**College/School:** College of Engineering

**Description:**

In 1987, with the ratification of the Montreal Protocol, the United Nations agreed that environmentally harmful refrigerants would need to be phased out. This has created a need for refrigerants with low global warming (GWP) and low ozone depletion potential (ODP). Ammonia refrigerant is promising in this regard because it possesses both of these characteristics as well as being a naturally occurring compound. Unfortunately, ammonia is toxic and corrodes copper, thus it is not commonly used in HVAC systems. Recent government policies encourage the use of low GWP and the interest in ammonia has grown since. However, there is a lack of information regarding the frictional pressure drop during two-phase flow phase change processes when ammonia is used inside the tubes of a heat exchanger. A tube calorimeter is used to measure the differential pressure drop across a 180° U-bend. The calorimeter is constructed from 3/8", 3/4", and 1" stainless steel tubing with pressure transducer taps at specific distances. The bend radius – tube diameter ratio varies from 1.2 to 2.5. Flow visualization data is recorded across a 180° glass U-bend using a high-speed camera and a pressure chamber. The data from this study is used to improve pressure drop models of ammonia. Furthermore, increased energy efficiency can be expected for heat exchangers that are designed using the new model and more accurate heat transfer. Because of this, ammonia has the potential to become an attractive refrigerant for wide usage in HVAC and refrigeration applications.

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**Title:** Prevention of heat stress adverse effects by beneficial modulation of the gut microbiota

**Primary Author (and presenter):** Giblot Ducray, Henri A.

**Additional Authors:** Globa, Ludmila; Pustovyy, Oleg; Vodyanoy, Vitaly; & Sorokulova, Iryna

**Department:** Anatomy, Physiology and Pharmacology

**College/School:** College of Veterinary Medicine

**Description:**

Temperature is a severe stressor, affecting health. An outcome of heat stress is the alteration of the gut barrier integrity, serving as the first barrier between luminal content and circulation. Dysfunction of this protective barrier results in increased intestinal permeability and diffusion of bacterial endotoxins (particularly lipopolysaccharides -LPS). Elevated level of LPS accompanies various pathological conditions and was documented in marathon runners and during intensive physical exercises. It was shown that the gut microbiota and its metabolites can regulate the gut barrier function. There are strong evidences for the significant changes in the composition of the gut microbiota after exposure to stress conditions. Thus, restoring the microbiota can present a novel approach for preventing stress adverse effects. The main goal of this study was to evaluate the efficacy of pro- and prebiotics in maintaining the gut barrier integrity during metabolic and environmental heat stress. Male rats were pre-treated by oral gavage either with prebiotic, probiotic strain or PBS before exposure to heat treatment or exercise. Control rats received the same treatment, but were kept at room temperature without stressor. Elevated body temperature in rats pre-treated with PBS resulted in significant changes of the gut morphology. The level of LPS in serum significantly increased in these animals. All registered adverse effects were prevented in rats, pre-treated with probiotic or prebiotic before exposure to stress conditions. Analysis of the gut microbiota revealed significant disruption of microbial composition only in the stressed rats pre-treated with PBS. The results of our study showed high effect of tested pre- and probiotic in preventing heat stress-related complications. We can speculate that maintaining of the balanced gut microbiota by tested products is a key for keeping the gut barrier integrity of intestine.

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**Title:** It's clean up time: Brownfield regeneration

**Primary Author (and presenter):** Gibson, Makala A.

**Department:** Environmental Design

**College/School:** College of Architecture, Design, and Construction

**Description:**

As of 2014 in America, there were 450,000 brownfield sites. Brownfields are harmful to our cities and communities as the urban systems that once rest there before (gas stations, power plants, industrial buildings) have left chemicals and substances that are hurtful to the air we breathe. Instead of letting these many abandoned sites sit and rot, they could be redeveloped and reused for social and public use. These can mean various ideas such as housing, mixed-use development, parks and recreation, and much more. The effect of revitalizing these brownfield sites have positive effects on the economy, human health, the environment, and overall quality of life. Because most brownfield sites were places of high human usage, the location efficiency is greater than in new development, reducing carbon emissions into the air from the reducing of miles travelled to and from the site. When a brownfield is selected to be redeveloped this requires a tremendous amount of planning, construction, design, and engineering, resulting in projects creating jobs for people in the area. The EPA Brownfield Program has already produced over forty thousand jobs throughout the country, with over a million in the process. With so many sites still in the United States, the clean-up of many communities and cities' brownfields can start in the push for more healthy, sustainable lives.

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**Title:** The association between sleep and adjustment in adolescence: Physical activity as a moderator of risk

**Primary Author (and presenter):** Gillis, Brian T.

**Additional Authors:** El-Sheikh, Mona

**Department:** Human Development & Family Studies

**College/School:** College of Human Sciences

**Description:**

Sleep insufficiency and poor sleep quality are associated with adjustment difficulties (e.g., internalizing and externalizing) in adolescence (Gregory & Sadeh, 2012), outcomes that also are influenced by physical activity (Biddle & Asare, 2011). Little is known, however, about the specific role that sleep and physical activity might play in concert with one another to promote well-being and prevent adjustment problems among youth. The present study seeks to examine the conjoint influence of sleep and physical activity on adolescent adjustment. A representative community sample of 235 youth ( $M$  age = 15.78 years,  $SD$  = 9.58 months) participated as part of a larger study. The sample was diverse with respect to sex (53% female), race (34% AA) and SES (43% at or below the poverty line). Adolescents wore actigraph watches for up to 7 nights to provide objective measures of sleep minutes, efficiency (% of minutes slept during the night), and latency (# of minutes spent trying to fall asleep). Youth then visited the laboratory to report on daily physical activity over the previous week using the Physical Activity Questionnaire (Kowalski, Crocker, & Faulkner, 1997) and on their adjustment using the Youth Self-Report of internalizing (e.g., depression) and externalizing (e.g., rule-breaking) symptoms (Achenbach & Rescorla, 2001). After controlling for potential confounds, preliminary analyses yielded a consistent pattern of effects showing that the interaction of sleep and physical activity is associated with adjustment outcomes ( $B$ s = -.20-.24,  $p$ s = .001-.056). Demonstrating multiplicative risk, adolescents who receive short or poor quality sleep in combination with lower levels of physical activity are most at risk for adjustment problems. This information can be used to bolster arguments for programs and policies that increase the amount of time adolescents spend engaged in both sleep and physical activity to protect against anxiety, depression, and externalizing problems.

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**Title:** The relationship between serum relaxin concentrations and knee kinematics during a single leg squat

**Primary Author (and presenter):** Gilmer, Gabrielle, G

**Additional Authors:** Roberts, Michael; Oliver, Gretchen

**Department:** School of Kinesiology

**College/School:** College of Education

**Description:**

Approximately 10% of female athletes tear their anterior cruciate ligament (ACL), and studies have shown females are 2-9 times more likely to tear their ACL than their male counterparts. In the past 20 years, injury prevention programs and clinical tests have been developed in an attempt to identify injury susceptibility. Despite the implication of these programs, females continue to have substantially higher ACL injury rates than males. Recently, relaxin, a peptide hormone similar to insulin, has been identified as interfering with the structural integrity of ACLs in females but not males. Thus, the purpose of this study was to identify the relationship between knee kinematics (valgus/varus, extension/flexion) during a single leg squat (SLS) and serum relaxin concentrations (SRC). It was hypothesized that SRC would have a positive correlation with knee extension and valgus. Twenty-two female athletes ( $21.7 \pm 3.7$  yrs.;  $64.8 \pm 8.2$  kg;  $1.8 \pm 0.3$  m) participated. Data were collected two times during the participants' menstrual cycle: the maximum and minimum SRC. Kinematic data were collected at 100 Hz using an electromagnetic tracking system synced with The Motion Monitor®. Participants performed a SLS on each leg, and each SLS was analysed at three events: 45° knee flexion of the eccentric phase, maximum knee flexion, and 45° knee flexion of the concentric phase. Blood was drawn during peak SRC and processed using a Quantikine Human Relaxin-2 Immunoassay. Pearson product-moment correlations revealed a significant, positive correlation between knee valgus and SRC during all three events in the right SLS. In the left SLS, a significant, positive correlation was found between knee flexion and SRC during maximum knee flexion. These findings suggest biomechanical and hormonal risk factors for ACL

injury are not independent of each other. With the continual increase in ACL injury, further investigation into a more holistic approach of injury prevention implementation is needed.

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**Title:** Minimization of aggregates in silane functionalized cellulose nanocrystal dispersions

**Primary Author (and presenter):** Glover, Elliott T.

**Additional Authors:** Saha, Partha; Davis, Virginia A.

**Department:** Chemical Engineering

**College/School:** Auburn University Samuel Ginn College of Engineering

**Description:**

The easy dispersability of cellulose nanocrystals produced by sulfuric acid hydrolysis of biomass enables them to be readily processed into aligned films. However, this same solubility causes the films to swell or dissolve in water. This research is focused on the fluid phase functionalization of CNC with (3-aminopropyl)triethoxysilane (APTES). This functionalization scheme can be used to increase CNC's hydrolytic stability. However, APTES functionalization can result in undesirable CNC cross linking and aggregate formation. This research is focused on understanding the effects of the initial CNC concentration and APTES:CNC ratio on the ability to achieve functionalization without aggregates. Since APTES functionalization is a first step in many schemes for immobilizing biomolecules on nanomaterials, the results of this research will also advance the development of CNC sensing devices.

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**Title:** Characterization of mitochondrial variation between oocytes harvested from lean and obese pigs.

**Primary Author (and presenter):** Gohlke, Madison, K

**Additional Authors:** Dyce, Paul; and Brandebourg, Terry

**Department:** Department of Animal Sciences

**College/School:** College of Agriculture

**Description:**

Mangalitsa pigs exhibit an obese phenotype distinct from leaner Yorkshire pigs. Studies show that mitochondrial DNA influences metabolism and susceptibility to disease. Mitochondrial DNA exchange confers protection against cardiovascular disease in obese mice with mitochondria from genetically lean counterparts (Fetterman et al, 2013). To examine the role of mitochondria in obesity-induced metabolic disease, the objective was first to verify that differences in oocyte mitochondria exist between lean and obese pigs. This was accomplished by characterizing the number and distribution of mitochondria and quantifying lipid content in porcine oocytes harvested from lean Yorkshires and obese Mangalitsas. Oocytes were aspirated from the ovaries of cycling pigs. Oocytes were stained with brilliant cresyl blue (BCB) to predict developmental competence. BCB+ staining indicates higher developmental competence (Casteneda et al, 2013). BCB+ oocytes were then stained with MitoView Green fluorescent stain to visualize mitochondrial number and distribution. Finally, BCB+ oocytes were denuded and stained with lipophilic Nile Red to determine lipid content. Upon staining, 47/61 Yorkshire oocytes and 22/25 Mangalitsa oocytes were BCB+. BCB+ Mangalitsa oocytes had higher corrected total cell fluorescence and, thus, higher numbers of mitochondria than BCB+ Yorkshire oocytes or either set of BCB- oocytes. Mangalitsa oocytes had higher contents of polar and neutral lipids compared to Yorkshire oocytes and a higher ratio of polar to neutral lipids within individual oocytes. These results suggest that differences exist between mitochondria of Yorkshire and Mangalitsa pigs, consistent with the hypothesis that mitochondrial disparities account in part for divergent body composition. These data support further pursuit of mitochondrial nuclear exchange between Mangalitsa and Yorkshire pigs to discover whether manipulation of the mitochondrial genome can uncouple obesity from metabolic disease.

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**Title:** Cellulose-based material for removal of microcystin from contaminated water sources

**Primary Author (and presenter):** Gomez Maldonado, Diego

**Additional Authors:** Hornus, Marina; Vega, Beatriz; Filpponen, Ilari; Wilson, Alan; Waters, Matthew; & Peresin, Maria Soledad

**Department:** Forestry

**College/School:** School of Forestry and Wildlife Sciences

**Description:**

As water temperatures increase, blooming seasons of algae and cyanobacteria last longer and with this, toxins concentrations exceed safe limits for human consumption. Microcystin-LR has been reported as one of the main cyanotoxins related to a liver cancer and its abundance in water is constantly monitored. The World Health Organization (WHO) stipules that the maximum concentration in water should be 1 µg/L, but in national's lakes, the Environmental Protection Agency reported a mean concentration of 3.0 µg/L with some studies where concentrations up to 225 µg/L were found. Traditional ways of treatment are chlorination, filtrations and ozonating, but this could not always be as effective, especially in blooming seasons. Therefore, a need exists to develop new methods to remove this toxin from water sources. Utilizing cellulose-based products as alternative materials for water treatment hold an exciting potential for generating value-added, environmentally friendly products, which production, use and recycling can promote an important portion of the forestry economy and pulp and timber industries. In this project, we used a cellulose-based material modified with cyclic polysaccharide (cyclodextrin) under different conformations; the produced material was used for the recovery of microcystin from different water sources. The characterization of the modified substrate was performed with FT-IR and AFM; while the recovery uptake (of microcystin) was assessed by QCM-D, and chromatographic techniques.

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**Title:** Vitamin B complex encapsulated on bacterial nanocellulose: A model study on adsorption and controlled delivery system

**Primary Author (and presenter):** Gomez Maldonado, Diego

**Additional Authors:** Sanchez, Diego; Castro, Cristina; & Peresin, Maria Soledad

**Department:** Forestry

**College/School:** School of Forestry and Wildlife Sciences

**Description:**

Cellulose is one of the most abundant materials on nature, it can be obtained directly from wood and other lignocellulosic biomass or through bacterial synthesis. Bacterial nanocellulose (BNC) has been widely used in the food industry as dietary fiber, as well as a thickening and water-binding agent. BNC has the capability to absorb vitamins of the B complex (B1, B2, B3 and B12) which are among the micronutrients with the highest heat sensitivity, requiring certain strategies to prevent degradation during cooking and the delivery of optimum dosages upon consumption. In this work, we investigate the utilization of agroindustry waste derived BCN as an encapsulating agent for vitamins of B complex (B1, B2, B3 and B12), following the adsorption capability of the vitamins on the BCN surface by Quartz Crystal Microbalance with Dissipation Monitoring (QCM-D), as well as the desorption of vitamin B complex on thin model films of BNC at different pH values. The morphology of the surfaces was studied using Atomic Force Microscopy (AFM).

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**Title:** Thermal performance of perforated pen panels for on-farm nutritional test trials

**Primary Author (and presenter):** Goneke, Kelly, E.

**Additional Authors:** J.D. Davis, J.L. Purswell, G.D. Chesser, and C.M. Edge

**Department:** Biosystems Engineering

**College/School:** Engineering

**Description:**

Test pens are commonly used to segregate and geolocate birds in commercial-scale broiler houses to control for spatial variation in the environment. These pens should subject test birds to similar environmental conditions outside the enclosure, however pen design and materials can vary significantly and may affect environmental conditions within the pen. Evaluation of pen construction and materials is necessary to determine the optimum wall construction to maintain similar environmental conditions within the pen. Proportion of perforated area and air velocity were tested as main effects in a 7 x 3 factorial design. Treatments included seven levels of perforation area (100%, 90%, 70%, 50%, 30%, 10%, and 0%) and three levels of air velocity (2, 3, and 4 m/s). Two 0.75 x 1.5 m panels were installed in a wind tunnel to simulate the windward and leeward panels of a test pen. Sensible heat generation was simulated for 14 birds in the pen using enclosed incandescent bulbs. Five simulated birds were constructed outside the pen on both the windward and leeward side. A metal feeder was suspended in the center of the pen. Results showed that as open area was decreased, sensible heat increased both in the pen as well as on the windward side. Proper design and construction of test pens is critical to accurately assess performance of test birds in a commercial broiler house when compared with the remaining flock.

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**Title:** The potential role of inflammation in oocyte health and developmental potential.

**Primary Author (and presenter):** Gorman, Sara, A

**Additional Authors:** Phillips, Kaitlyn; Read, Casey; Brandebourg Terry; Dyce, Paul.

**Department:** Animal Sciences

**College/School:** College of Agriculture

**Description:**

Infertility has long been associated with infections of the uterus and mammary gland in cattle. Recently granulosa cells have been identified as active players in localized inflammatory reactions within the ovary. It has been shown that granulosa cells have Toll-like receptors that can detect microbes and respond by increasing the expression of innate immune regulating cytokines such as tumor necrosis factor alpha (*TNF $\alpha$* ), and interleukin 6 (*IL6*). *TNF  $\alpha$*  (pro-inflammatory) is associated with changes in tumor grade and the expression of chemokine receptors on ovarian cancer cells. *IL6* (pro or anti-inflammatory) functions as a stimulus for the immune system.

We have recently developed a single oocyte system allowing the retrospective comparison of cumulus cells originating from cumulus oocyte complexes that either develop to the blastocyst stage (high developmental) or stall at the two-cell stage (low developmental) following *in vitro* fertilization (IVF). We investigated the mRNA expression levels of various inflammatory markers including *TNF $\alpha$* , *IL6*, C-X-C motif chemokine 5 (*CXCL5*), chemokine ligand 2 (*CCL2*), and periostin (*POSTN*) in the cumulus cells from oocytes categorized as high developmental and low developmental, following IVF, in an attempt to elucidate the possible role of inflammation in the development of oocyte competence.

We found there was significantly higher expression of the pro-inflammatory cytokines *TNF alpha* and *IL6* in the cumulus cells from oocytes categorized as low developmental. Conversely, we did not see a significant difference in the expression of *CXCL5*, *CCL2*, or *POSTN* in the high or low developmental groups.

These results suggest localized inflammation may play a role in the developmental competence of bovine oocytes. Additional markers related to oocyte health and inflammation are the focus of ongoing research.

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**Title:** Analyzing the economic impact of channel-blue hybrid catfish growth variability on production

**Primary Author (and presenter):** Gosh, Kamal

**Additional Authors:** Hanson, Terry; Dunham, Rex; Chatakondi, Nagaraj; & Ganesh Kumar  
**Department:** Fisheries, Aquaculture and Aquatic Sciences  
**College/School:** College of Agriculture

**Description:**

Hybrid catfish (channel catfish, *Ictalurus punctatus*, ♀ x blue catfish, *I. furcatus*, ♂) farming is a prime example of yield intensification, but has witnessed growth variability issue. Analyzing the economic impact of this issue is critical to understand fish producer's profitability as the fish processor's demand for specifically sized categories of fish (undersized, premium, and oversized). A comprehensive industry-wide fish sampling and survey were conducted in Mississippi, Arkansas, and Alabama from 2015 to 2017. In total, 164 ponds were sampled, which included single batch (N=25), multiple batch (N=16), split pond (N= 98) and in-pond raceway system (IPRS, N=25). Comparative economic analyses were developed by using a standard enterprise budget, partial budget and sensitivity analysis approaches. Preliminary results suggest that intensive production systems (split pond and IPRS) have more economic benefit compared to traditional systems (single and multiple batch). These are evidenced from the higher incomes above variable costs resulting from the higher gross yield, especially from the premium sized fish category (0.45-1.81 kg in weight and sales price = \$2.46/kg). Current analyses also suggest that variations in dockage rates, particularly for the price of undersized (< 0.44 kg in weight, sales price = \$2.34/kg) and oversized fish (> 1.81 kg in weight, sales price = \$2.08/kg), have a significant economic impact on the net returns that result in revenue loss. This loss is \$1,712/ha for undersized and oversized fish, irrespective of the production system, and is greater for oversized fish (65%) compared to undersized fish (35%). Partial budget analyses suggest that use of larger sized fingerlings (23 cm) could be an acceptable choice to erase revenue losses but would not be a feasible enterprise when compared with net returns of medium sized fingerlings (18 cm) due to a lower net return.

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**Title:** Evaluating the impact of management factors that cause growth variation on channel-blue hybrid catfish production

**Primary Author (and presenter):** Gosh, Kamal

**Additional Authors:** Dunham, A. Rex; Hanson, Terry; Chatakondi, Nagaraj; Drescher, David; Robinson, Dalton; Bugg, William; & Backenstose, Nathan

**Department:** Fisheries, Aquaculture and Aquatic Sciences

**College/School:** College of Agriculture

**Description:**

The growth variability of channel catfish, *Ictalurus punctatus*, female x blue catfish, *I. furcatus*, male hybrids was studied in both commercial and research settings. Various production variables were, therefore examined surveyed from traditional ponds of single batch (N=25) and multiple batch (N=16), split ponds (N=98), and in-pond raceway system (IPRS) (N=25). Out of these IPRS, four raceways were selected from research settings while the rest were selected from commercial settings. Stepwise regression, partial F test, ANOVA (analysis of variance) and residual analysis (i.e., residual vs fitted, Durbin Watson test) were, hereby, performed for data analysis. Preliminary results suggested that the coefficient of variation (CV) (%) was in the expected range of 37-48%, which was quite closer as compared to fingerling stage (23-56%). These were evidenced from the several population distribution curve, which formed almost a bell shape with showing the positive and moderate skewness (value >1). Mean percentage of undersized (<1 lb.) and oversized fish (> 4 lb.) were also found in minimal stage, which were 12% and 5%, respectively. Preliminary results also suggested that aeration, individual weight of stocked fingerling, grading, FCR (feed conversion ratio), feeding and culture period, survival rate, sock size, and harvesting method (partial/complete) could have the largest impact on growth variability. Growth variability could also be affected by sire and dam effects.

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**Title:** Intravenous delivery of AAV gene therapy in GM1 gangliosidosis

**Primary Author (and presenter):** Gross, Amanda L.

**Additional Authors:** Gray-Edwards, Heather; Sena-Esteves, Miguel; & Martin, Douglas

**Department:** Anatomy, Physiology, and Pharmacology

**College/School:** College of Veterinary Medicine

**Description:**

GM1 gangliosidosis is a hereditary lysosomal storage disease caused by a deficiency of lysosomal  $\beta$ -galactosidase ( $\beta$ -gal). The most common form of GM1 gangliosidosis affects children, is fatal by 4 years of age, and is characterized by rapidly progressing and fatal neurological disease. Outside of palliative and supportive care, there is no effective treatment for GM1. Adeno-associated viral (AAV) therapy has proven effective in a well-characterized feline model of GM1 gangliosidosis, demonstrating a greater than 10-fold increase in lifespan after injection to the brain thalami and deep cerebellar nuclei. However, this injection route is invasive, so intravenous delivery was studied to circumvent the surgical risk while potentially increasing cortical and systemic biodistribution. The six animals included in the study were divided into two cohorts: 1) a long term group, which was followed to humane endpoint, and 2) a short-term cohort, with samples collected 16 weeks post treatment. Animals were assessed using a clinical rating score to determine disease progression. At the designated time point, biodistribution of  $\beta$ -gal and vector were assessed, using a synthetic enzyme substrate and qPCR. Biomarkers of disease progression were studied in the CSF, and brain metabolites were analyzed using magnetic resonance spectroscopy (MRS). In both cohorts, there was an increase in the distribution and activity of  $\beta$ -gal, reaching normal levels in some areas of the CNS and peripheral tissues. Also, secondary biomarkers of lysosomal function were improved. Analysis of CSF biomarkers and brain metabolites showed a normalization in comparison to untreated animals which indicates amelioration of cell damage, gliosis, and demyelination. Taken together, this data strongly supports the use of IV injection of AAV gene therapy as a safe and effective treatment for GM1 gangliosidosis.

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**Title:** Dietary counseling for gastrointestinal disorders

**Primary Author (and presenter):** Grounds, Leslie D.

**Additional Author:** Ellison, Kathy J.

**Department:** Nursing

**College/School:** School of Nursing

**Description:**

Pharmacological therapy is one of the most common approaches to treating functional gastrointestinal (GI) disorders such as irritable bowel syndrome. However, symptom management is often insufficient with pharmacologic strategies alone. Dietary manipulation may be an effective treatment for the disease and has the potential to improve symptom management, enhance quality of life (QOL), and improve clinical outcomes for patients diagnosed with these conditions. The purpose of this project is to determine whether the use of dietary counseling with consistent follow-up for patients adhering to a prescribed diet will positively affect dietary compliance (DC) as well as symptom severity (SS) and QOL related to their GI condition. The target population included patients at Internal Medicine Associates of Opelika, Alabama who were 19 years of age or older experiencing GI symptoms that could be improved by dietary intervention. Participants were provided with an educational packet regarding their prescribed diet and were asked to complete questionnaires regarding the severity of their symptoms and how those symptoms affected their QOL. For four weeks, each participant's symptoms, QOL, and DC were monitored weekly by telephone interview. Data collection is in progress. Presently, eleven patients have

consented to participate in the project. Demographic data has been collected regarding age, gender, and ethnicity. 27% of participants were prescribed a gluten-free diet, 45% a dairy-free diet, 27% a combination of a gluten-free and dairy-free diet, and 0% a low-FODMAP diet. Following completion of the project, data will be presented on DC and the mean differences between baseline and follow-up SS and QOL scores. SS and QOL scores are expected to improve with dietary counseling and consistent follow-up among patients with GI disorders. Implementing a dietary counseling service within this clinical setting is achievable and continuation of the project is advised.

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**Title:** Synthesis and Characterization of Transition Metal Complexes for Antimicrobial Application

**Primary Author (and presenter):** Grundhoefer, JP

**Additional Authors:** Hardy, Emily E.; Wood, Aiden E.; West, Maya M.; Curtiss, Ashley B.; Gorden, Anne E. V.

**Department:** Chemistry and Biochemistry

**College/School:** College of Science and Mathematics

**Description:**

As the population increases, the risk of infection and spreading disease also increases. With these increased risks, new compounds with antimicrobial activity are of interest. Schiff base compounds, incorporating certain biologically non-toxic metals, have been used in this area. The most common way to synthesize these compounds is through a condensation reaction between a diamine and two equivalents of an aldehyde. As an honors undergraduate lab experiment in Spring 2017, the ligand was synthesized from 1,2-diamino-3-propanol and 2-hydroxynaphthaldehyde and complexed with the biologically relevant metals copper and nickel. The complexes were further studied over the following summer and fall. Here, the synthesis, solution phase characterization, solid-state crystal structure, and binding studies of these complexes is presented and discussed.

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**Title:** Evaluation of nitrogen delivery methods for stocker cattle grazing annual ryegrass: 2-year summary

**Primary Author (and presenter):** Gunter, Phillip A.

**Additional Authors:** Peacock, Robert; Muntifering, Russell; & Mullenix, Kim

**Department:** Animal Sciences

**College/School:** College of Agriculture

**Description:**

A 2-yr grazing experiment was conducted to evaluate replacing N fertilizer with either interseeded legumes or protein supplementation for stocker cattle grazing annual ryegrass (*Lolium multiflorum*). Each yr, 90 steers (initial body weight (BW),  $225 \pm 10$  kg) were assigned to the following treatments, with or without monensin fed in a free-choice mineral supplement: ryegrass fertilized with 112 kg N/ha (NFERT); ryegrass interseeded with crimson clover (CC, *Trifolium incarnatum*); ryegrass interseeded with arrowleaf clover (AC, *Trifolium vesiculosum*); dried distillers grains with solubles (DDGS) supplemented at 0.65% BW daily; and whole cottonseed (WCS) supplemented at 0.65% BW daily. Steers were weighed unshrunk every 28 d, and forage mass (FM) was measured concurrently using the destructive harvest/disk meter double-sampling method. Thirty 0.81-ha paddocks were stocked initially with 3 steers, and stocking density was adjusted using put-and-take steers based on changes in FM and steer BW to maintain a forage allowance of 1 kg DM/kg steer BW. Grazing was discontinued on May 11, 2016 in Yr 1 and May 10, 2017 in Yr 2 following 140 and 84 d of grazing, respectively. Data were analyzed by PROC MIXED for a factorial design experiment with repeated measures for which pasture (n = 3/treatment) was the experimental unit. Mean ADG (kg/d) greater ( $P = 0.01$ ) for DDGS (1.46) and WCS (1.43) than CC (1.30) and AC (1.25) treatments, but not different from NFERT (1.34).

Total gain (kg/ha) was greater ( $P = 0.05$ ) for DDGS (502) and WCS (478) than AC (397), but not different from NFERT (448) and CC (442). Mean stocking density (steers/ha) was greater ( $P = 0.03$ ) for NFERT (3.85) than CC (3.36), AC (3.26), DDGS (3.50), and WCS (3.49). Results are interpreted to mean that ryegrass pasture supplemented with either DDGS or WCS supported ADG, stocking densities, grazing days/ha and total gain/ha similar to or greater than ryegrass amended with N fertilizer or interseeded with annual legumes.

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**Title:** Using high-protein brewer's yeast products to replace fishmeal and soybean meal in practical diets for the Pacific white shrimp *Litopenaeus vannamei*

**Primary Author (and presenter):** Guo, Jingping

**Additional Authors:** Qiu, Xuan; Chaturanga, G.A. Harsha S.; & Davis, D. Allen

**Department:** Fisheries, Aquaculture and Aquatic Sciences

**College/School:** College of Agriculture

**Description:**

Yeast as one kind of high protein source become more affordable and attracted extensive attention in recent years. Two 6-week growth trials and a digestibility trial were conducted to evaluate the effects of two all-natural high-protein brewer's yeast products (DBY50 and DBY70) on the growth performance of Pacific white shrimp, *Litopenaeus vannamei*. In the first growth trial, graded levels of DBY50 (0, 6, 12, 18, and 24 %) were used to replace fishmeal (FM: 19.12, 14.34, 9.56, 4.79, and 0 %) and soybean meal (SBM), referred to Diet 1-5, and Diet 6-8, 4 and 9, respectively. Each diet was randomly fed to four replicate groups of 10 shrimp. The results from the first growth trial showed that there were no significant differences in final biomass, survival, protein retention efficiency and feed conversion ratio (FCR); limited differences in final weight, percent gain, and weight gain (WG) were shown in the FM replacement series. There was no significant difference on the growth performance in the SBM replacement series. To confirm the results of the first trial, a second growth trial was conducted with Diet 1, Diet 3-6 and a low-FM diet containing 2 % of a 72.4 % protein product [DBY70 (Diet10)]. Each diet was randomly fed to four replicate groups of 30 shrimp. Shrimp fed the high-FM basal diet exhibited significantly higher final mean weight, percent gain and WG than those offered the diet containing 24% DBY50. There was no difference in performance of shrimp fed the low-FM diet or the low-FM diet containing DBY70. The ingredients DBY50, DBY70, menhaden FM, and solvent-extracted SBM were evaluated in a digestibility trial using the 70:30 replacement technique. In general, nutrient availability of DBY50 and DBY70 was similar to SBM and significantly higher than FM. Results of this study indicate that DBY50 is a good protein source for shrimp, and 18-24 % DBY50 can be effectively used in practical diets as a replacement for FM, or up to 24 % when replacing SBM.

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**Title:** Engineered tumor-on-a-chip model for *in vitro* recapitulation of the native prostate tumor microenvironment

**Primary Author (and presenter):** Habbit, Nicole L.

**Additional Authors:** Anbiah, Benjamin; Hassani, Iman; Eggert, Matthew; Jasper, Shanese; Prabhakarandian, Balabhaskar; Arnold, Robert; & Lipke, Elizabeth

**Department:** Chemical Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

The current likelihood of approval for oncology drugs entering clinical trials is only 5.1%, nearly half that of all drug development programs combined. This poor performance can be attributed to the lack of a physiologically relevant drug testing platform that can accurately predict drug safety and efficacy

during preclinical research. This study reports the development of a three-dimensional bioengineered prostate tumor model that recapitulates the native tumor microenvironment, transcends the limitations of conventional two-dimensional, cell aggregate, or murine platforms, and can be employed in a microfluidic chip-based drug delivery system. *In vitro* tumor tissues were fabricated utilizing a biohybrid hydrogel scaffold comprised of poly(ethylene glycol)-fibrinogen (PF) with varying amounts of excess poly(ethylene glycol) diacrylate (PEG) to stiffen the polymer matrix. Metastatic PC-3 prostate cancer cells and BJ-5ta fibroblasts were encapsulated within the photocrosslinked hydrogel, thus forming an engineered tumor tissue. Encapsulated cells remained viable and demonstrated appropriate morphological changes over 29 days in culture. *In vivo* tumor tissue samples were generated in immunocompromised mice and sectioned into samples similar in geometry to engineered tissues. Mechanical stiffness quantification revealed that varying culture time points of engineered tissues in PF, PF+1% PEG, and PF+2% PEG closely mimicked *in vivo* tissue samples from three geometric regions of the excised tumor. The 3D engineered tumor tissue platform was then extended to a microfluidic chip device, which augmented physiological relevancy by incorporating additional cell types, dynamic flow conditions, and the ability to model intravasation and extravasation during tumor metastasis. Perfusion of a fluorescent probe through the endothelialized vasculature under physiological flow demonstrated the ability to achieve differential drug distribution, such as is observed in native tumors.

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**Title:** Quantifying the prevalence of the West Nile Virus, Rift Valley Fever Virus, and Dengue Fever Virus across Mouse Lemurs Populations from Madagascar.

**Primary Author:** Hale, Emma

**Additional Authors:** Schwartz, Tonia; Zohdy, Sarah

**Department:** Biological Sciences

**College/School:** College of Science and Mathematics, School of Forestry and Wildlife

**Description:**

Wildlife, non-human primates in particular, can serve as reservoirs for arboviruses that can be transferred to humans via mosquitoes. Dengue Fever Virus, West Nile Fever Virus, and Rift Valley Fever Virus have all been identified in humans in Madagascar. Mouse lemurs (*Microcebus* spp.), primates endemic to Madagascar, may act as potential reservoirs for these viruses, but this has yet to be determined. This study hopes to determine the prevalence of these viruses in brown mouse lemurs of Madagascar and test if there is a correlation in the presence of these viruses with habitat degradation. To validate the protocol, house mouse (*Mus musculus*) blood was spiked with non-infectious viral RNA in a dilution series. RNA was isolated converted to cDNA and virus detected using qPCR. Lemur blood samples were collected from intact forest and deforested regions of Madagascar. We are testing these samples for each of the viruses by qPCR. The results will be discussed.

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**Title:** Effect of size and surface charge of polymeric composite nanoparticles on cell cytotoxicity and uptake

**Primary Author (and presenter):** Hall, David Aaron

**Additional Authors:** Sangle, Prachi P. & David, Allan E

**Department:** Chemical Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

PLGA (Poly lactic-co-glycolic acid) is a negatively charged copolymer of lactic and glycolic acid that is widely known for its biomedical applications. It is biocompatible, biodegradable and FDA approved for its use in therapeutic devices. PLGA has hydrophobic and hydrophilic properties that can be

readily be controlled by changing the ratio of lactic acid to glycolic acid. This ratio has an effect on the overall crystallinity (mechanical strength), polydispersity index and hydrophobicity (the rate of hydrophobic interactions) of the particles. Chitosan is a linear polysaccharide composed of  $\beta$ -(1 $\rightarrow$ 4)-linked *N*-acetyl-D-glucosamine and D-glucosamine. Chitosan becomes positively charged in acidic environments due to the protonation of the free amino groups. This property allows chitosan to polymeric structure in neutral environments, and dissolves in acidic environments. Properties of chitosan allow it to rapidly clot blood, hence it has recently been approved in Europe and the United States for hemostatic agents and bandages. Being hydrophilic, biocompatible and mucoadhesive, its properties are also useful for drug delivery. Synthesized particles were characterized using Dynamic Light Scattering (DLS) (for size and surface charge) and scanning electron microscope (SEM) (for size and surface morphology). Varying the amount of chitosan in the composite has an effect on overall surface charge as well as size. These difference in properties have a distinct effect on cytotoxicity and uptake of the composite nanoparticles. Cytotoxicity of the particles to the cells was determined by using MTT assay.

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**Title:** Embryological development and global change: How do reptile embryos respond to thermal stress?

**Primary Author (and presenter):** Hall, Joshua M.

**Additional Authors:** Warner, Daniel

**Department:** Biological Sciences

**College/School:** College of Sciences and Mathematics

**Description:**

Two components of global change, climate change and urbanization, both contribute to increased ambient temperatures that may induce heat stress or mortality in animals. Each phenomenon independently results in both increased mean temperatures and increased maximum day-time temperatures; however, there is also the potential for these components to act synergistically: extreme temperatures due to the urban heat island effect are likely to be exacerbated as the earth's surface warms due to climate change. Many animals can respond to harmful temperatures behaviorally, by altering their periods of activity or shifting their habitat use. Such behavioral compensation, however, is unavailable to embryos of ectotherms which typically develop inside eggs in the ground and receive little or no parental care. Thus, this early life stage is expected to be more vulnerable to harmful temperatures caused by aspects of global change, and yet, the effects of ecologically relevant thermal stress on these embryos has received little attention. We sought to understand the consequences of such extreme temperatures on embryological development by utilizing two species of lizard (*Anolis sagrei* and *Anolis cristatellus*) that commonly inhabit urban areas. We measured ground temperatures in an urban landscape where lizards nest and modeled daily thermal fluctuations that included brief periods of extremely high temperatures. We then subjected eggs of both species to various magnitudes and frequencies of these thermal fluctuations at multiple stages of embryological development. We report the effects on embryo survival at these ecologically relevant thermal regimes and demonstrate that extreme incubation temperatures differentially impact species, and the thermal sensitivity of reptile embryos changes through development. Thus, future studies of the thermal tolerance of vertebrate embryos must consider changes in thermal sensitivity across development and among species to determine the impacts of global change.

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**Title:** Membrane electrodes for capacitive deionization

**Primary Author (and presenter):** Hamade, Fatima A.

**Additional Authors:** Davis, Virginia; & Radich, James

**Department:** Chemical Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Interest in capacitive deionization (CDI) improvement has grown in the past decade due to its benign, cost-effective, and efficient qualities for simultaneously storing energy and deionizing water on a large scale. However, the challenge in enhancing CDI performance and expanding renewable energy technologies lies in a lack of fundamental understanding of electrochemical responses and interactions at the conductive surface of the electrodes. The focus of this research is to investigate the influence of tuning the microstructure of electroactive percolated membrane electrodes composed of expanded reduced graphene oxide/manganese dioxide (XRGO/MnO<sub>2</sub>) nanowire hybrids. Membrane electrodes produced from freeze-drying anisotropic dispersions of XRGO/MnO<sub>2</sub> hybrids are being studied to determine the robustness, pore size distribution, surface properties, phase behavior, and electrochemical performance of the membranes. To improve CDI performance, membrane electrodes should possess high electrical conductivity and surface area to enhance electrode-electrolyte interactions and porous architecture to enhance intercalation of salt ions from brine solution. This study discusses (1) variations between the initial dispersion microstructure and final microstructure upon freeze-drying different concentrations of XGO, XRGO, MnO<sub>2</sub>, XRGO/MnO<sub>2</sub> hybrids synthesized together, and mixtures of XRGO and MnO<sub>2</sub> synthesized separately, and (2) capacitive behavior of the freeze-dried electrodes. These results provide key details of the influence of modifying anisotropic dispersion characteristics on membrane morphology upon freeze-drying. In ongoing work, the effects of concentration on the initial microstructure are being characterized using optical microscopy and rheology. This will enable further development of processing-structure-property relationships and provide a foundation for further understanding fluid and ion transport as well as reaction engineering principles for optimal CDI design.

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**Title:** An exploratory factor analysis of the Internet Sex Screening Test (ISST)

**Primary Author (and presenter):** Harrelson, Megan E.

**Additional Authors:** Alexander, Apryl A.

**Department:** Psychology

**College/School:** College of Liberal Arts

**Description:**

The Internet Sex Screening Test (ISST) is the most used assessment of problematic online sexual behavior. Previous factor analysis of the ISST identified five dimensions assessed by instrument items: online sexual compulsivity (i.e., online sexual behavior problems), online sexual behavior-social (i.e., interpersonal interactions with others during online sexual behavior), online sexual behavior-isolated (i.e., solitary online sexual behavior), online sexual spending (i.e., purchasing sexual material and/or paying for access to sex-related websites), and interest in online sexual behavior (i.e., use of the computer for sexual pursuits) (Delmonico & Miller, 2003). However, several concerns regarding this factor structure have been identified, including unpublished validity testing, low factor internal consistency, and lack of replication in non-clinical samples. To address these concerns, the ISST factor structure was re-examined using exploratory factor analysis in a sample of undergraduate students. A two-factor solution (*Online Sexual Behavior* and *Compulsive Online Sexual Behavior*) was chosen as the most parsimonious model and accounted for 64.1% of the variance. The two-factor solution suggests that most ISST items measure the presence of, or compulsion to engage in, cybersex. The clinical utility of the ISST is enhanced by the current factor structure through increased parsimony over the previous factor structure, identified areas of impairment caused by problematic cybersex, and generalized validity testing to a non-clinical sample. Implications for assessment of online sexual behavior will be discussed.

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**Title:** Childhood poly-victimization and risky sexual behavior in college-aged women

**Primary Author (and presenter):** Harrelson, Megan E.

**Additional Authors:** Alexander, Apryl A.  
**Department:** Psychology  
**College/School:** College of Liberal Arts

**Description:**

The present study examined the relationships between polyvictimization, or the cumulative influence of childhood victimization, and risky sexual behavior (RSB) in college women. Previous research suggests a link between childhood maltreatment (e.g., physical abuse, sexual abuse, neglect) and RSB in emerging adults; however, many studies neglect evaluating the influence of high levels of polyvictimization on RSB expression. Thus, this study aimed to evaluate the contribution of polyvictimization on RSB, defined as sexual behavior that is unprotected, anonymous, or occurs under the influence of alcohol or drugs, in a sample of 321 undergraduate women. First, the relative contributions of polyvictimization and six individual categories of childhood victimization (Conventional Crime, Child Maltreatment, Physical Victimization, Peer and Sibling Victimization, Sexual Victimization, Indirect Victimization) in predicting RSB were examined. The study then tested whether polyvictimization contributed any unique variance, beyond that accounted for by the combination of all six aggregate categories. Regression analyses revealed that a) polyvictimization accounted for a significant proportion of variability in RSB, beyond that accounted for by any of the six categories of childhood victimization alone, and b) the categories of childhood victimization contributed little to no variability in RSB beyond that accounted for by polyvictimization. Further, polyvictimization accounted for a significant proportion of variability in RSB, beyond that already accounted for by the simultaneous entry of all six categories as predictor variables. Findings suggest that treatment providers working with undergraduate students should assess for the presence of polyvictimization to inform RSB treatment efforts. Implications for RSB prevention on college campuses will be discussed.

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**Title:** Examining the Effects of Tissue Geometry on Cardiomyocyte Maturation in 3D Developing Human Engineered Cardiac Tissues.

**Primary Author (and presenter):** Harris, Bryana, Nycole

**Additional Authors:** Ellis, Morgan; Lipke, Elizabeth

**Department:** Chemical Engineering

**College/School:** Auburn University

**Description:**

Heart disease is the leading cause of death worldwide. Current technology to study mechanisms of the heart involve both animal and *in vitro* models. While animal models are useful they do not accurately portray the native human heart tissue. Additionally, current *in vitro* models fail to show features of mature human cardiac tissue. In recent years, our research group has developed a method for encapsulating human-induced pluripotent stem cells (hiPSCs) in poly (ethylene glycol) fibrinogen (PEG-FN) to form 3D developing human engineered cardiac tissues (3D-dhECTs). In this previous study, the 3D-dhECTs presented T-tubules adjacent to Z-lines, which is considered a key component of functional maturation. Although this study was successful, contractions often propagated in a circular motion along the dense, compact edges of the microisland, which is not indicative of contracting human myocardium. In this study, we seek to alleviate this issue by investigating whether the tissue geometry of the 3D-dhECTs impacts the alignment of the cells and action potential propagations required to drive the engineered tissues toward a more mature state. To do this, we compared three different geometries: a rectangular tissue, a square tissue, and the established microisland geometry. After encapsulating the hiPSCs in the various tissue geometries, a variety of assays were performed to characterize cardiac maturation. To measure changes in the size of engineered tissues geometry over time, phase contrast images were taken and analysed using Image J. To quantify the contractions of the engineered cardiac tissues, analysis was performed on videos taken at various time points. A live/dead assay was performed to examine cell viability. Preliminary encapsulations

showed onset of spontaneous contraction on Day 8 for all geometries. At later time points, more consistent data was shown between square and rectangle geometries. From the data collected, we hope to determine the most favourable tissue geometry for driving cardiomyocyte maturation.

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**Title:** Nanoparticle surface characteristics influence *in vitro* cytotoxicity and *in vivo* circulation time

**Primary Author (and presenter):** Harris, Patrick R.

**Additional Authors:** Kelly, Alexander, L.; Paul, Kyle, D; & David, Allen, E.

**Department:** Chemical Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Nanoparticles have garnered considerable attention regarding their uses in therapeutic delivery systems. These particles provide unique characteristics that not only mitigate immunological effects of intravenous delivery, but also induce longer circulation half-lives for the therapeutic *in vivo*. Silica nanoparticles (SNPs) are of specific interest due to inherent biocompatibility and high range of surface functionalization. Surface characteristics of nanoparticle delivery platforms have been linked to behaviour *in vivo*. Many studies have investigated the use of polymer coatings, such as polyethylene glycol (PEG), to improve circulation half-lives upon injection. Though PEG is highly utilized within the field, its mechanism is poorly understood, with little knowledge regarding optimal polymer lengths necessary for efficacious improvement of nanoparticle systems. This research investigates the effect of PEG size on SNP cytotoxicity *in vitro*. Cellular uptake and viability studies have been conducted with particles coated in various PEG sizes. These experiments have produced a standard for comparison on the effects of differently sized PEG. Chinese Hamster Ovary cells were used in this study given their prevalence in cytotoxicity and uptake literature. RAW 264.7 macrophage cells were used to study immunological cellular uptake relating to *in vivo* nanoparticle clearance. Comparisons between particles taken up by cells and those associated with cell surfaces were made with confocal microscopy and flow cytometry. This study found that size and surface coatings have a dramatic influence on cell viability and uptake *in vitro*. In addition, these studies show there may be interplay between both variable sets. This work provides a basis of comparison that could be extended to further nanoparticle platforms. Understanding the impact of widely used nanoparticle compositions, sizes, and coatings on mammalian systems is an important step in developing robust drug delivery vehicles.

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**Title:** A Direct Algorithm for Velocity-map Imaging Systems (DAVIS)

**Primary Author (and presenter):** Harrison, Geoffrey, R

**Additional Authors:** Vaughan, John; Hidle, Brock; Laurent, Guillaume

**Department:** Physics

**College/School:** COSAM

**Description:**

In this work, we report a novel algorithm to reconstruct the three-dimensional (3D) momentum space picture of any charged particles collected with a Velocity Map Imaging system from the two-dimensional (2D) projected image captured by a detector. The method uses the proper analytical two-dimensional projection function to retrieve the 3D distribution. The meaningful angle-correlated information is first extracted from the raw data by expanding the 2D image with a complete set of Legendre polynomials. Both the particle's angular and energy distributions are then retrieved from the expansion coefficients. The algorithm is simple, easy to implement, fast, and does not require any initial guess for the 3D distribution. In addition, our procedure explicitly takes into account the pixelization effect in the measurement.

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**Title:** The longitudinal dynamics between work-family conflict, enrichment, and balance

**Primary Author (and presenter):** Hartman, Paige

**Additional Authors:** Lorys, Anna & Michel, Jesse

**Department:** Psychology

**College/School:** College of Liberal Arts

**Description:**

Previous literature has proposed that work-family conflict and work-family enrichment may serve as antecedents of work-family balance, but little empirical evidence exists to support this notion. The present study sought to explore antecedents of work-family balance and to answer the call for longitudinal research within the work-family domain to better understand the work-family interface. To address this, we tested longitudinal linkages between work-family conflict, enrichment, and balance and observed the time-lagged and reverse causation effects to evaluate the dynamic nature of work-family constructs over three time points each separated by one month. Based on the Conservation of Resources and Broaden-and-Build theories, we proposed that there would be dynamic effects of work-family conflict and enrichment on work-family balance and dynamic effects of work-family balance on work-family conflict and enrichment. Using a diverse sample from Amazon's Mechanical Turk across three time points, our findings suggest work-family conflict, enrichment, and balance are dynamically linked. Specifically, work-family conflict (particularly in the work-to-family conflict direction) and the two major facets of work-family balance, work-family balance satisfaction and effectiveness, are the most reciprocally related. These results support previous literature that states that work-family conflict and work-family enrichment influence work-family balance satisfaction and work-family balance effectiveness, and also supports the notion that work-family balance influences work-family conflict and enrichment. We further discuss implications and future research directions based on these results.

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**Title:** Effect of pectin amendments on PGPR-mediated growth promotion of soybean

**Primary Author (and presenter):** Hassan, Mohammad, K<sup>1</sup>

**Additional authors:** McInroy, John<sup>1</sup>; Jones, Jarrod<sup>3</sup>; Shantharaj, Deepak<sup>2</sup>; Liles, Mark<sup>2</sup>; and Kloepper, Joseph<sup>1</sup>

**Departments:** <sup>1</sup>Entomology and Plant Pathology; <sup>2</sup>Biological Sciences

**College/ School:** <sup>1</sup>College of Agriculture; <sup>2</sup>College of Sciences and Mathematics; <sup>3</sup>Gulf Coast Research and Extension Center, Fairhope, AL

**Description**

There is a need to develop sustainable agriculture practices such as the use of plant growth-promoting rhizobacteria (PGPR). While PGPR strains can reproducibly promote plant growth under controlled greenhouse conditions, their efficacy in the field is often more variable. Here we test the hypothesis that combining *Bacillus velezensis* (Bv) strains with pectin amendments will enhance Bv-mediated plant growth promotion compared to Bv strains alone. *In vitro*, greenhouse and field experiments were conducted to determine if pectin amendments to soil enhanced traits related to growth promotion by the PGPR Bv strains AP136 and AP193. The treatments included soybean seeds planted in field soil that contained Bv strains and non-inoculated controls with and without 0.1% pectin. In greenhouse tests, 35 days after planting (DAP), the plants were removed from pots and analyzed for treatment effects. Results showed that the addition of pectin to strain AP136 significantly enhanced shoot height compared to AP136 alone. Dry shoot and root weights of PGPR strains with pectin were not significantly different from PGPR strains alone. The addition of pectin to PGPR strains AP 136 and AP193 significantly increased number of nodules by native *Bradyrhizobium japonicum* present in the soil

compared to PGPR strains alone. The nodule dry weight from treatment of AP193 with pectin increased significantly compared to AP193 alone. In the field trial, at 55 DAP, pectin amendment increased shoot height and dry weights of plants treated with AP193 compared to AP193 alone. Shoot height and dry weight of AP136 with pectin were not increased from treatment with AP136 alone. The addition of pectin did not increase soybean yield compared to PGPR strains alone. However, pectin significantly enhanced nodule number and dry weight by AP136 compared to AP136 alone. These studies revealed that co-applications of selected PGPR strains with pectin can improve soybean plant growth and nodulation.

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**Title:** Personalized in vitro 3D colorectal cancer model using patient-derived xenografts

**Primary Author (and presenter):** Hassani, Iman

**Additional Authors:** Anbiah, Benjamin; Ahmed, Bulbul; Habbit, Nicole; Greene, Michael W.; & Lipke, Elizabeth A.

**Department:** Chemical Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Colorectal cancer (CRC) is the third most common cancer in men and the second in women worldwide. To investigate drug responsiveness and tumor progression, in vitro 2D and 3D models have been established using standard cancer cell lines. However, 2D models are unable to replicate physiological complexities of native tissues. In this study, we have developed a 3D engineered tumor model using patient-derived xenograft (PDX) tumor cells. There are two main advantages of this model; 1) 3D culture better mimics native tissue microenvironment in terms of physiological context and dimensionality, and 2) PDX tumor cells are patient-specific and better reflect the phenotype of human tumors compared to cancer cell lines. Briefly, PDX tumors were established through patient tumor cell implantation in SCID mice. The tumors were then excised and dissociated, and the isolated cells were encapsulated within a biomimetic polymer, polyethylene glycol-fibrinogen, to create the 3D engineered PDX CRC model. Viability of the cells was assessed, and colony diameter of the PDX CRC cells and the mechanical stiffness of engineered tumor tissues were investigated and compared with in vivo culture. Our PDX CRC engineered model supported the growth and viability of the CRC cells, had a stiffness range of in vivo tumor tissues, and closely mimic the in vivo tumor conditions. The established platform can potentially be used in the future to develop patient-specific therapeutics and treatment strategies.

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**Title:** Implementation of educational and referral programs in community pharmacies to assist Medicare beneficiaries with limited income

**Primary Author (and presenter):** Hastings, Tessa J.

**Additional Authors:** Hohmann, Lindsey & Westrick, Salisa

**Department:** Health Outcomes Research and Policy

**College/School:** Harrison School of Pharmacy

**Description:**

The Certified Aging Resource Educated Specialist (C.A.R.E.S.) Program was developed as a partnership between the School of Pharmacy and State Department of Senior Services to increase pharmacists' awareness of available programs for limited income and integrate an efficient referral process into pharmacy workflow. Our objective here is to describe the C.A.R.E.S. Program in terms of 1) participant evaluation, 2) pre-post assessment of knowledge, and 3) outputs. The C.A.R.E.S. Program has two parts: educational program and referral network. The educational program includes two ACPE accredited components: 1) introductory written article (0.1CEU) focusing on subsidy programs and 2) comprehensive asynchronous online training program (0.3CEU). Community pharmacies with at least

one pharmacist who complete the online program can enroll in the C.A.R.E.S. Referral Network. Referred beneficiaries are contacted, screened for all available benefits, and assisted with application completion by counselors at the local Aging and Disability Resource Centers (ADRCs). A total of 117 (82 pharmacists; 35 technicians) and 62 (30 pharmacists; 11 technicians; 20 students) have completed the introductory and comprehensive programs, respectively. The mean pre-comprehensive program knowledge score improved from 70.3% to 96.0% ( $p < 0.05$ ) after completion of the program. Participants reported positive assessments of both programs. To date, 25 community pharmacies have enrolled in the network. Each network pharmacy has 1-3 pharmacists and 0-4 technicians. A total of 84 Medicare patients have been contacted and screened for available benefits. Pharmacists are well positioned to identify and refer Medicare patients with limited income to get assistance. An educational program and referral network are feasible methods of equipping pharmacists and pharmacy technicians with the knowledge and means to provide long-term solutions for Medicare beneficiaries.

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**Title:** An evaluation of a time-in light procedure on problem behavior and on-task behavior

**Primary Author (and presenter):** Hatley, Benjamin H.

**Additional Authors:** Richling, Sarah; Merrill, Miranda; & Chambless, Kalie

**Department:** Psychology

**College/School:** College of Liberal Arts

**Description:**

Problem behavior and on-task behavior in children with intellectual disabilities has long been an area of focus for behavior analysts. These issues can be particularly problematic when working with children who engage in problematic behaviors to escape work. Escape extinction and Functional Communication Training are well established treatments for escape-maintained problem behavior; however, both of these treatments have produced negative side effects in children's behavior. Additionally, they are not designed to increase on-task behavior with a broad range of academic materials. The time-in light procedure is an alternative treatment for escape-maintained problem behavior that addresses both of these concerns. This procedure consists of a child turning on a light to signal their readiness to work. When they turn the light on, the value of their current reinforcer should be high enough to offset the aversiveness of the demands. Then, when the value of their reinforcer is lessened, the child can engage in an alternative response (e.g., turning the light off) to escape demands. Three boys with autism spectrum disorder participated in the study. Results from a non-concurrent multiple baseline design show a decrease in problem behavior and an increase in on-task behavior across all three participants after implementation of the time-in light.

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**Title:** Bridging the gap: The intersection of technology and teaching pedagogy in secondary agriscience classrooms

**Primary Author (and presenter):** Heidenreich, Abigail

**Additional Authors:** Clemons, Christopher & Lindner, James

**Department:** Curriculum and Teaching

**College/School:** College of Education

**Description:**

Education in the United States has experienced a continuous surge of technology in classrooms and curriculum. The students of the 21<sup>st</sup> century are digital natives in technology-friendly classrooms and learning styles. The content and learning environment in agriculture classrooms is changing. In order to meet the needs of their students, teachers are shifting from traditional to non-traditional agriculture instruction, while still recognizing the need for traditional agricultural content. As the shift from

traditional to non-traditional instruction occurs, teachers need resources and assistance that would enable them to structure their curriculum and teaching style in a way that welcomes technology integration while challenging students to think critically and creatively. As agriculture teachers rise to meet the needs and needs of students, the knowledge gap between available technology and fluency may present pedagogical limitation for instruction. Focused professional development for agriculture teachers to improve technology awareness and fluency is vital to the continued improvement of student learning. Mean Weighted Discrepancy Scores (MWDS) and demographic information was collected from 136 participants ( $n=136$ ). Participants indicated, environmental, technology and agriscience content, core agriculture content areas, technology and advanced sciences were vital topic areas of need for professional development. Each topic area was further investigated within related sub-topics to better understand specific needs of teachers. Agriculture technology and computerized record keeping achieved the highest MWDS in the category of environmental, technology, and agriscience content. Unmanned aerial vehicles construction technology were significant within the agriscience category, and multimedia equipment and computer use in the classroom represented specific needs in technology and advanced sciences.

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**Title:** American Skullcap exhibits neuroprotection against hydrogen peroxide-induced neurotoxicity in hippocampal cells

**Primary author:** Heiner, Jacob C.

**Additional Authors:** Lohani, M.; Govindarajulu, M.; Majrashi, M.; Ramesh, S.; Desai, D.; Almaghrabi, M.; Shannon, D.; Suppiramaniam, V.; Moore, T.; Schwartz, D.; Kemppainen, B.; Dhanasekaran, D.

**Department:** Department of Drug Design and Development

**College/School:** Harrison School of Pharmacy

**Description:**

The hippocampus is associated with the processing and storage of memory, and is responsible for encoding short-term and long-term memory consolidation and retrieval. Deficits in the physiology and/or anatomy of hippocampal neurons can result in impairment of memory. Further, there are several neurological disorders that are associated with memory deficits due to hippocampal dysfunction. However, natural or synthetic substances that can provide hippocampal neuroprotection can enhance memory. Therefore, in this study, we assessed the neuroprotective effects of the American skullcap (*Scutellaria lateriflora*) against hydrogen peroxide-induced neurotoxicity in H19-7 cells. This neuronal cell line has been a vital tool in understanding the pathogenesis of Alzheimer's disease, since hippocampal neurons are responsible for cognition and memory, which are greatly affected in Alzheimer's disease patients. Hence, we assessed the markers of oxidative stress, excitotoxicity and apoptosis to validate the neuroprotective effects of American skullcap extract; the extract was shown to suppress caspase-3 expression and scavenge the reactive oxygen species induced by hydrogen peroxide. Additionally, the extract increased the expression of brain-derived neurotrophic factor (BDNF) without affecting the N-methyl-D-aspartate (NR2A & NR2B) receptors' expression. These outcomes indicate that the American skullcap exhibits neuroprotection and therefore can be an excellent adjuvant therapy for treating various cognitive disorders.

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**Title:** Rural community gardens' capacity to increase accessibility and affordability of healthy foods in Alabama

**Primary Author (and presenter):** Henning, Megan M.

**Additional Authors:** Powers, Alicia R.; Brock, Ruth; & Struempfer, Barb

**Department:** Nutrition, Dietetics and Hospitality Management

**College/School:** College of Human Sciences

**Description:**

Urban community gardens have been shown to make healthy foods more accessible and affordable. A growing body of evidence demonstrates community gardens' ability to positively influence fruit and vegetable consumption among gardeners and the entire community. There is limited research available, however, regarding the influence of rural community gardens, where populations consume less fruits and vegetables and often travel further and pay more for healthy food. The purpose of this longitudinal pilot study was to evaluate rural community gardens' capacity to increase accessibility and affordability of healthy food. Trained community champions at nine established rural Alabama gardens used harvest collection forms and standardized scales to measure production capabilities and cost savings. Production capabilities were measured using harvest weight, in pounds and ounces, and conversion to serving size. Cost savings were calculated using average retail prices of produce for measured harvest weights. Descriptive statistics of harvest weights, serving sizes and cost savings will be presented for each garden, as well as, the aggregate of sampled gardens. Findings of this study will inform future studies seeking to determine the capacity of rural community gardens in addressing barriers to healthy eating, and ultimately, the impact rural community gardens have in improving fruit and vegetable consumption of rural populations.

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**Title:** Submerged liquid jet arrays for power electronics using spent fluid management

**Primary Authors (and presenters):** Henry, Michael A. and Reid, Kayla E.

**Additional Authors:** Bhavnani, Sushil; Knight, Roy; & Maddox, John

**Department:** Mechanical Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Increasing numbers of under-hood sensors and power electronics modules are becoming standard in both commercial and military vehicles. In order to function reliably, these technologies require a dedicated and dynamic cooling system, such as liquid jet impingement in a jet array. In a jet array, the spent fluid from upstream jets interact with the downstream jets degrading their performance. In order to counteract this effect, this study used an expanding manifold, with larger area for flow downstream, to allow the spent fluid from upstream jets to be diverted, reducing degradation of the heat transfer coefficients downstream. Experimental and numerical studies of liquid jet impingement utilizing water as the working fluid were performed to examine the heat transfer rate when using expanding manifold angles in staggered jet arrays compared to inline jet arrays. The examined parameters included the jet spacing, angle of manifold, volumetric flow rate and array orientation. The numerical simulations revealed details of the complicated interaction between the jets, their fountain regions and the crossflow. The experimental and numerical studies showed that the angled manifold systems with a staggered jet array had greater temperature uniformity and increased heat transfer coefficients compared to systems with constant area manifolds and inline jet arrays.

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**Title:** Modelling Shape-Memory Alloy as Anatomical Tendons for Hand Exoskeleton Motion

**Primary Author (and presenter):** Herrera, Sean Vincent, Salazar

**Additional Authors:** Zabala, Michael

**Department:** Mechanical Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Many musculoskeletal disabilities restrict motor hand movement to a point of limiting day-to-day function. The purpose of my research was to create a biomechanical glove to aide in finger movement for those with such disabilities. This was done through heating and cooling of shape memory alloy (SMA) wire laced into a finger of a glove as SMA wire contracts in length under a heated condition.

Two applications were tested with motion capture: 1. a 3D printed finger and 2. a custom designed biomechanical glove. Data was also collected of a human finger to serve as an anatomical standard. For each finger, the angle that the mid phalange makes with the proximal phalange was calculated as a function of time. Motion capture data was processed so that the flexion of the 3D printed finger and the biomechanical glove could be compared to the human finger.

The time to reach full flexion for the human finger, 3D printed finger, and the glove-assisted finger was approximately 1.2 s, 2.1 s, and 1.85 s, respectively; the change in the mid phalange joint angle over this time was 33.2 degrees, 64.7 degrees, and 29.8 degrees, respectively. The 3D printed finger and the human finger both have positive sloping curves, indicating that the SMA wire in the 3D printed finger was successful in actuating finger movement in the correct direction. The shape of the human finger flexion curve was different from the 3D printed finger (linear vs exponential). This might be a result of greater joint friction in the printed finger than human finger, thus creating irregularity in the rate at which the 3D printed finger actuates. The glove's flexion curve and the human finger's flexion curve were very similar in shape and range. The glove-assisted finger flexed at a similar rate as the human finger. The similarity of the human finger flexion and the glove-assisted flexion demonstrates the glove's capability of actuating an impaired user's finger to produce natural, human-like movement.

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**Title:** Investigating algae-substrate interactions using polylactic acid and cellulose nanocrystal composites

**Primary Author (and presenter):** Herring D Wriley

**Additional Authors:** Passantino Joshua M , Karimi, Zahra, Rodriguez Marisa, Blersch David M, Davis Virginia A

**Department:** Chemical Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

The overall goal of this research project is to investigate the attachment of micro-algae on different substrates in a stationary environment. Algae have proved to be a viable solution to alternative energy by the process of converting their high fat content into usable biofuels. The current roadblock is the cost associated with industrially scaling up the process of growing and processing the algae cells. A major portion of the the high production cost is from harvesting algae from the large open water pond systems they are grown in. This is associated with having to drain, filter and refill the ponds for every harvest. The focus of this project is to design a material that algae will attach to in the open water pond system. This would allow the material to be removed, harvested, and then placed back into the pond for regrowth, eliminating the expensive dewatering and filtration processes. The main scope of the research is focused on polylactic acid (PLA) ,a biodegradable polymer, with the addition of cellulose nanocrystals (CNC), a fibril derived from trees. Various composites were made using different concentrations and process methods of CNC to test the attachment of algal cells. The thermodynamics of the composites were also investigated using sessile contact angle measurements that were paired with the Derjaguin-Landau-Verwey-Overbeek (xDLVO) model in order to estimate the attraction energy between the substrate and algae cells. The composites were also tested experimentally by placing the samples in suspended algae solutions over time and comparing the amount of algae cells that attached to the surface. The results obtained from using both of these methods shed light on the interaction of algae cells and substrates at the microscopic level.

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**Title:** The role of CXCR3 in the CNS following peripheral viral infection

**Primary Author (and presenter):** Heslin, Ryan T.

**Additional Authors:** Setti, Sharay E. & Reed, Miranda N.

**Department:** Drug Discovery and Development

**College/School:** Harrison School of Pharmacy

**Description:**

Clinical evidence has demonstrated that viral infections in the periphery exacerbate memory deficits in Alzheimer's disease (AD). We have recently demonstrated that challenge with a viral mimic, polyinosinic-polycytidylic acid (PIC), induces a robust hippocampal hyperexcitability. It has also been shown that increased CXCL10 expression is one of the earliest molecular events in the CNS to occur following peripheral infection. CXCL10 is a chemokine that acts through its cognate receptor CXCR3, a chemotactic receptor located primarily on microglia in the CNS. Microglia are the most immunocompetent cells in the brain and have been shown to disrupt inhibitory synapses following chemotactic activation, leading to neuronal hyperexcitability. To test the hypothesis that CXCL10 acting through CXCR3 mediates the onset of hyperexcitability, mice were given an intracerebroventricular (ICV) injection of either vehicle (VEH) or the CXCR3 inhibitor, AMG487 (AMG). Three hours following ICV injection, mice received a single i.p. injection of either saline (SAL) or PIC (12 mg/kg). Twenty-four hours after PIC injection, we measured *in vivo* glutamate levels to characterize hyperexcitability in the hippocampus using a ceramic microelectrode array. Further identification of the role of CXCR3 in the CNS across different disease states may spur the development of therapeutic strategies to prevent infection-related exacerbations in patients afflicted with neurodegenerative diseases.

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**Title:** Gender typicality in personnel selection: The mediating role of attractiveness

**Primary Author (and presenter):** Hickey, Hayden, K.

**Additional Authors:** Rotch, Michael & Franco-Watkins, Ana

**Department:** Psychology

**College/School:** College of Liberal Arts

**Description:**

Incorporating judgment and decision making principals into organizational research is important for understanding the effects of gender bias in personnel selection contexts. Bias in selection is often implicit, or unconsciously activated, where hiring managers are unaware of their own use of stereotyping applicants based upon their represented groups (i.e., gender, ethnicity, etc.). Although many hiring decision aids exist to reduce the effects of human judgement error (e.g., paper-and-pencil tests, structured interviews), a major reliance on human intuition in the selection process is predominant. If organizations rely on the continual use of unstandardized methodology (i.e., unstructured interviews) in conjunction with the lack of bias awareness, organizations run the risk of excluding members of unrepresented groups because of ineffective decision making processes. The purpose of this study was to examine how facial attractiveness between genders influences perceptions of hirability for job applicants. Study participants provided ratings for 24 portrait photographs of various human faces. Judgments included perceived attractiveness and likelihood of hiring for a management position. A moderated mediation analysis indicated an indirect effect between face gender typicality and likelihood of hire for female, but not male, faces through perceptions of attractiveness. These findings indicate a pervasive bias of attractiveness influencing hirability as well as gender typicality influencing attractiveness for females. Partially mediated models suggest that trustworthiness facilitates the relationship between attractiveness and hirability, and that attractiveness facilitates the relationship between gender female femininity and hirability (but not male masculinity). These findings are important for examining potential gender bias in selection procedures, specifically for females in managerial roles.

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**Title:** Asthma education in school systems  
**Primary Author (and presenter):** Hill, Amanda K.  
**Additional Authors:** Gibson-Young, Linda  
**Department:** Nursing  
**College/ School:** School of Nursing

**Description:**

There is evidence that lack of asthma knowledge leads to increased asthma exacerbations in school aged children. Evidence-based guidelines recommend providing asthma education in school systems to decrease unplanned healthcare provider visits as well as unplanned hospitalizations. The purpose of this project was to implement asthma education in schools for children and families of children who have been diagnosed with asthma. School absences and unplanned healthcare visits were assessed. Target population included children (4-18 yrs) who have been diagnosed with asthma by a healthcare provider. Following informed consent, participants completed an initial questionnaire. The project manager reviewed the data with the nurse practitioner and educational material was developed. The educational materials were given to school systems to present to and educate the families of participants. Monthly follow-up questionnaires were sent to participants. Descriptive statistics were used to describe participant age, gender, ethnicity, and how many years the child has been diagnosed with asthma. The pre-post questionnaire responses of participants were compared with independent t-tests. X consented to participate (% males), average years diagnosed with asthma of X (sd) years. X % were African-Americans, X % were Caucasian, X % were Asian, and X % were Hispanic. School absences were X % and unplanned healthcare visits were X %. The mean questionnaire responses of participants improved from pre- (mean, sd) to post- (mean, sd) significantly ( $p=.005$ ). Assessing asthma knowledge levels of participants and their families identified areas of asthma education that needed to be addressed and taught to decrease school absences and unplanned healthcare visits. Knowledge assessment and development of educational material for asthma patients are achievable in this family medicine clinic and further implementation of the project is warranted.

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**Title:** Understanding the metabolic shift of *Scheffersomyces stipitis* from aerobic growth to oxygen-limited fermentation at genome Scale  
**Primary Author (and presenter):** Hilliard, Matthew V.  
**Additional Authors:** Jeffries, Thomas; He, Peter Q.; & Wang, Jin  
**Department:** Chemical Engineering  
**College/School:** Samuel Ginn College of Engineering

**Description:**

*Scheffersomyces stipitis* was grown under full aerobic conditions in the presence of excess xylose. Once a steady state biomass concentration was achieved, the oxygen supply was terminated and 18 cell samples were obtained at 10 minute intervals. The samples were immediately frozen and later analyzed for RNA-sequencing. In addition to the samples taken during the transition period, two steady state aerobic samples and two steady state anaerobic samples were obtained for gene sequencing. *Scheffersomyces stipitis* is an industrially important strain of yeast, as it has the highest naturally occurring ability of known yeast strains to ferment xylose to ethanol. Under aerobic conditions, *S. stipitis* produces biomass, acetic acid, and carbon dioxide; however, when the oxygen supply is suppressed, the yeast undergoes a metabolic adjustment to survive the transient external environment. It is well known that *S. stipitis* converts xylose to ethanol under anaerobic conditions; however, little is known about the metabolic shift required for the yeast to survive the new, oxygen-limited conditions or to begin producing

ethanol. This experiment seeks to provide further insight into the underlying transient adaptations that *S. stipitis* undergoes as it switches from aerobic to anaerobic conditions. The gene expression dynamics observed in our data may provide some insight into different regulatory responses that *S. stipitis* exhibits which may explain why total ethanol yield is lower than the total expected ethanol yield. This may result from less efficient enzymes being expressed more abundantly resulting from an easier transcription process that the cell utilizes when it first senses oxygen stress. Other observations include genes that are only expressed during the transition period indicating their involvement in the regulation/deregulation of enzymatic pathways.

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**Title:** Manufacturing of Carbon Fiber From Electrospun and Wetspun Lignin Fiber

**Primary Author:** Hinkle, John, A

**Additional Authors:** 2<sup>nd</sup> Bansode, Archana; 3<sup>rd</sup> Upp, Christopher; 4<sup>th</sup> Nam, Hyungseok; 5<sup>th</sup> Filpponen, Ilari; 6<sup>th</sup> Adhikari, Sushil; 7<sup>th</sup> Auad, Maria

**Department:** Polymer and Fiber Engineering

**College/School Name:** Samuel Ginn College of Engineering

**Description:**

During the project we developed a simple and green approach to produce conductive 3D porous structures with high surface area and excellent bulk conductivity.

Lignin is the third most abundant natural polymer, next to cellulose and chitin, and ranks as one of the most abundant phenolic natural polymers. Lignin is usually obtained as a byproduct of the chemical pulping and biofuel production. With only a small fraction being burned as low-valued fuel, lignin represents a significantly under-utilized biomass.

3D porous carbon structures based of nanocellulose and lignin were manufactured during the project using wet spinning and electrospinning techniques. Different carbonization and activation (KOH and NaOH) procedures were explored in order to maximize the electrochemical properties. Different ratios of lignin and crosslinking agent, alginate acid, were tested to examine the crosslinking capability of the agent for the wet spun fibers. Finally, we characterized the chemical and mechanical structure of the carbon fibers, in addition to the electrical conductivity, wettability and microstructure.

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**Title:** Using salpenazine type imidazoles in chemosensing for detection of  $[UO_2]^{2+}$  and other metal ions

**Primary Author (and presenter):** Hiti, Ethan A.

**Additional Authors:** Tutson, Charmaine D.; Hardy, Emily E.; Maynard, Branson A.; & Gorden, Anne E. V.

**Department:** Chemistry and Biochemistry

**College/School:** College of Science and Mathematics

**Description:**

As the need for renewable and more carbon neutral energy increases, the need and interest in nuclear power is growing simultaneously. A major concern with nuclear power is the generation of radioactive waste and the possibility of the radioactive material being released into the environment. To combat this issue, fast and in-the-field detection of radioactive material is needed for faster response and clean up if a spill should occur. One method for detecting radioactive by-products is by using a chemical sensor, or chemosensor, that can selectively bind or give a distinct response when bound to uranyl, the most biologically relevant species of uranium. The rational design of such a species can be quite challenging. Schiff base ligands with the N-C-C-C-O binding motif have been used previously for this purpose. The Schiff base ligand, 2-(1H-imidazo[4,5b]-phenazin-2-yl) and derivative thereof, is formed from a condensation reaction followed by an intramolecular cyclization of an array of salicylaldehydes

and 2,3-diaminophenazine. These ligands are examined here for their efficiency as chemosensors for uranyl ( $\text{UO}_2^{2+}$ ) and other metals such as Cu (II) and Zn (II). The shift upon metal binding was observed and allows for sensing of various metal ions. Tuning the electronics of the ligand through substituent effects and of the binding affinity to these metal ions is also discussed.

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**Title:** Cell culture techniques in the preparation of brain endothelial cells as a blood-brain barrier model

**Primary Author (and presenter):** Hoffman, Grace E.

**Additional Authors:** Darakjian, Lucy; Duong, Quoc-Viet A; Abdallah, Ihab; Kaddoumi, Amal

**Department:** Drug Discovery and Development

**College/School:** Harrison School of Pharmacy

**Description:**

Alzheimer's is a progressive disease of neurodegeneration resulting in memory loss and eventually, the inability to perform daily tasks. A person's genetic makeup combined with lifestyle and environmental factors may contribute to an increased risk for developing toxic changes in the brain, which occur over the course of decades, and ultimately lead to Alzheimer's disease (AD). Although the U.S. Food and Drug Administration (FDA) has approved medications indicated for symptom relief, this debilitating disease does not have a cure. Understanding the significance of the blood-brain barrier (BBB), a diffusion barrier held together by tight junctions, is integral in developing therapies to combat the accumulation of amyloid-beta ( $\text{A}\beta$ ) and tau proteins leading to loss of brain function in AD. In addition to accumulation of damaging peptides, chronic inflammation of the brain also contributes to the pathogenesis of AD. One important characteristic of a compound to be therapeutically effective against AD is to reach the brain and cross the BBB. For this, in our lab we perform in vitro transport studies to evaluate a compound's transport across the BBB using mouse brain endothelial cells, bEnd3. Using sterile techniques under a hood, confluent cells were seeded on inserts or filters that separate 2 compartments mimicking blood (A) and brain (B) sides. After incubation for 5 days, cells were treated with one of our promising compounds (AD01) at different concentrations for 1 and 2 hours. Samples were collected and analysed by high-performance liquid chromatography (HPLC) for AD01 concentration in both compartments. The results showed that AD01 crosses the BBB, indicating AD01 could be a promising compound and requires further evaluation for its effect against AD.

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**Title:** Impact of a multicomponent immunization intervention on pneumococcal and herpes zoster vaccinations: A randomized controlled trial of community pharmacies in 2 states

**Primary Author (and presenter):** Hohmann, Lindsey A.

**Additional Authors:** Hastings, Tessa; Garza, Kimberly; Huston, Sally; Ha, David; & Westrick, Salisa

**Department:** Health Outcomes Research and Policy

**College/School:** Harrison School of Pharmacy

**Description:**

The We Immunize Program was created to enhance pharmacy-based immunization services. The purpose of this study was to assess the impact of the program on the structure, process, and outcomes of pneumococcal and herpes zoster immunization services in community pharmacies. A randomized controlled trial was conducted among community pharmacies in Alabama and California. Pharmacist-technician pairs were recruited via telephone and randomized to control or intervention groups. All participants were offered immunization update training. Intervention participants were also offered: 2-hour video-based practical strategies training; and telephonic tailored expert feedback for 6 months. The primary outcome was change in number of pneumococcal and zoster vaccine doses administered during the 6-month study period compared to the same 6-month period in the previous year. Other outcome

measures included pharmacy completion and engagement in structure and process activities. Differences between groups were assessed using negative binomial models, Fisher's Exact and Mann-Whitney U tests. Sixty-two community pharmacies participated (intervention=30/control=32). Slight increases in vaccine administration in the intervention group were observed during the study period compared to the pre-study period for pneumococcal (21.6 versus 15.8 doses) and zoster (12.3 versus 9.8 doses) vaccines. Change in mean total vaccine doses was also greater in intervention pharmacies compared to controls (8.3 versus 0.3). Additionally, intervention pharmacies completed 10 of 14 immunization service structure activities and engaged in 8 of 10 process activities on average. However, no statistically significant differences were found. Practical strategies training combined with tailored expert feedback may enhance existing pneumococcal and zoster immunization services in community pharmacies. Future studies across a larger population are needed to assess the impact of the program with sufficient power.

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**Title:** Patient preferences for financial versus social incentives for medication adherence in chronic conditions

**Primary Author (and presenter):** Hohmann, Natalie S.

**Additional Authors:** Hastings, Tessa; Jeminiwa, Ruth; Qian, Jingjing; Hansen, Richard; & Garza, Kimberly

**Department:** Health Outcomes Research and Policy

**College/School:** Harrison School of Pharmacy

**Description:**

We investigated patient preferences for financial vs. social incentives for medication adherence in chronic conditions. A mixed methods study was performed using a national online survey, with recruitment via a market research panel. Eligible participants were adults who self-reported taking at least one prescription medication for heart disease, hypertension, hyperlipidemia, diabetes, and/or asthma/COPD. Survey domains included: 1) overall preference for a financial vs. social medication adherence incentive; 2) rank order task for 5 financial incentives; 3) rank order task for 5 social incentives; and 4) demographics and self-reported medication adherence barriers. Logistic regression models were used to examine predictors of incentive preference. 1,009 complete responses were received. Of these, 933 (92.5%) preferred to receive a financial rather than social incentive. In regression analyses, age ( $p=0.030$ ), sex ( $p=0.006$ ), ethnicity ( $p=0.012$ ), annual household income-level ( $p=0.012$ ), and therapy-related adherence barrier score ( $p=0.032$ ) were statistically significantly associated with preference for a financial vs. social incentive. Among those preferring financial incentives, the largest portion ( $n=292$ , 31.3%) chose receiving a guaranteed prize after a one-month time-lag in the form of a \$50-valued household good as their most preferred incentive. Among those preferring social incentives, the largest portion ( $n=37$ , 48.7%) chose receiving a certificate of achievement every two weeks via their health insurance plan's smartphone app as their most preferred incentive. Patient preferences for medication adherence incentive structure may differ by sociodemographic characteristics and underlying adherence level. This may have implications for the design of health plan-sponsored medication therapy management (MTM) programs. Incorporating patient preferences into these programs may lead to improvements in patient medication adherence, clinical outcomes, and plan satisfaction.

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**Title:** Perceived discrimination as a mediator for race differences in epinephrine and norepinephrine

**Primary Author (and presenter):** Homandberg, Lydia, K

**Additional Authors:** Curtis, David; Fuller-Rowell, Thomas

**Department:** Human Development and Family Studies

**College/School:** College of Human Sciences

**Description:**

Perceived discrimination (PD) has been associated with self-rated health, mortality, and aggregate indexes of physiologic dysregulation (Barnes et al., 2008; Schulz et al., 2006). However, few studies have examined associations between PD and catecholamines, and even fewer using longitudinal data. The current study examined PD as a predictor of changes in urinary epinephrine and norepinephrine concentrations over a three-year period in a sample of college students at a large, predominantly white, Midwestern University ( $N = 149$ , 45% Black, 55% White; Mean age at baseline = 18.8,  $SD = .96$ ). Two thirds of participants completed a follow-up assessment three years later (T2). Epinephrine and norepinephrine concentrations were obtained from 12-hour overnight urine samples at both time points. PD ( $\alpha = .91$ ) was assessed using 13 items from the Racism and Life Experiences Scales (RaLES; Harrell, 2000). Path analyses examined the effect of PD on catecholamines at T2, adjusting for T1 catecholamine concentrations and other controls. An additional model further adjusted for depression, negative affect, and rejection sensitivity. Full Information Maximum Likelihood estimation was used to deal with missing data. The analytic sample was therefore 149 across all models.

Model results for norepinephrine are shown in Table 1. PD was associated with changes in norepinephrine ( $B = .310$ ;  $p = .008$ ) across the three-year period. These effects remained after further adjusting for depression, negative affect, and rejection sensitivity. Analyses for epinephrine yielded the same pattern of findings. These results are consistent with previous studies showing that PD is associated with poorer health and extends this work by establishing a longitudinal association with indicators of sympathetic nervous system activation. Additional research is needed to further explicate the mechanisms for the effects of PD on health.

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**Title:** Happiness Happens Here

**Primary Author (and presenter):** Hooper, Kimberly, P

**Department:** Environmental Design

**College/School:** The College of Architecture, Construction, and Design

**Description:**

Happiness Happens Here is a research project that starts by examining common characteristics of the built environment in the world's happiest cities. The project's goal is to raise the happiness quotient in cities that lack these human-centric design characteristics. Due to the rapid growth of cities and our reliance on automobiles, many places have omitted human-centric design when they first planned their communities and cities. Applying these common characteristics can improve happiness even in places that cannot afford the high budget costs of rebuilding infrastructure by focusing on what really matters the most: people. To approach this problem, I first determined the world's happiest cities by using a combination of qualitative exploration and quantitative data collection and analysis. A happy city has the following characteristics in the built environment: pedestrian streets, bicycle lanes, reliable transit, safety, pedestrian comforts, community gardens, seating, culture, and art. After identifying common characteristics of the built environment in these locations, I chose to compare them to our state capitol, Montgomery, Alabama. To discover what characteristics of the built environment Montgomery, Alabama has, I studied specific areas and photo-documented my discoveries. Results showed that Montgomery is a city that has focused design decisions on transportation but not the people who live there. The city lacks many of the characteristics of the happy city and there are many beneficial improvements that could be made in the built environment. After realizing Montgomery could improve more than their design, I also studied their reputation and safety. I compared the city safety scores of Montgomery, AL to the world's happiest cities using quantitative data collection and analysis. I found that although Montgomery was perceived as relatively safe during the day, the perceived safety plummets at night. Changes to the built environment could be made to improve safety on the streets. Re-branding of the capitol city could also help citizens take pride in their home, feel safer, and encourage others to stay in the area, helping the economy. Similarly, to Montgomery, other cities could

apply these best practices of human-centric design in the built environment to improve the daily lives of their citizens.

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**Title:** Oriented strand board from softwood: A biorefinery approach

**Primary Author (and presenter):** Hornus, Marina

**Department:** Forestry

**College/ School:** School of Forestry and Wildlife Sciences

**Description:**

Oriented strand board (OSB) is a wood composite used for building wood-based structures (i.e., walls, floors, ceilings, furniture, etc.) and is manufactured with small pieces of wood called strands. These strands are linked together with adhesives to make a composite material. The goal of this project is to extract hemicelluloses from the strands and to use the remaining part of the strands for manufacturing OSB. The hemicellulose stream will generate additional revenue for the manufacturer and can be used by downstream consumers who wish to use green chemistry in their products. Such an effort can assist our country to be less petroleum reliant by creating chemical feedstocks from renewable manufacturing. As a benefit to OSB manufacturers, project results have shown that removal of hemicellulose increases the dimensional stability of the final wood composite. Pressure assisted hydrothermal water processing has been used for extracting hemicellulose. The most important parameters during the process are temperature and time. Temperatures below 120°C decrease the amount of hemicelluloses that can be extracted, while temperatures above 160°C reduce the grade of polymerization in cellulose. The objective of the study is to find the best processing conditions for extracting high amounts of hemicellulose without degrading cellulose. If cellulose is degraded, the mechanical properties in the OSB will decrease. Mechanical and physical properties testing for OSB has been performed according to the ASTM standard.

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**Title:** Computational fluid dynamic modelling of a wedge airfoil in supersonic flow

**Primary Author (and presenter):** Hu, Jiayue

**Additional Authors:** Barkley, Zachary

**Department:** Aerospace Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Computational fluid dynamics (CFD) is a powerful instrument to visualize the flow field transformation and reveal physical mechanism of fluid flow based on computational or experimental results. The team utilized CFD techniques to simulate the supersonic flow transformation on a wedge airfoil with a flat mounting plate. Computer models of the wedge airfoil were developed in different grid method. Simulations are being used to evaluate the accuracy of our numerical method results compared with wind tunnel experiments. Meanwhile, the results help us better understand the interactions between airplane fuselages and wings when subjected to supersonic wind speeds. The information obtained from this experiment will reveal the characteristic of supersonic flow within boundary layers and help us to generate supersonic flows through setting aerodynamic parameters in wind tunnel experiments.

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**Title:** A spatial model to determine the social impact that the built environment has on resident community health in Opelika, AL

**Primary Author (and presenter):** Huang, Felix Y.

**Department:** Community Planning

**College/School:** College of Liberal Arts

**Description:**

One of the primary goals of city planners is to provide a living environment that accounts for the basic needs of its residents. Many cities are revisiting how well their infrastructure impacts social, economic, and health concerns. The American Planning Association and United States Department of Housing and Urban Development both have developed numerous tools to help planners in cities, towns, and municipalities create their own metrics tailored to the city's needs. The City of Opelika built its industry on textile mills and railroads. After both industries left the city, Opelika experienced a period of decline. However, with its newly revitalized historic district, its distinction as Alabama's first "Gig City," and its proximity to nearby Auburn University and Tuskegee University, the city has seen a resurgence in its population and economic growth. However, many social problems remain unaddressed. This project's goal is to assess the city's main issues and needs, then spatially determine what areas within the city require the most attention. This data will then be used to create an interactive modelling tool to assess how well community needs are being met over a period of five years. Research will primarily revolve around resident accessibility to schools, parks, jobs, groceries, and other amenities through walking, cycling, and driving. Additional suggestions from residents, as well as the physical built environment, will also be considered in the model. This modelling tool will ideally provide direction for how future planning decisions will impact all residents within the city.

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**Title:** Effect of Initial Stiffness and Slip Force of Friction Force Damper on Response of Steel Structure to Wind and Seismic Loads

**Primary Author (and presenter):** Hudson, Jared, S

**Additional Authors:** Marshall, Justin

**Department:** Civil Engineering

**College/School:** College of Engineering

**Description:**

Every year there are roughly 20,000-30,000 recorded earthquakes of magnitude 2 or higher. The devastation of the larger earthquakes is realized by most of the world, but the smaller earthquakes can have quite a costly economic impact on society as well. Through the course of my fellowship I have researched the effect that initial stiffness and slip force of a friction damper device has on improving the performance of structures in response to seismic and wind loads. The primary aim of this research is to protect the structure from any permanent damage sustained during an earthquake and secondly to allow for quick reintroduction of a building's occupants after a seismic event. I began by building an analytical model of a beam-column sub-assembly outfitted with a friction damper to find the effect that the friction device stiffness and slip force has while the assembly is undergoing deformation like what would be experienced under true lateral loading of a structure. This sub-assembly will later be tested at several levels of earthquake intensity based on historical time series records. This friction device will hopefully dissipate a sizable amount of energy that is generated within a structure during a seismic event and in doing so help to prevent permanent structural damage.

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**Title:** Cover crop effects on the effectiveness of urease inhibitors

**Primary Author (and presenter):** Hull, Noah R.

**Additional Authors:** Guertal, Elizabeth

**Department:** Crop, Soil, and Environmental Sciences

**College/School:** College of Agriculture

**Description:**

Urease inhibitors continued to be introduced in the agricultural market, and thus new studies with these products are warranted. The objective of this project was to examine the utility of these inhibitors for reducing ammonia (NH<sub>3</sub>) losses from soil (Pacolet fine sandy loam (clayey, kaolinitic, thermic, Typic Hapludults)) across minimal or no tillage systems. For this laboratory experiment intact (15-cm diam., 4-cm deep) cores were removed from selected plots of the Old Rotation, with cover residue treatments of either none (continuous cotton since 1896) or winter cover (since 1896, winter cover of either hairy vetch (*Vicia villosa* Roth) or crimson clover (*Trifolium incarnatum* L.). A second set of experiments used cores from long-established tillage plots at the EV Smith Research Farm. Harvested cores were immediately removed to the laboratory and placed into glass jars for use in a 7 day experiment where emitted ammonia was trapped in boric acid, with levels measured daily. Specific treatments were: 1) no residue via winter cover, or, winter cover crop residue, and, 2) possible urease inhibitors, including various formulations of NBPT (N-(n-butyl) thiophosphoric triamide) and maleic-itaconic acid copolymer. Treatments were arranged as a 2 x 4 factorial of residue cover and urea with/without urease inhibitors (surface applied), with 4 replications of each. Each experiment was repeated in time. Statistical analyses revealed a residue by inhibitor interaction at almost every sampling date at the Old Rotation, but not at EV Smith. If the interaction was significant it was because NBPT reduced ammonia volatilization regardless of the presence of residue, while ammonia losses from urea-treated and urea plus maleic-itaconic acid copolymer were higher from soil containing crop residue, when compared to soil with little crop residue. Results from this laboratory study reveal that use of NBPT as a urease inhibitor may have utility in high residue cropping situations.

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**Title:** Trends and factors associated with respiratory allergy conditions among U.S. prostate cancer patients in 2007-2016

**Primary Author (and presenter):** Huo, Nan

**Additional Authors:** Li, Chao; Chou, Chiahung; Garza, Kimberly, B.; & Qian, Jingjing

**Department:** Health Outcomes Research and Policy

**College/ School:** Harrison School of Pharmacy

**Description:**

The immune system responding to allergens may affect the prognosis of prostate cancer. Therefore, comorbid allergic conditions among prostate cancer patients may influence cancer screening practice, treatment choice, and patient's quality of life and survival. This study examined the long-term trends in prevalence and factors associated with allergic conditions among prostate cancer patients. A serial, cross-sectional study was conducted using the National Health Interview Survey data from 2007 through 2016. Two self-reported allergic conditions (asthma or hay fever) and prostate cancer diagnosis were identified from survey questions asking if a participant had hay fever last year and had asthma and prostate cancer ever. Simple linear regression models were applied to test annual prevalence trend in allergic conditions among prostate cancer patients. Multivariable logistic regression model was used to identify factors associated with allergic conditions among prostate cancer patients. Statistical significance was set at  $P < 0.05$  and all results were weighted to represent national estimates. A total of 3,311 prostate cancer patients (average weighted  $n = 0.24$  million/year) were identified over the 10-year period. Annually, about 16% of prostate cancer patients had asthma or hay fever from 2007 to 2016. The annual prevalence of allergic conditions trend was stable from 2007 to 2016 (trend  $P = 0.89$ ). Prostate cancer patients who had comorbid asthma or hay fever were more likely to be younger, non-Hispanic black, and living in the West region. This study found high prevalence of allergic conditions among U.S. prostate cancer patients. In 2007-2016, the overall trend in allergic conditions prevalence among prostate cancer patients remained stable. Understanding prevalence of allergic conditions and associated factors helps practitioners better assess disease burden and improve clinical decision making in treatment for prostate cancer patients with comorbidities.

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**Title:** Sex differences in differential eyeblink classical conditioning

**Primary Author (and presenter):** Hurst, Danielle R.

**Additional Authors:** Bolaram, Anudeep & Cheng, Dominic T.

**Department:** Psychology

**College/School:** College of Liberal Arts

**Description:**

Classical conditioning is a type of associative learning through which a neutral conditioned stimulus (CS) is repeatedly paired with a biologically salient unconditioned stimulus (US). After repeated pairings, the CS alone is sufficient to elicit a conditioned response (CR), suggesting an association between the CS and US has been formed. As associative learning is an essential part of the way humans learn about and interact with their environment, it is important to understand individual differences in associative learning tasks. One well-studied form of conditioning, eyeblink classical conditioning, can be beneficial to further investigate these individual differences. Prior studies have found sex differences in classical conditioning tasks in humans and non-human animals (Spence and Spence, 1966; Lowgren, et al., 2017). Females typically outperform males by producing more conditioned responses than males do in single-cue designs. However, it is not clear what sex differences exist in differential conditioning. Differential conditioning procedures commonly include two CSs: one that is always paired with the US (CS+), and one that is never paired with the US (CS-). The present study investigates how sex differences affect participant's ability to discriminate between two cues during eyeblink classical conditioning. Participants in this study completed an eyeblink classical conditioning procedure in which two pure tones (600Hz and 1000Hz, both 85dB) were used as conditioned stimuli. The US was a mild (5 psi) puff of air delivered to the left cornea. Participants were asked to sit in a sound-attenuated booth and watch a silent film while the tones and airpuffs were presented. Eyeblinks were recorded and measured to be used as an index of learning. Preliminary data showed a trend of greater conditioning levels in female participants compared to male participants. These results are consistent with what has been found previously in single-cue conditioning and extend our knowledge on sex differences in this fundamental learning task.

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**Title:** *BRCA1* and *BRCA2* analyses in canines with suspected hereditary mammary tumors

**Primary Author (and presenter):** Huskey, Anna, L.W.

**Additional Authors:** Lloveras-Fuentes, Carlos; Goebel, Katie; & Merner, Nancy

**Department:** Drug, Discovery and Development

**College/School:** Harrison School of Pharmacy

**Description:**

Considering that canines are genetic homologues to humans, they serve as an excellent model to enhance disease gene discovery efforts in both species. Canine breeding practices result in large and consanguineous pedigrees with reduced heterogeneity, comparable to isolated human populations, except there is even less genetic variation. Therefore, canine mammary tumors (CMTs) represent useful genetic models for human breast cancer. Unfortunately, insufficient results on the genetics of hereditary CMTs are available. DNA samples from 85 CMT affected canines were extracted from blood/buccal swabs for genetic analysis. Pedigree analyses were performed which identified breed-specific common ancestors, further indicating reduced heterogeneity. From these analyses fourteen samples representing four different breeds (Golden Retrievers, Siberian Huskies, Standard Schnauzers and Dalmatians) were sent for whole genome sequencing. Following sequencing and bioinformatic processing, orthologs of human breast cancer susceptibility genes were investigated. Analysis of *BRCA1* and *BRCA2* yielded twelve coding variants: nine nonsynonymous and three synonymous. The nonsynonymous variants include one non-

frameshifting deletion, one indel, and seven missense mutations: 5 likely benign and two probably damaging (based on PolyPhen analysis). One of the probably damaging missense mutations (*BRCA2*: p.H1435R) is suspected to influence both CMT risk and breast cancer risk in humans and is found in 3/3 Standard Schnauzers, 5/5 Golden Retrievers (including two males), and 2/3 Dalmatians. Interestingly, while the mutation is not breed specific, it does seem that breeding practices perpetuate its continuation. In addition to p.H1435R, seven other variants have been identified in CMT cohorts previously, but have yet to be conclusively linked to CMT or breast cancer risk.

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**Title:** Design and synthesis of a carboxylate-containing ligand that increases the T<sub>1</sub>-weighted relaxivity response of a manganese complex to hydrogen peroxide

**Primary Author (and presenter):** Hutchinson, Tessa E.

**Additional Authors:** Goldsmith, Christian

**Department:** Chemistry and Biochemistry

**College/School:** College of Sciences and Mathematics

**Description:**

Reactive oxygen species (ROSs) commonly result from the incomplete reduction of O<sub>2</sub> to H<sub>2</sub>O; the overproduction of ROSs has been associated with a wide range of health disorders. Recently, we have developed Mn(II) complexes with polydentate ligands containing quinols. These react with H<sub>2</sub>O<sub>2</sub> under physiologically relevant conditions to yield species with increased aquation numbers and T<sub>1</sub>-weighted relaxivities (r<sub>1</sub>). The oxidation by H<sub>2</sub>O<sub>2</sub> converts the quinols to *para*-quinones, which bind more weakly to metal ions, but doesn't oxidize the manganese. In order to improve the stability of the Mn(II) complexes in both their pre-activated and oxidized states, we have introduced carboxylate groups into the ligand framework. Here, we describe the synthesis and characterization of the *N,N'*-Bis(2,5-dihydroxy-benzyl)ethanediamine-*N,N'*-diacetic acid (H<sub>6</sub>qc1) ligand and its Mn(II) complex. The ligand is confirmed to bind more tightly to the metal. Counterintuitively, the stronger binding affinity increases the r<sub>1</sub> response to H<sub>2</sub>O<sub>2</sub>. Preliminary MRI studies confirm increased r<sub>1</sub> values from 4.4 to 8.6 of the reduced to oxidized Mn-H<sub>6</sub>qc1 complex.

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**Title:** Chemometrics in the quality assessment of botanical products: A case study in sandalwood oil

**Primary Author (and presenter):** Ibtisam, Ibtisam

**Additional Authors:** Levenson, Corey & Calderón, Angela

**Department:** Drug Discovery and Development

**College/School:** Harrison School of Pharmacy

**Description:**

Shorter-time screening processes that allow the detection of all chemical constituents without the risk of losing some compounds in structure elucidations is indispensable in the quality control and assessment of botanicals. Similarly, ensuring the quality control and authenticity of sandalwood oil is of great importance with respect to variations in the chemical constituents depending on its geographic origin, taxonomy, genetic, trees age, harvest seasons, and post-harvest methods (drying process, storage, extraction methods, *etc*). In this study, chemical fingerprinting of 35 sandalwood oils (0.1 %) in 70 % ethanol was evaluated using high resolution liquid chromatography mass spectrometry (LC-MS). The resulting chromatogram profiles were subjected to chemometrics analysis. Analysis of five samples from various lots showed that 26 entities consisted of sesquiterpene alcohols and sesquiterpene hydrocarbons ranging from C<sub>9</sub> to C<sub>17</sub> carbon atoms. This identification was done using a combination of batch recursive molecular feature extraction algorithm (*rMFE*) and database hits. Using these 26 entities, a clear distinction was observed between Australian sandalwood oil (ASO lot 160506SDSA) as compared to other samples (East

Indian sandalwood oil, EISO) through Principal Component Analysis (PCA) scores plot with total variability 96.89 % for the three components. This is in line with the taxonomy differences of ASO and EISO (*Santalum spicatum* and *Santalum album*, respectively). ASO can be distinguished from EISO based on four unique entities  $C_{15}H_{20}$ ,  $C_{15}H_{22}O$ ,  $C_{15}H_{24}O$ , and  $C_{15}H_{26}O_2$ . Furthermore, PCA on EISO has distinguished the EISO (lot 150302SDSA) based on single unique entity  $C_{15}H_{26}O_2$  as compared to other EISO. Taken together, our data suggest that a combination of chemometrics and LC-MS technique can be used to identify and classify the natural oil samples with respect to its chemical entities, geographic origin, and taxonomy differences.

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**Title:** Lignin containing cellulose nanofibrils (L-CNF) as an additive in drilling fluids

**Primary Author (and presenter):** Iglesias, Maria C.

**Additional Authors:** Villada, Yurany<sup>1</sup>; Casis, Natalia<sup>1</sup>; Estenoz, Diana<sup>1</sup>; Peresin, Maria S.

**Department:** Forest Products Development Center

**College/School:** School of Forestry and Wildlife Science; <sup>1</sup>INTEC, Universidad Nacional del Litoral – CONICET, Argentina

**Description:**

Over the years, the use of cellulose nanofibrils (CNF) as an additive to improve materials properties has been increased widely, due to a successful combination among the characteristics conferred by the nanoscale and the intrinsic properties of the cellulose. Nowadays, the main source for CNF is bleached cellulose pulp, typically obtained by removal of lignin and hemicelluloses using chemical treatments. The removal of those cell wall components has proven to improve the visco-elastic properties of the nanofiber suspensions. However, the presence of residual lignin in raw materials confer different properties to CNF that are of potential interest in several novel applications, such as increased hydrophobicity and distinct rheological behavior. Additionally, using unbleached cellulose pulp to produce lignin-containing cellulose nanofibrils (L-CNF) is more environmentally friendly, and allows to obtain higher production yields, while reducing costs, due to the lower energy consumption during the manufacture process and the avoidance of bleaching steps. Drilling fluids are commonly used in oil and gas drilling operations. The performance of the drilling operations is directly related to the properties of these fluids. During the last years, the use of cellulose nanoparticles as an additive in drilling fluids as rheological modifier has been reported, particularly focused on the utilization of cellulose nanocrystals (CNC) and fully bleached cellulose nanofibrils. In this work, we investigate the use of L-CNF as a component of drilling fluids. We had demonstrated that the utilization of L-CNF as replacement of xanthan gum (XGD), could improve the filtering properties, without affecting its rheological behavior. Additionally, interactions between L-CNF and the main components of the fluids were studied through Quartz Crystal Microbalance with Dissipation monitoring (QCM-D), and a better understanding on component ratios and order of addition was achieved.

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**Title:** Critical knowledge gaps for subsurface compressed energy system (CES) in porous formation

**Primary Author (and presenter):** Iloejesi, Chidera O.

**Additional Authors:** Beckingham, Lauren E.

**Department:** Civil Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Fluctuation in renewable energy production may be alleviated by utilizing underground aquifers to store energy and maintain a constant supply to the grid to meet energy demands. This process of storing energy in a liquid or gaseous phase in underground aquifers is known as subsurface compressed

energy storage. While simulations have been developed to study this system, fluid interactions and the impact of long term storage and injection-exaction cycling on formation integrity is not well understood. This research seeks to evaluate some of the critical knowledge gaps that detract from the general understanding of the processes and evolution of these underground storage systems. Here, fundamental geochemical and geomechanical processes critical for extensively studied similar carbon dioxide storage systems are extrapolated to address some of the knowledge gaps that are still not well understood in these systems. This includes understanding of the injected gas properties, where some gases may undergo phase transition, complexities of multi-phase flow, and other reservoir heterogeneities impacting flow, reactions, and formation integrity. The recommendations presented in this review when incorporated in an analysis of compressed energy systems will enhance understanding of the evolution of fluid-fluid and fluid-formation interaction in these systems, including fluid properties and geochemical reactions, the evolution of the porous media and potential impacts on formation integrity.

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**Title:** Quasi-static and dynamic fracture behaviors of additively printed ABS studied using DIC: Role of build architecture and loading rate

**Primary Author (and presenter):** Isaac, John, P.

**Additional Authors:** Tippur, Hareesh

**Department:** Mechanical Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Poly (acrylonitrile-butadiene styrene) or ABS is a popular and inexpensive amorphous thermoplastic used for Additive Manufacturing (AM) of engineering components using fused filament fabrication (FFF) process at relatively modest temperatures ranging between 175-275 °C. The 3D fabrication typically involves feeding a thermoplastic filament through a heated nozzle to deposit the molten material on a build plate. The emergent material is laid down layer-by-layer as molten strings along prescribed computer-generated paths and a fill-factor predetermined by the designer. Each of these layers can be configured separately and it introduces anisotropy into the printed product even though the base material used is isotropic and hence the resulting mechanical characteristics in general and failure properties in particular need attention. This work focuses on fracture behavior of such AM printed ABS under quasi-static and dynamic conditions. For this research, planar coupons have been printed using a Cubicon 3DP-110F printer with a heated circular nozzle producing a continuous bead of 0.2 mm diameter and 0.2 mm layer thickness in the build direction to perform tension and fracture tests. The feed rate used during the printing operation is 100 mm/sec with a 100% fill factor. Of specific interest to this work are 0/90° vs. ±45° in-plane orientations built with in-plane specimen orientation parallel and perpendicular to the build plate. The local measurement of in-plane displacements are performed optically using DIC up to crack initiation and during growth in quasi-statically loaded 3-point bend specimens and impact loaded notched specimens. The latter set of experiments is carried out using an instrumented Hopkinson bar and ultrahigh-speed digital camera. Significant differences in the tensile and fracture parameters and failure modes as a result of the build variables and loading rates are observed.

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**Title:** Bioinspired and sustainable improvement of the crack resistance of clayey soils

**Primary Author (and presenter):** Izzo, Michael, Zach

**Additional Authors:** Miletic, Marta

**Department:** Department of Civil Engineering

**College/School:** College of Engineering

**Description:**

Desiccation cracking of soils is the development of cracks on the surface of clayey soils as a result of a reduction in soil water content. Clayey soils constitute a large portion of the soil profile in Alabama; thus, the decrease in soil surface area owing to the desiccation of such soils had a severe impact on the performance of clay soils in various geotechnical, agricultural and environmental applications all over the state and worldwide. Many efforts have been made across the globe to overcome the catastrophic consequences of desiccation cracking, such as massive financial damage and even the loss of life. The most popular process to enhance soil strength and resistance to cracking is chemical treatment using additives like cement, but its use raises a number of environmental concerns such as CO<sub>2</sub> emissions, groundwater contamination, prevention of vegetation growth, etc. Therefore, the demand for bioinspired and sustainable soil improvement alternatives is increasing.

The main aim of this research is the development of eco-friendly soil improvement techniques and the investigation of their effect on the desiccation cracking behavior. The types of sustainable soil enhancements used in this study were biopolymers, carpet fibers, and fly ash, along with fly ash-fiber combinations. Improvement of soil crack resistance by sustainable reinforcement was investigated by conducting desiccation tests on the treated and non-treated clay specimens. Image-processing using MATLAB was conducted to quantitatively describe the effect of sustainable reinforcement on the geometrical characteristics of crack patterns, such as crack length and width. The experimental and image analysis results showed that all the soil improvement techniques significantly enhanced the soil strength and reduced the amount of cracking. Furthermore, the addition of biopolymers to clayey soil proved to be the most effective solution and provided plenty of potential for future sustainable engineering.

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**Title:** Aging scrotum in goat is attributed to augmented oxidative stress and reduced mitochondrial functions

**Primary Author (and presenter):** Jackson, Caroline A.

**Additional Authors:** Majrashi M., Beamon H., Almaghrabi M., Desai D., Ramesh S., Moore T., Bradford C., Dhanasekaran M.

**Department:** Drug Development and Design

**College/School:** Harrison School of Pharmacy

**Description:**

The most common disease states / pathological conditions affecting goat scrotum are epididymitis, Fournier's gangrene (fasciitis of the scrotum and groin), Henoch-Schonlein purpura, hydrocele, hypogonadism, orchitis, scrotal abscess (infection of the scrotum), scrotal wall cellulites, spermatocele, testicular torsion and varicocele. These pathological conditions associated with scrotum or testicles can lead to pain, swelling, tenderness, and lump. Interestingly, the function of scrotum decreases with age leading to various complications. However, the etiology associated with the decreased function of scrotum is not understood well. Hence, in this study we elucidated the role of oxidative stress and mitochondrial functions during aging in goats. Scrotums from Kiko goats of three different age groups were obtained. The three age groups were: Neonates (13-20 days), prepubertal (108-124 days), Adult (above 6 months). Oxidative stress markers and mitochondrial Complex I and IV activities were measure spectrophotometrically / fluorimetrically. During the process of aging, there was significant increase in the markers of oxidative stress (Reactive oxygen species, nitrite, protein carbonyl and lipid peroxides), decreased antioxidant (glutathione) and reduced mitochondrial functions (decreased Complex-I and IV activities). Thus, aging had a direct correlation with oxidative stress and decreased mitochondrial functions.

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**Title:** Transmitted antiretroviral drug resistance evaluation in treatment-naïve HIV-infected patients in central Alabama

**Primary Author (and presenter):** Jacobs, Joi N.

**Additional Authors:** Chou, Chiahung; Reyes-Sacin, Carlos; & Hester, Kelly

**Department:** Pharmacy

**College/School:** Harrison School of Pharmacy

**Description:**

The southern US has the highest incidence of new HIV diagnosis. There has not been an evaluation of transmitted antiretroviral drug resistance (TDR) in Alabama or trends since the wide availability of single tablet regimens and antiretroviral therapy regimens with high barriers to resistance. The objective of the study was to evaluate the incidence of transmitted antiretroviral drug resistance, individual and multi-drug class resistance rates, relationship between demographics and risk of baseline resistance, resistance trends over ten years, and influence of drug development on trends of resistance. A retrospective chart review was conducted at the Copeland Care Clinic in Montgomery, Alabama. Data was collected on treatment-naïve HIV-infected patients between January 1, 2006 and December 31, 2016. Major antiretroviral (ARV) drug mutations were identified using the 2017 International Antiviral Society USA Drug Resistance Mutation list. Demographics, laboratory monitoring, and genotype resistance results were extracted from electronic medical records. Of the 238 patients meeting inclusion criteria, the prevalence of TDR was 21.4% (single, major mutations) in this population. Of those with TDR 95.7% had single ARV class resistance mutations. Compared to national statistics and previous studies in southern states our study indicated a higher TDR rate of 19.7%.

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**Title:** Comparison of product yield and fuel properties obtained from hydrothermal liquefaction of filamentous and microalgae

**Primary Author (and presenter):** Jain, Nikhil

**Additional Authors:** Adhikari, Sushil

**Department:** Biosystems Engineering

**College/School:** College of Agriculture; College of Engineering

**Description:**

Filamentous algae as compared to microalgae are easy to grow and harvest. However, most studies on Hydrothermal Liquefaction (HTL) of algae is focused on microalgae. This study presents the comparison on product yield and properties obtained from HTL of microalgae of species *Nannochloropsis* (A\_Micro), and filamentous algae grown on four different nitrogen nutrient conditions (optimal nitrate (A\_NO<sub>3</sub>), optimal urea (A\_Urea), nitrate stressed algae for 14 days (A\_14\_NO<sub>3</sub>), and urea stressed algae for 14 days (A\_14\_Urea)). HTL was carried out at 320°C and a reaction time of 30 mins. Highest oil yield of 67.5 % was observed for A\_14\_Urea while A\_14\_NO<sub>3</sub> could produce only 29.1 % oil. The oil yield for A\_Urea, A\_NO<sub>3</sub>, and A\_Micro were 44, 34, and 45 % respectively. Highest heating value (HHV) of HTL oil from all algae were around 30-32 MJ/kg. Total acid number (TAN) was lowest for A\_Micro (20.8 mg KOH/g) while for other non-stressed algae it was around 40 mg KOH/g. TAN for stressed algae was slightly above 100 mg KOH/g which was because of the presence of around 50 % of Hexadecenoic acid as observed in gas chromatography. Simulated distillation revealed about 11 % and 86 % of the oil for stressed algae in diesel range and vacuum gas oil (>343°C) range respectively while for non-stressed algae was 16 % and 77 % respectively.

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**Title:** Thermal study of potassium nitrate for thermal energy storage by molecular dynamic simulations

**Primary Author (and presenter):** Jamshideasli, Dourna

**Additional Authors:** Khodadadi, Jay M.  
**Department:** Mechanical Engineering  
**College/School:** Samuel Ginn College of Engineering

**Description:**

Greater utilization of the concentrated solar power to compete with conventional power generation systems is strongly linked to updated and more accurate thermophysical property data for molten salts. In this study, nonequilibrium Molecular Dynamics (MD) simulations to model thermal transport phenomenon associated with potassium nitrate (KNO<sub>3</sub>) in both solid and liquid states as high-temperature phase change materials for thermal energy storage systems were performed with LAMMPS. The Buckingham potential energy function that described the interaction potential and comprised both bonded and non-bonded interactions was employed. Particle-particle particle-mesh was used for the Coulombic interactions. The crystal structures for melting and solidification and instantaneous movements of the constituents of the system were visualized by OVITO. As a future work, a new potential field based on a more accurate basis set can be developed to improve the data. The current code can be extended to simulate the salts with carbon-based nanoadditives, specifically graphene nanoplatelets to realize the effect of alignment factor and the interfacial thermal conductance between the nanofiller and the salt matrix. The relevant MD predictions of the properties can be compared with simultaneous in-house experimental data under development and literature values.

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**Title:** Exploring the use of enzyme-responsive liposomes in the treatment of triple-negative breast cancer

**Primary Author (and presenter):** Jasper, Shanese L.

**Additional Authors:** Arnold, Robert D.

**Department:** Drug Discovery and Development

**College/School:** Harrison School of Pharmacy

**Description:**

Secretory phospholipase A<sub>2</sub> (sPLA<sub>2</sub>) cleave phospholipids at sn-2 ester bonds, releasing lysophospholipids and fatty acids, and are over expressed in several pathologies including breast cancer. Herein, we evaluated the therapeutic activity of enzyme responsive liposomes compared to the clinically used, sterically stabilized liposomes (SSL) for *in vitro* response in a triple-negative breast cancer (TNBC) model. In these studies, SSL and SPRL formulations were made according to previous studies and resulting in three formulations SSL, SPRL- E and SPRL-G. SPRL were made by the addition of either DSPE (SPRL-E) or DSPG (SPRL-G). Doxorubicin was used as the drug of choice and Dox-loaded liposomes were prepared by remote-loading using an ammonium sulfate gradient. Toxicity studies were performed by the use of 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) and the use of a three-dimensional in-vitro model was employed. Treatment of breast cancer cells with doxorubicin encapsulated in SSL and SPRL resulted in cytotoxicity in the MDA-MB-231 cells line comparable to free drug. SSL and SPRL formulations showed similar trends in reducing cell numbers within 3-dimensional models. These preliminary data show the therapeutic activity of SPRL compared to SSL, and suggest that SPRL may be useful for the treatment of TNBC. Since 2-dimensional models do not fully recapitulate the complexity of barriers to drug delivery, future directions will endeavour to continue exploring the utility of these liposomes in 3-D and microfluidic models.

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**Title:** Physics of silicon carbide electronic devices

**Primary Author (and presenter):** Jayawardhena, Isanka Udayani

**Additional Authors:** Dhar, Sarit

**Department:** Physics

**College/School:** College of Sciences and Mathematics

**Description:**

4H-Silicon carbide is one of the enabling semiconductor materials for modern high voltage and high temperature power electronic devices owing to its striking material properties. However, a significant drawback for improving device performance is the high channel resistance due to electron traps at the gate dielectric - 4H-SiC interface. Gate dielectric thin films (~50 nm) are typically formed by thermal oxidation of SiC to SiO<sub>2</sub>. This produces a high density of interface defects (or dangling bonds) that appear as energy states in the bandgap of 4H-SiC, which are spatially located within ~1 nm from the interface. To advance 4H-SiC Metal-Oxide-Semiconductor field-effect transistors (MOSFETs), studying and improving the SiC-SiO<sub>2</sub> interface characteristics becomes the priority. The main theme of the author's research is investigation and engineering of interface 'passivation' processes that reduce trap densities and improve device resistance. In this talk, various state-of-the-art passivation processes will be introduced. First, the industry standard process – high temperature annealing in nitric oxide (NO) will be introduced. This process introduces nitrogen atoms at the SiO<sub>2</sub>/4H-SiC interface and reduces the trap density by an order of magnitude. Next, more recently invented processes that offer further improvement beyond nitrogen passivation, namely, phosphorus and boron doping of SiO<sub>2</sub> will be discussed. In addition, some of main experimental techniques that are used to evaluate interface traps will be also be discussed in this talk.

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**Title:** Physicians' health technology-related needs in a low-resource setting: A pilot study

**Primary Author (and presenter):** Jeminiwa, Ruth

**Additional Authors:** Fox, B.I. & Franco-Watkins, A.

**Department:** Health Outcomes Research and Policy

**College/ School:** Harrison School of Pharmacy

**Description:**

To investigate the electronic health record (EHR)-related needs of physicians who practice in a low resource setting. A cross-sectional study was performed to assess the informational, organizational, and technological needs of physicians in an electronic health record. Eligible participants were physicians practicing in Nigeria, in a clinical role in either a public or private setting. A recruitment text or email invitation was sent by the Nigerian Medical Association. Informed consent was obtained from all participants and the study was approved by the Institutional Review Board at Auburn University. Descriptive statistics including frequencies and percentages were computed. A total of 61 responses were obtained. The most cited informational need included medical history, lab test results, past medication history, and allergies while the least cited was immunization dates. In terms of use of EHR to access information, access to patients' complete medical history, and data for research purposes were the most rated uses of an EHR while the least rated was access to clinical guidelines. The most rated organizational need were training and infrastructure while the least rated was physicians' income. The most cited technological needs were prompts to ensure completeness of patient information, a low price, and ability to run with batteries. Emphasis on cost, the ability of EHRs to run on batteries, access to medical history and data for research reflects the reality of practicing in low-resource settings. These findings are useful for programs that seek to improve EHR implementation and adoption in places with low resources. Tailoring of technology to reflect findings may improve adoption of EHRs in similar settings. Future studies should investigate the lack of consideration of access to clinical guidelines and preventative medicine promoting information as important by physicians in low-resource settings.

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**Title:** Butanol tolerance improvement on the biofuel-producer bacteria *Clostridium sacharoperbutylaceticum* N1-4 by means of the expression of exogenous efflux pump

**Primary Author (and presenter):** Jimenez-Bonilla, Pablo

**Additional Authors:** Wang, Yi

**Department:** Biosystems Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Fossil fuels and chemicals are present on most human activities; however, their use has intrinsic problems such as their finite nature, the geopolitical instability, and global effects on climate. Butanol has various advantages over fossil fuels and other biofuels such as ethanol. Bio-butanol can be produced from renewable carbon sources through the acetone-butanol-ethanol (ABE) fermentation with solventogenic clostridia, its completely miscible with gasoline and its energy content is about the same than gasoline and one third higher than ethanol. It is a valuable feedstock material for chemical industry, as well. However, biobutanol fermentation is limited by the low yield and low final titer (about 2%, compared with 16% in ethanol), due mainly to the high toxicity of butanol to the cells. Other bacteria species cannot produce but can tolerate higher concentrations of butanol. We explored their genetic capabilities in order to provide the same features to butanol-producer bacteria. For example, *Pseudomonas putida* S12 can naturally tolerate up to 49g/L of butanol. The efflux pump *srpABC* is one of the known mechanism used by *P. putida* to extrude different chemicals out of the cell membrane. This gene has been used to increase the tolerance of *E. coli* to different chemicals including alcohols and butanol. In our work, we tested the butanol tolerance of *C. sacharoperbutylaceticum* N1-4 harboring *srpABC* by plasmid overexpression. This gene increase not just the butanol tolerance but also the furfuric and phenolic tolerance, which are types of inhibitors commonly present in biomass hydrolysates. Further studies are still needed to generate higher titers on the production. An optimization on the expression level can make a difference, as reported previously. Efflux pumps involve complex mechanism not well understand yet, and this study represent valuable information on the utilization of this system to increase the biofuel tolerance.

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**Title:** Pioglitazone through PPAR $\gamma$  dependent mechanism suppresses A $\beta$  overproduction induced by high glucose in HT-22 cells

**Primary Author:** Jones, Ellery A.

**Additional Authors:** Govindarajulu, Manoj; Ramesh, Sindhu; Adamek, Danielle; Lynd, Tyler; Briggs, Gwyneth; Knowlton, Stella; Dhanasekaran, Muralikrishnan; & Suppiramaniam, Vishnu

**Department:** Drug Discovery and Development

**College/School:** Harrison School of Pharmacy

**Description:**

Type 2 diabetes mellitus (T2DM) is known to be a precursor for Alzheimer's disease due to high glucose and high insulin levels. Brain insulin resistance with hyperinsulinemia has been known to predispose to high levels of amyloid beta(A $\beta$ ) in the brain, a major pathology of AD. Thiazolidinediones (TZDs) are insulin sensitizing peroxisomal proliferator activating receptor gamma (PPAR $\gamma$ ) agonists that have shown to improve cognitive function through the PPAR $\gamma$  dependent deregulation of APP-cleaving enzyme BACE1. Recent evidence has shown that high levels of glucose decrease PPAR $\gamma$  expression. This lack of PPAR $\gamma$  causes an increase BACE1, thereby promoting increased A $\beta$  levels. Hence, the aim of this study is to investigate the neuroprotective effects of Pioglitazone on high glucose induced A $\beta$  overproduction in HT22 cells. HT cells were divided into four groups; a control group with normal glucose levels (NG), high glucose (HG) levels group without pio, and two groups of HG with two different concentrations of pio (5 & 10  $\mu$ mol/L). ROS levels, lipid peroxidation, antioxidant levels, and mitochondrial function were measured. A $\beta$ , BACE1, and PPAR $\gamma$  protein levels were assayed with a western blot; BACE1

and PPAR $\gamma$  mRNA levels were acquired using a rt-PCR; and ELISA was performed to determine A $\beta$  levels in the neurons and in the medium. Pio at both doses attenuated high glucose treatment induced increased ROS and lipid peroxidation; decreased antioxidant levels and decreased mitochondrial complex I and IV. HT-22 cells treated with HG show increased A $\beta$  associated with increased mRNA and protein levels of BACE1 which was reversed by Pio. These can be attributed to higher levels of PPAR $\gamma$  which binds to the promoter region of the BACE1 enzyme, thereby decreasing its transcription. Pioglitazone through its PPAR $\gamma$  dependent mechanism improves antioxidant activity, mitochondrial energy regulation, while decreasing A $\beta$  levels thereby decreasing the pathologies of AD.

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**Title:** Phage-GnRH constructs for population control of feral animals: evaluation in cats

**Primary Author (and presenter):** Jones, Rebecca L.

**Additional Authors:** Johnson, Aime; Kraneburg, Carol; Cochran, Ann; Samoylov, Alex; Barstow, Carla; Cannon, Jessica; Korbely, Melissa; Wright, James; Cattley, Russell; & Samoylova, Tatiana

**Department:** Pathobiology

**College/School:** College of Veterinary Medicine

**Description:**

The overpopulation of cats is a problem in the United States and worldwide due to public health concerns and their role as a predator of wildlife species. Our focus is the development of anti-fertility vaccines composed of whole phage particles carrying peptides with contraceptive properties for use in feral animals. The vaccines trigger antibody production against gonadotropin releasing hormone (GnRH). The antibodies inactivate GnRH, causing reduced release of gonadotropic hormones and gonadal atrophy. Phage-GnRH constructs with potential contraceptive properties were generated via selection from a phage display library. When tested in mice, these constructs invoked the production of antibodies against GnRH and suppressed serum testosterone. The goal of this study is to evaluate the potential of these vaccines in cats. Sexually mature male cats were characterized as to their reproductive parameters and injected with a phage-GnRH vaccine according to the following treatment groups: single phage-GnRH vaccine with adjuvant (group 1, n=5), a phage-GnRH vaccine without adjuvant and a booster one month later (group 2, n=5), or a phage-GnRH vaccine with adjuvant and a booster three months later (group 3, n=5, in progress). Anti-GnRH antibodies and testosterone in serum, testicular volume, and quality and quantity of sperm were evaluated monthly during a 7-month period following immunization. All cats developed anti-GnRH antibodies of varying levels after primary immunization and levels increased significantly after booster immunization in groups 2 and 3. The total testicular volume decreased up to 42%, indicating potential gonadal atrophy. In group 1, serum testosterone was suppressed in four cats at three time points post-immunization. All cats in groups 1 and 2 produced sperm at month seven with up to a 38% decrease in normal sperm cells. This ongoing study has thus far demonstrated the potential of phage-GnRH vaccines for immunocontraception of cats.

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**Title:** Synthesis of UV curable PEGDA macromere based hydrogels with polysaccharides

**Primary Author (and presenter):** Joshi, Prutha

**Additional Authors:** Breaux, Steven & Azad, Tanzina

**Departments:** Polymer and Fiber Engineering; Chemical Engineering; Center of Polymers and Advance Composites

**College/School:** Samuel Ginn College of Engineering

**Description:**

Hydrogels are polymeric materials widely used in medicine due to their similarity with the biological components of the body. Hydrogels are biocompatible materials to promote cell proliferation

and tissue support because of their hydrophilic nature, porous structure and elastic properties. The objective of this research was to obtain poly (ethylene glycol) diacrylate (PEGDA) based polysaccharide semi-interpenetrating networks (semi-IPNs). The mechanical and structural features of PEGDA hydrogel can be modulated by comprising polysaccharide networks, such as gelatin, chitosan, and nano-fibrillated cellulose (NFC). Firstly, methacrylated gelatin and chitosan were synthesized with methacrylic anhydride. Moreover, microwave synthesis of the PEGDA macromere was completed using linear poly (ethylene glycol) (PEG) and an excess of methacrylic anhydride. Secondly, the synthesized and freeze-dried powder of modified gelatin, modified chitosan, or NFC was completely dissolved in phosphate buffered saline and mixed with PEGDA aqueous solution. Finally, the mixture of both polymers was cured using the commercial photo-initiator Irgacure 2959 (2-Hydroxy-1-[4-(hydroxyethoxy) phenyl]-2-methyl-1-propanone) at 80°C. The mechanical properties and swelling characteristics of the cured hydrogels were investigated. Altogether, the biomaterial hydrogel properties open the way for applications in the field of medicine. Mechanical properties of these hydrogels were demonstrated to be tunable for various biomedical applications through modification of the degree of methacrylation and gel concentration. The characterization data suggest that with further studies, hydrogels could be useful for complex tissue engineering applications requiring. Moreover, the 3D printing and simultaneous UV curing of hydrogels will be another future research scope for applications in tissue engineering.

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**Title:** Assessing input uncertainty and sensitivity of the process-based wetland water quality model WetQual

**Primary Author (and presenter):** Kanber, Recep Tayyip

**Additional Authors:** Kalin, Latif

**Department:** Natural Resources

**College/School:** School of Forestry and Wildlife

**Description:**

Wetlands are the most significant natural ecosystems that have numerous beneficial missions for people and wildlife. Most of them are improving water quality and acting as natural water purifiers and absorb sediment and other pollutants from waterbodies. Wetland water quality models are developed to represent real ecosystems. These models are used to observe changes in the aquatic ecosystems and make prediction of the future water quality of the wetlands. WetQual is a process-based wetland model which simulates nutrients and carbon transformations in wetlands. In this research, the impact of wetland bathymetry, temperature conversion equations' coefficients and changing input parameter's temporal resolution on the wetland predicted uncertainty will be studied. Firstly, wetland geometry is important for wetland hydrology and removing of nutrient and sediment. Wetland bathymetry data can be measured detailed or created in tolerant range. Both methods will be computed and identified in which sensitivity of the geometry measurement is enough to reach safe uncertainty band. Secondly, temperature, which helps to remove nutrients from the waterbody, is also needed to calculate evapotranspiration (ET). The equation, which is used to convert air temperature to water temperature in the model, will be tested to identify its coefficients sensitivity. Finally, to improve model accuracy, temporal resolution will also be tested so that hourly ET and precipitation data will be used instead of daily data. These studies will be conducted to the wetlands in Central Valley, CA and Kent Island, MD.

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**Title:** Graphene for electrochemical energy storage

**Primary Author (and presenter):** Kanungo, Rohit

**Additional Authors:** Radich, James

**Department:** Chemical Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Graphene, owing to its large specific surface area (SSA) and excellent electronic conductivity has been a focus of research as an electrode material in electrochemical capacitors (EC). However, van der Waals' attraction between the individual graphene sheets results in stacking of sheets while fabricating electrodes. This phenomenon decreases the SSA and restricts electrolyte diffusion pathways thereby deteriorating the performance of EC. Another challenge is that bulk manufacturing of graphene with a low cost process does not exist. These challenges can be resolved by using reduced graphene oxide (RGO) which is structurally similar to graphene with few oxygen functional groups and defects. Solution based process to synthesize RGO are indeed facile. Furthermore, previous studies indicate that modified RGO morphologies can be used as potential electrode material for electrochemical capacitors (EC). By creating nanopores within the RGO sheets, the specific surface area of electrode and diffusion of electroactive species can be improved. Here, we present a simple solution based process to manufacture holey graphene from graphene oxide (GO) via microwave (MW) radiations. GO aqueous dispersion prepared by modified Hummer's method can be converted to RGO via thermal, chemical or photochemical methods. Then, RGO in presence of hydrogen peroxide is irradiated with microwaves. The application of MW radiation generates OH free radicals, which etch the carbon atoms present at the active defective sites on RGO. This creates a carbon vacancy on RGO sheet, consequently extending to form the nanopores. This holey graphene is characterized using TEM, XPS, Raman & FTIR. Next, holey graphene is utilized to build an electrochemical capacitor and tested to show improved diffusion of electrolyte and higher energy density. The fundamental knowledge gained from this study can also be applied in the fields of batteries, hydrogen storage and catalysis.

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**Title:** Investigating the interaction of moderately resistant breeding lines and the nematocide Velum Total to Reniform Nematode (*Rotylenchulus reniformis*)

**Primary Author (and presenter):** Kaplan, Gulsah

**Additional Authors:** Koebernick, Jenny; Lawrence, Kathy S.; & Sikkens, Roelof B.

**Department:** Crops, Soil and Environmental Science

**College/ School:** College of Agriculture

**Description:**

Reniform nematode (*Rotylenchulus reniformis*) (RN) is a factor limiting cotton yields. At present, nematicides are an effective management tool for producers with only marginal resistance/tolerance being observed in commercial cultivars. The objective of our study is to investigate the use of moderately resistant breeding lines and the interaction effect of nematicide x breeding line under high reniform nematode pressure. A population has been developed from a cross with a RN resistant line and a conventional cultivar. Select breeding lines from the F<sub>4</sub> generation were planted in a split plot design with genotype being the main treatment and the nematicide, Velum, as the sub treatment. This design was replicated four times in field trials of both a RN infested and non-infested field in Belle Mina, AL, as well as in microplots at Auburn University. Lint yield values of 6 sister breeding 194 population lines out performed control and parental lines in RN infested field with velum and non-Velum.

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**Title:** Effect of maturity on physicochemical quality of genomically diverse banana (*Musa* spp.) cultivars from Southeastern United States

**Primary Author (and presenter):** Kargar, Mahnaz

**Additional Authors:** Woods, Floyd; Wall, Marisa; Fonsah, Greg; Kessler, Raymond; Shetty, Kalidas; Jeganathan, Ramesh; & Larsen, Nick

**Department:** Horticulture

**College/School:** College of Agriculture

**Description:**

Banana (*Musa* spp.) is the fourth most important food crop after rice, wheat, and maize consumed across the world. Optimum ripening is required to maintain the quality of the fruit and good market price, followed by correct handling and processing of the fruit. The current study was designed to determine the effects of maturity on physicochemical quality of genomically diverse banana cultivars in the Southeastern U.S. pH, titratable acidity (TA), soluble solid content (SSC), and SSC/TA ratio (sweetness) of six banana cultivars different in genome including 'FHIA 1' (AAAB), 'Hua Moa' (AAB), 'Kandarian' (ABB), 'Pisang Raja' (AAB), 'Saba (ABB)', and 'Williams' (AAA) were determined during four maturity stages (i.e., mature green, transition, fully ripe, over ripe). The lowest values of pH and the highest values of TA were observed in fully ripe stages of all cultivars. SSC and SSC/TA increased significantly during ripening from mature green to over ripe stage. Fully ripe fruits of 'Williams' were reported as the sweetest fruits with the highest value of SSC/TA among the other cultivars and stage of maturities. This study provides a useful guide for postharvest handling and packaging of bananas of similar maturity and characteristics for commercial practices.

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**Title:** Development of selective algal cultivation substrates by tuning the surface energy

**Primary Author (and presenter):** Karimi, Zahra

**Additional Authors:** Passantino, Joshua M.; Herring, Derryn W.; Rodriguez, Marisa G.; Blersch, David M.; & Davis, Virginia A.

**Department:** Chemical Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

The objective of this research is to develop environmentally benign substrates, suitable for selective algal attachment and growth. Algae has the potential for significant economic impact in many applications including biofuels, environmental remediation, and nutritional supplements. Algal cultivation on substrates has a promising potential as an effective strategy for boosting the efficiency of algal growth systems. However, limited fundamental scientific understanding of algal attachment and growth is one of the major barriers in designing high yield cultivation substrates that are species-selective. In addition, to date, most studies in the field focus on non-filamentous species and very little is known about substrate preferences of filamentous algae. In this research, a bio-derived polymer, polylactic acid (PLA) and PLA composites containing lignin and/or cellulose nanocrystals (CNC) were investigated as potential substrates for algal growth. These substrates were thermodynamically investigated by determination of the surface energies *via* sessile drop contact angle measurements. The extended Derjaguin-Landau-Verwey-Overbeek (xDLVO) model was used to calculate the attraction energy between substrates and various algal species. The model results are being compared to experimental findings on algae-substrate attachment. The results demonstrate the effect of chemical composition on the surface energy of the substrates which ultimately affects the interaction energy between the algae and the substrate.

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**Title:** Effect of current and projected agricultural irrigation water withdrawals on Upper Floridan Aquifer in the Lower Apalachicola-Chattahoochee-Flint River Basin, USA

**Primary Author (and presenter):** Karki, Ritesh

**Additional Authors:** Guzman, Sandra & Srivastava, Puneet

**Department:** Biosystems Engineering

**College/School:** College of Agriculture; Samuel Ginn College of Engineering

**Description:**

The Upper Floridan aquifer (UFA) is one of the most productive aquifers in the United States and is the principal water source for irrigation, industrial, and domestic water uses in the lower Apalachicola-Chattahoochee-Flint (L-ACF) River Basin in Alabama, Georgia, and Florida. With nearly 500,000 irrigated acres from about 4,000 wells, the UFA is a major source of water for agricultural irrigation in the L-ACF River Basin. In recent years, stress on the UFA has increased with increasing agricultural acreage, population, industry, and more frequent drought conditions. This has become a major concern in the region and has led to increasing conflict for water allocation between Georgia, Florida, and Alabama. An increasing trend in monthly withdrawals from the UFA for crop production in the L-ACF is projected by the Georgia State-wide Water Management Plan, which will likely cause further decreases in groundwater levels and increased stress on the UFA. The objective of this study was to evaluate the effects of current and future irrigation water withdrawals from UFA on groundwater levels, groundwater budget, and stream-aquifer fluxes. A three-dimensional groundwater flow model over an area of 4,632 mi<sup>2</sup> of UFA in the L-ACF was developed using the USGS Modular Three-Dimensional Finite-Difference Ground-Water Flow Model (MODFLOW) to simulate the effect of projected increases in water withdrawals on the UFA. The model was calibrated and validated for steady-state and transient conditions for the period 2010 to 2016, which included both wet and dry climate periods. The model was then used to simulate projected irrigation scenarios and quantify the effects of the projected water withdrawals on the UFA.

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**Title:** Mitohormesis- A Look into the Effects of Irradiation and Oxidative Damage on the Respiratory Function of Hepatocyte Cell Cultures

**Primary Author (and presenter):** Kash, Mary

**Additional Authors:** 2<sup>nd</sup> Taylor, Halie; 3<sup>rd</sup> Zhang, Yufeng; 4<sup>th</sup> Hood, Wendy

**Department:** Biological Sciences

**College/School:** Auburn University

**Description:**

Radicals produced by oxidative phosphorylation in the mitochondria were thought to be harmful to the cells, but recent studies have challenged this theory. This research project examined the effects of radiation and oxidative stress from reactive oxygen species (ROS) on the respiratory function of hepatocyte cell cultures. This study was an extension of a previous project, done in Dr. Hood's lab, examining the effects of radiation on respiratory function in tissue samples from entire animal specimens. This project consisted of growing the cell cultures, until they reached 80% plate coverage, and, either irradiating the cells with a dosage of 25 centi-gray, or using the cultures as control groups. The cells were then allowed to continue to grow and were removed at specified times by treatment with the protease, trypsin. After the removal, the cells were divided to determine the respiratory function, amount of ROS, and presence of specific proteins. Cells were placed in respiration buffer inside an Oxytherm Chamber to measure the response of the mitochondria with measured concentrations of substrates. Another portion of cells was placed in a Flow Cytometer to measure the ROS present in the cells. Lastly, cells were frozen to allow for future protein testing. The results of this study showed that the mitochondria tested recovered their function initially lost by the effects of the radiation after 72 hours. While most of the complexes of the electron transport chain did not show significant difference from the control, complex four showed an interesting variable. This allowed us to draw similarities to the previous study. This research is important because not only did it help to confirm a previous study, but it also opened the door for future studies into different cell types and their response to ROS. Mitohormesis, the way mitochondria are believed to heal themselves from ROS exposure, is becoming an even more attractive theory with the results of this study.

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**Title:** Effects of the lateral dimensions on the electrochemical performance of 2D MXenes in supercapacitors

**Primary Author (and presenter):** Kayali, Emre

**Additional Authors:** Beidaghi, Majid

**Department:** Materials Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Two-dimensional (2D) transition metal carbide/nitrides, also known as MXenes, have emerged as an important family of 2D materials. In the past few years, characterization of the properties of MXenes has revealed their high potential for various applications. Various MXenes are demonstrated to have excellent physical and chemical properties and also shown to be dispersible in water and a range of organic solvents. MXenes have a general formula of  $M_{n+1}X_nT_x$ ; where M denotes an early transition metal, X stands for carbon or nitrogen, and  $T_x$  symbolizes surface terminations.  $Ti_3C_2T_x$ , the first discovered and the most studied MXene, has shown to have outstanding performance as an electrode material for energy storage applications. This is due to exceptionally high electrical conductivity of this 2D material and fast redox reactions that can take place at its surface. Although both properties are expected to be highly dependent on the lateral dimensions of 2D  $Ti_3C_2T_x$  sheets, its common synthesis method has prevented the control of the lateral size of the sheets. Thus, a clear understanding of the size-dependent properties of this material remained unexplored. In this talk, we will first introduce a general method to accurately control the lateral dimension of  $Ti_3C_2T_x$  sheets and then, present our recent results on the effect of the lateral dimensions on the electrochemical performance of  $Ti_3C_2T_x$  electrodes. Our results show that the electrical and electrochemical properties of MXene electrodes can be controlled by changing the dimension of flakes. Using our findings to the design of freestanding MXene electrodes makes it possible to achieve exceptionally high electrochemical performances. As a result, when tested as an electrode in electrochemical capacitors, specific capacitance values as high as 420 F/g are achieved with  $Ti_3C_2$  electrodes designed using combinations of different lateral dimensions.

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**Title:** IFN-induced transmembrane protein 6 expression in adipose tissue

**Primary Author (and presenter):** Kazi, Safa

**Additional Authors:** O'Neill, Ann Marie; Greene, Michael W.

**Department:** Biology

**College/School:** College of Arts and Sciences- Auburn University at Montgomery

**Description:**

Current figures estimate that over one third of the adult population of the United States is obese, and that figure is predicted to rise. Obesity has been linked to the worsened prognosis in a number of cancers. One of the characteristics of obesity is a chronic low grade state of inflammation in adipose tissue, including the presence of M2 macrophages that have been implicated in tumor progression. In this study, we aimed to assess the expression of a little known marker of M2 macrophages, IFN-induced transmembrane protein (*Ifitm6*). Using cDNA obtained from adipose tissue of lean mice that were fed a chow diet or mice rendered obese by a high fat plus sugar diet, we sought to verify initial data obtained by RNA sequencing. Using quantitative PCR, our initial data indicates that *Ifitm6* expression is significantly increased by 4-fold in retroperitoneal adipose tissue from obese mice compared to lean, and by 5-fold in epididymal adipose tissue. Previous work has demonstrated that adipose tissue from obese mice displays an increase in the number of genes associated with M2 macrophages compared to that of lean mice. Our results suggest that *Ifitm6* may be an additional marker for the presence of M2 macrophages in adipose tissue. In addition, *Ifitm6* has been shown to be present on the surface of tumor infiltrating macrophages. Given the paucity of data on this marker, further studies will attempt to elucidate the usefulness of *Ifitm6* as both a marker for inflammation and macrophage infiltration in both adipose tissue and tumors.

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**Title:** Evaluation of potentially inappropriate medications in older adults admitted to the Medical Intensive Care Unit

**Primary Author (and presenter):** Keeton, Amber N.

**Additional Authors:** Rahman, Motiur; Connor, Andrew; Qian, Jingjing; Bulloch, Marilyn

**Department:** Research of Health Outcomes

**College/School:** Harrison School of Pharmacy

**Description:**

To examine and compare the numbers of potentially inappropriate medications (PIMs) prescribed in older adults admitted to the medical intensive care unit (MICU) as identified by the 2012 and 2015 Beers Criteria for Potentially Inappropriate Medication Use in Older Adults and the Screening Tool of Older People's Potentially Inappropriate Prescriptions (STOPP) at hospital admission and discharge and to evaluate impact of total PIMs use at admission and discharge on ICU length of stay, hospital length of stay, and inpatient mortality in older adults. The institutional review board approved this retrospective cohort study conducted at a community teaching hospital. Patients aged 65 years and older who were admitted to the MICU in 2014 and taking at least one medication on admission were included in the study. The proportion and number of patients with PIMs at admission and discharge were compared using Chi square and paired t tests. A Poisson regression model was conducted to determine any association between hospital and MICU length of stay and PIMs of all patients as detected by Beers 2012, 2015 or STOPP, controlled for covariates including patient demographics, admission source and diagnosis, and total number of medications at admission. Proportions of in-hospital mortality, hospital readmission and MICU readmission were also compared among patients identified with PIMs using the 3 criteria. A priori p-value of less than 0.05 was considered statistically significant. The proportions of PIMs in patients admitted to the MICU was significantly higher according to both versions of the Beers Criteria evaluated compared to STOPP. Patients with PIMs identified using Beers Criteria were associated with shorter hospital length of stay while patients with PIMs identified with the STOPP tool were associated with significantly longer MICU length of stay.

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**Title:** Evaluating *Toxoplasmosis gondii* in Invasive Wild Pigs (*Sus scrofa*)

**Primary Author (and presenter):** Kelly, Hannah A

**Additional Authors:** Lepczyk, Christopher; Zohdy, Sarah

**Department:** Forestry and Wildlife

**College/School:** School of Forestry and Wildlife Sciences

**Description:**

Wild pigs (*Sus scrofa*) are one of the most detrimental invasive species occurring in the Southeastern U.S. pigs pose a threat to human health because they harbor and transmit diseases like *Toxoplasmosis gondii*. *T. gondii* is a parasite that can be found in the tissues of *S. scrofa*, as a cystic form, which then can be passed to humans. Given that hunters are actively removing pigs and consuming them our goal was to identify what strains of *T. gondii* are harbored in the tissues of wild pigs. To address our research goal, we obtained 37 blood and tissue samples from US Fish and Wildlife Services as part of their whole-sounder removal project. Currently I am analyzing samples DNA extraction and polymerase chain reactions (PCR). Positively identified *T. gondii* samples will then be genotyped. Results of our research can provide needed information on the types of strains infecting wild pigs and ultimately if these strains are of concern to human health.

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**Title:** Constitutive model comparison involving strain-softening clay in numerical simulations of the Fourth Avenue landslide

**Primary Author (and presenter):** Kiernan, Michael, J.

**Department:** Civil Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Strength loss in clays has been a major source of damage in previous earthquakes, including extensive damage to downtown Anchorage in 1964. Despite this potential for damage, there are methods to evaluate the potential deformations due to cyclic softening of clayey soils are less developed than those for sands. Part of the reason for this is that clayey soils may exhibit strain softening behavior which can be difficult to model numerically due to the mesh dependent nature of the solution. Techniques to overcome this mesh dependency have been developed, but have not been fully tested for modeling cyclic softening. This presentation will summarize results from a numerical analysis of one of the landslides that occurred in Anchorage during the 1964 Great Alaska Earthquake. The cause of this landslide was attributed to cyclic softening in the underlying sensitive Bootlegger Cove Clay deposit. This site has been extensively characterized by previous researchers including both field and laboratory tests on the Bootlegger Cove Clay. The current study will examine two alternative material models which are both able to represent the strain softening nature of this clay. The first model is a relatively simple total stress-based model which is easy to calibrate, but provides a rather crude approximation of the true soil behavior. The second model is a more complicated effective-stress based model which requires detailed calibration, but can provide a much better approximation of the cyclic loading behavior of clayey soils. The ability of each model to produce reasonable estimates of observed Fourth Avenue landslide deformations will be compared. The sensitivity of the results to the mesh size will be examined along with the influence of calibration procedure. It is hoped that the results of this study will provide practicing engineers with a framework to estimate potential deformations due to cyclic softening in clayey soils.

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**Title:** Synthesis and properties of PTEMA

**Primary Author (and presenter):** Kim, Jihyuk

**Additional Authors:** Minkler, Michael J.; Beckingham, Bryan S.;

**Department:** Department of Chemical Engineering

**College/School:** Auburn University

**Description:**

Increasing demand for energy has led to the search for alternative renewable sources of energy and better means of energy transport. To look for ways to improve the efficiency of energy usage, polythiophene, a conductive polymer, has been studied due to its favorable optoelectronic properties and thereby potential application to flexible electronics including organic photovoltaics. Polythiophenes show great potential to improve current energy transport technology due to their capacity to transition between semiconducting and conducting states. Thus, in order to better understand how the microstructure of polythiophene impacts its optoelectronic properties and solid-state properties, we synthesize and examine the properties of poly(2-(2-thiophen-3-yloxy)-ethyl malonic acid) (PTEMA). Here, we first synthesize the novel 2-(2-(thiophen-3-yloxy)-ethyl) malonate monomer (TEMA) and subsequently polymerize it via Grignard Metathesis polymerization (GRIM). The monomer was prepared by following the synthesis of a series of chemical intermediaries starting from commercially available 3-bromothiophene: synthesis of 3-methoxy thiophene, synthesis of 3-(2-bromo) ethyloxythiophene, synthesis of 2-(2-(thiophen-3-yloxy) ethyl) malonate. Once the TEMA monomer was synthesized, the monomer was polymerized into PTEMA using GRIM. The molecular, solid-state and optoelectronic properties of PTEMA were then characterized using UV-Vis spectroscopy, <sup>1</sup>H NMR spectroscopy, gel-permeation chromatography (GPC), differential scanning calorimetry (DSC) and X-Ray Diffraction. The knowledge gained through this research will help

understand the structure-property relationships of the different microstructure of polythiophene on the resulting materials properties.

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**Title:** Fundamental understanding of pervaporation membranes for organic-organic mixtures

**Primary Author (and presenter):** Kim, Jung Min

**Additional Authors:** Beckingham, Bryan

**Department:** Chemical Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Pervaporation is a promising technique for separating liquid mixtures due to its utility in breaking azeotropic mixtures (e.g. ethanol/water) and lower energy requirements compared to conventional separation processes (i.e. distillation). Molecular transport rates in pervaporation membranes is driven by differences in vapor pressure between the permeate-vapor side and the feed-liquid side which is typically induced by vacuum or cooling the permeate-vapor side. However, the solution-diffusion model of transport in polymer membranes governs the molecular solubility and diffusion of solutes into and within the membrane. In previous research, our group has demonstrated a facile technique for measuring the liquid-phase permeability of single and multi-solute aqueous mixtures based on diffusion cell experiments and the solution-diffusion model of molecular transport in polymer membranes and found membrane selectivities to be dependent on the presence of co-solutes (i.e. differences in selectivity between multi-component permeabilities and those calculated from single component permeabilities). Here, we examine links between this type of liquid-phase diffusion and the liquid-phase diffusion that occurs within pervaporation membranes. We will synthesize novel block-copolymer pervaporation membranes with varied molecular structure in the transport phase to tune membrane transport properties. We will design a custom pervaporation apparatus outfitted with in situ attenuated-total-reflectance Fourier Transform Infrared (ATR-FTIR) spectroscopy to determine time-resolved permeabilities based on the solution-diffusion model for comparison with liquid phase permeabilities from diffusion cell experiments. Overall, we aim to predict pervaporation performance from polymer membrane material properties (solubility and diffusivity) and engineer polymer membranes with high selectivity for separating organic-aqueous and organic-organic mixtures.

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**Title:** Distinct functional signatures between genes expressed in porcine oocytes and in cumulus cells

**Primary Author (and presenter):** Kimble, Katelyn M.

**Additional Authors:** Biase, Fernando H.

**Department:** Animal Sciences

**College/School:** College of Agriculture

**Description:**

Oocyte growth and maturation, as well as the differentiation of the surrounding cumulus cells (CCs) are integral to folliculogenesis. During this time, bidirectional communication, through molecular exchanges between the oocyte and CCs, is essential for the oocyte to acquire developmental competence. Irrespective of the critical importance of an oocyte for fertilization and embryo development, the oocytes' influence on the gene expression in CCs, and vice versa, has yet to be studied. Our goal was to elucidate the functional roles of the genes expressed in oocyte and CCs through transcriptome analyses. We collected cumulus-oocyte complexes (COCs, n=20) out of follicles from abattoir-sourced pig ovaries. Morphologically similar COCs were individually separated into a CC sample, consisting of all CCs on the COC, and the corresponding oocyte free of CCs, with each snap frozen upon collection. We generated RNA-seq (for the CCs) and single-cell RNA-seq data (for the oocytes) and quantified the expression of

7404 genes in the oocytes and 4654 genes in the CCs. Of those, 3197 genes were exclusively transcribed in oocytes, 447 were transcribed in CCs, and 4207 were expressed across both cell types. Through gene co-expression network analysis and gene ontology (GO) analyses, we identified 1128 genes in the oocytes that formed clusters enriched (FDR<0.05) for the biological process (BP) “regulation of transcription, DNA templated”. Notably, in CCs only seven genes formed clusters enriched for the same term. Additionally, we found 294 genes in the CCs that formed clusters enriched for the BP "rRNA processing", while the term was absent amongst oocytes. These are two of the many examples of distinct functional architecture of the genes expressed in oocytes and surrounding CCs. In conclusion, after investigating the GO profiles of the porcine oocyte and CCs, the two cell types show remarkable different functional profiles that highlight their function in female gametogenesis.

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**Title:** African American influence on the historic Toomer’s Drugs  
**Primary Author (and presenter):** Kingston, Kira M  
**Additional Authors:** Bubba, Robert  
**Department:** Human Development and Family Studies  
**College/School:** College of Human Sciences

**Description:**

At the turn of the 20<sup>th</sup> century, African Americans began to establish themselves within a society that had worked hard to diminish their success and livelihood for hundreds of years. In the rural town of Auburn, AL, many African Americans worked daily to combat prejudice and discrimination. However, an African American man by the name of John Reese stands out as a prosperous Auburn native in spite of the oppression he faced. Although Reese could not read nor write and came from a family of enslaved persons, his life exemplified the possibility to become successful and to discover one’s identity in a society that was intentionally trying to hinder such progress. John was known not only by his occupation as a drayman, but also as a business, home, and car owner, and a contributor to the establishment of historic Toomer’s Drugs. Several sources support the story of John loaning Shel Toomer, the owner and founder of Toomer’s Drugs, \$500 to start a pharmacy (CPAAH, 2011; Logue & Simms, 2013). In fact, many African Americans had a role in the success of Toomer’s Drugs from the enslaved persons who manually made the bricks for the building to James Echols, who developed the recipe for the famous Toomer’s Lemonade and worked in Toomer’s Drugs for 40 years, prior to the civil rights movement until the 1990’s (LCHBC, 2002; Logue & Simms, 2013). The success of African American business owners, managers, and laborers, like John and James, reveal that the only significant difference between whites and blacks that has ever existed was and is the color of their skin. The African American influence on Toomer’s Drugs affirm that while racism was prevalent in the early 20<sup>th</sup> century, African American success often overshadowed any limitations and brought forth a new age of determination.

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**Title:** Database of slope failures along Alabama highways  
**Primary Author (and presenter):** Knights, Michelle J.  
**Additional Authors:** Montgomery, Jack & Suarez, Jessica  
**Department:** Civil Engineering  
**College/School:** Samuel Ginn College of Engineering

**Description:**

Landslides along highways are a significant concern for state and federal transportation agencies, leading to large direct repair costs as well as indirect costs—such as traffic disruption, driver inconvenience, commercial losses, road closures, and secondary maintenance. Management of these hazards requires collecting detailed information on the physical and material characteristics of the

landslides, as well as the impacts on the traveling public. This task is often accomplished through the use of specialized slope stability management systems (SSMS), or landslide mitigation programs, developed by state agencies to catalog and analyse slope failures adjacent to state highways. SSMS often have three main components: a landslide database, a web-based GIS component, and a hazard prioritization system. The Alabama Department of Transportation (ALDOT) does not currently have a SSMS which hinders their ability to effectively allocate funds for repairs. This presentation will discuss the development of a landslide database for ALDOT meant to improve their ability to identify and address common failure mechanisms throughout the state. This database, called Slide Spread, aids in the input, organization, and analysis of information about landslides along Alabama highways. The data is converted into a GIS database, which can be used to identify correlations between landslides and cross-reference with other spatial data, such as average precipitation and surface geology. The information from this database has been used to classify landslides according to the main failure mechanism which will aid in identifying effective and efficient remediation strategies. This presentation will discuss the key features of Slide Spread and present observations about important causes of failures along Alabama highways. It is hoped that the results of this research will allow ALDOT engineers to better plan and mitigate impacts from landslides.

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**Title:** SIRT3 activator Honokiol improves pathologies in vitro and in vivo models of Alzheimer's disease  
**Primary Author (and presenter):** Knowlton, Stella H.

**Additional Authors:** Ramesh, Sindhu; Govindarajulu, Manoj; Lynd, Tyler; Briggs, Gwyneth; Adamek, Danielle; Heiner, Jake; Jones, Ellery; Moore, Timothy; Amin, Rajesh; Suppiramaniam, Vishnu; & Dhanasekaran, Muralikrishnan

**Department:** Drug Discovery and Development

**College/School:** Harrison School of Pharmacy

**Description:**

Honokiol is a Sirtuin-3 (SIRT3) activator which exhibits antioxidant activity and augments mitochondrial function, acting as a metabolic regulator. Modern evidence suggests the critical role of SIRT3 in the progression of several metabolic and neurodegenerative diseases. SIRT3 is a nicotinamide adenine dinucleotide (NAD)-dependent deacetylase that localizes exclusively within the mitochondria and functions to prevent abnormal acetylation of proteins required for proper mitochondrial function. Alzheimer's disease (AD) is characterized by extracellular senile plaques composed of amyloid beta ( $A\beta$ ), intracellular neurofibrillary tangles consisting of hyperphosphorylated tau protein, and mitochondrial dysfunction. These pathologies are related to the development of cognitive impairment and neuronal cell death. Hence, we hypothesize that Honokiol, by improving mitochondrial function and antioxidant levels, alters the energy dysregulation thereby reducing the pathologies of AD. Chinese Hamster Ovarian (CHO) cells (carrying the amyloid precursor protein-APP and Presenilin PS1 mutation) were utilized. Concentration dependent effects of Honokiol on improving mitochondrial functions, enhancing antioxidant levels and decreasing Amyloid beta through amyloidogenic pathway were evaluated. Honokiol significantly enhanced SIRT3 expression, reduced reactive oxygen species generation and lipid peroxidation, and mitochondrial function. Honokiol increased the expression of AMPK, CREB, and PGC-1 $\alpha$ ; downregulated the expression and activity of beta secretase enzyme thereby leading to reduced  $A\beta$  levels. Honokiol is an activator of SIRT3 capable of improving antioxidant activity and mitochondrial energy regulation, while decreasing  $A\beta$ . We are currently conducting an *in vivo* study using a mice model of Alzheimer's Disease. Behavioral, biochemical and electrophysiological studies will be performed to determine the neuroprotective effects of Honokiol.

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**Title:** Lethal Effects of Stormwater Runoff on *Daphnia pulex*

**Primary Author (and presenter):** Kuntz, Rachel, M  
**Additional Authors:** Knappenberger, Thorsten; Brantley, Eve; Wilson, Alan  
**Department:** Crop, Soil, and Environmental Sciences  
**College/School:** College of Agriculture

**Description:**

Untreated stormwater entering our streams can result in the contamination of drinking water supplies and shellfishing waters, prohibitions of recreational uses including fishing, swimming, and boating, injury to aquatic biodiversity, danger to public health, and increased flooding. Total suspended solids, nutrients (including phosphorus and nitrogen), pathogens, and petroleum-based contaminants are common stormwater pollutants of concern. Bioretention cells are landscape features that may serve as stormwater control measures by reducing the impact of nonpoint source pollutants through filtration, absorption, and flow velocity reduction. The recommended bioretention media mixture for Alabama is 85% sand, 10% fines, and 5% organic matter. A summer Undergraduate Research Fellowship was funded through Auburn University to examine lethal effect of local stormwater runoff and to evaluate the influence of bioretention media on stormwater toxicity. *Daphnia pulex* (water flea) were exposed to untreated stormwater collected in Auburn, Alabama, during the “first flush” of a storm that contains around 90% of the pollutants and post first flush. Comparisons were made among the mortality of *Daphnia pulex adults* in control medium (pond water) and untreated and treated stormwater that had not or had been filtered through bioretention cell media, respectively. Results from this project will help inform the effectiveness of bioremediation media and increase overall knowledge and awareness about nonpoint source pollution.

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**Title:** Manufacturing of Nanoparticle Reinforced Materials through Electrospinning  
**Primary Author (and presenter):** LaBombard, Kiana  
**Additional Authors:** Adanur, Sabit  
**Department:** Mechanical Engineering  
**College/School:** Auburn University

**Description:**

Electrospinning is a production method that has been under study for many years, but recently has been growing in popularity. Popular uses of electrospun polymers is for filtration, textile manufacturing, medical technologies, composite materials, and chemical catalysts. A wide variety of polymers have historically been used with electrospinning, including polyvinyl alcohol (PVA), polyethylene (PE), polyethylene terephthalate (PET), polypropylene (PP), and others. This paper presents a test program conducted by the authors to characterize the effects carbon nanotubes have on PVA and polyimide during the electrospinning process. Carbon nanotubes are known for having exceptional high strength and stiffness. They are excellent additives to structural materials because of their thermal, mechanical, and electrical properties. After performing the electrospinning process, scanning electron microscopy (SEM) was used to view and measure the individual fiber threads. Tests to measure the ultimate tensile strength and filtration properties of the polymer material were performed. The test procedures and corresponding results are noted herein.

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**Title:** The relative importance of steric and electronic effects in 1,3-diene photoisomerization  
**Primary Author (and presenter):** LaGrone, Ryan, B.  
**Additional Authors:** Squillacote, Michael, E.  
**Department:** Department of Chemistry and Biochemistry  
**College/School:** College of Sciences and Mathematics

**Description:**

Retinal, the photoreceptor molecule of the visual system is constructed with a string of conjugated carbon-carbon double bonds, but during the initial photoreceptive event the geometry of only one of these bonds is affected and that with 100% efficiency. While the cascade of events following light absorption ultimately generating the optic nerve impulse is well understood, the near perfect 100% photoisomerization of a specific double bond remains without an easily explainable cause. Steric (size) effects near the double bond have been postulated as a rationale, but our group has discovered examples where steric effects in a photoisomerization process do not produce a large selectivity. Rather electronic effects of groups near the double bond seem to control the process. To investigate the relative importance of these steric and electronic effects we have chosen to synthesize and examine the photochemistry of an unsymmetrically substituted acyclic 1,3-diene, (Z,E)-1,1,1-trifluoro-2,4-hexadiene. The results of these efforts will be reported.

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**Title:** New structural and electronic insights on supported  $(VO_x)_m/(M_1O_y)_n/(M_2O_z)_{bulk}$  catalysts for the oxidative dehydrogenation (ODH) of light hydrocarbons

**Primary Author (and presenter):** Lawrence, Kaitlyn L.

**Additional Authors:** Stephens, Natalie; Moncada, Jorge; Thakur, Raj; & Carrero, Carlos A.

**Department:** Chemical Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

A heightened demand for commodity chemicals such as propylene and butylene paired with recent advances in hydraulic fracturing have motivated industry to turn to a domestic production feedstock: shale gas. Traditionally, C<sub>3</sub>-C<sub>4</sub> olefins were produced using steam cracking, an expensive, energy-intensive route to dehydrogenation, but as demand for the chemicals continues to soar, researchers investigate other pathways of production. One pathway that has been studied heavily in recent years is catalytic oxidative dehydrogenation, or ODH. The reaction is proven to run with high selectivity even in moderate conditions. The catalysts used vary, but most typically include one or more metals anchored to the surface of a less-expensive support. Group V metals perform well in these applications due to their unique structural and electronic properties. The goal of this project was to synthesize a collection of ternary catalysts, all of which utilized vanadium, while varying the ternary metal (Si, Ti, Zr, Al, Ce, Nb). Additionally, the loading of the metals was tuned with the goal of achieving monolayer coverage, a term used to describe the two-dimensional dispersion of active sites on the outer layer of the support. These samples were characterized by Brunauer-Emmett-Teller surface area tests (BET), inductively coupled plasma atomic emission spectroscopy (ICP-AES), Raman, and ultraviolet-visible spectroscopy. Thereafter, the catalysts were tested catalytically in a custom reactor set up. The final goal was to establish structure-reactivity relationships for the design of more selective, stable and active catalysts for the ODH reaction. The methodologies and data shown in this poster presentation have been compiled in a publication where we highlight not only the catalytic findings but also the unique advantages of using this research area to train future generations of scientists and engineers in catalysis-related research.

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**Title:** Development of executive function and its relation to performance in dogs

**Primary Author (and presenter):** Lazarowski, Lucia

**Additional Authors:** Waggoner, Paul & Katz, Jeff

**Department:** Psychology

**College/School:** College of Liberal Arts

**Description:**

Executive function (EF) refers to a suite of complex cognitive skills important for maintaining attention, flexible thinking, and self-control. In humans, EF predicts life outcomes in various domains and is affected by age and cognitive disabilities. While social cognition has been extensively studied in dogs, little is known about the development and importance of executive function in the species. Working dogs present an ideal opportunity for the study of EF and its relation to performance because many cognitive tasks have been adapted for canines and working dogs' training program outcomes can be easily tracked. Further, working dogs must exhibit exceptional focus, self-control, and other characteristics that allow them to successfully perform their jobs. The goals of this study were to assess the developmental trajectory of executive function in a population of working dogs, and to determine its relation to success or failure as a working dog. We tested groups of detection dogs-in-training at 3, 6, and 10 months old (n=25 per group) on three tasks of EF measuring attention, behavioral flexibility, and inhibitory control. EF measures showed improvements with age during development, and some aspects of EF were associated with dogs' likelihood of program failure or success. These results mirror findings with humans regarding the effect of age on the development of EF and its relation to life outcomes. These findings also suggest that higher-order cognitive processes are involved in detection dog performance, which may be used as early predictors of successful candidate working dogs and in turn improve the selection process.

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**Title:** Social cognition in working dogs

**Primary Author (and presenter):** Lazarowski, Lucia

**Additional Authors:** Waggoner, Paul & Katz, Jeff

**Department:** Psychology

**College/School:** College of Liberal Arts

**Description:**

Dogs' ability to communicate with humans unlike any other species has been extensively reported. Dogs can interpret and respond to human gestures, discriminate human emotional states, and even send communicative signals in ways similar to human children. This so-called "human-like" social cognition is thought to have emerged from a selection for human-oriented behaviors during domestication, allowing dogs to integrate into our society in both companion and working roles. However, investigations of canine socio-cognitive skills have focused largely on pets, ignoring working populations such as service and detection dogs. Exploring social cognition in these populations may provide insights regarding the origins of canine cognition because working populations are often not encultured as pet dogs are. Further, individual differences in social cognition may affect a dogs' ability to successfully fulfill particular working roles. For example, sensitivity to body language is a valuable quality in service dogs, but detection dogs that are too human-oriented are considered dependent and undesirable. This study explored social cognition in detection dogs (n=25) using three measures: 1) emotional contagion assessed by contagious yawning, 2) joint attention using the 'Unsolvable Task', and 3) point-following using an object-choice task. No contagious yawning was found, and dogs demonstrated high levels of independence and low reliance on humans which were associated with program success. These results suggest less attachment to humans in detection dogs, possibly reflecting selection and training for independence due to the nature of their work. Current investigations are underway using the same tasks with service dogs, in which we predict the opposite outcome (i.e., higher attachment and human-directed behavior). These findings present important comparisons for the canine cognition literature, and may be used to improve selection of suitable working dogs for particular roles.

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**Title:** The impact of hotel restaurant's relational benefits on customer emotion, satisfaction, and voluntary performance

**Primary Author:** Lee, Debora  
**Additional Author:** Rahman, Imran  
**Department:** Nutrition, Dietetics, and Hospitality Management  
**College/School:** College of Human Sciences

**Description:**

The hotel restaurant is unique as it primarily serves hotel guests in addition to being open to the general public. The concept of relational benefit is of utmost importance to these restaurants and their patrons. In related literature, empirical research has seldom gone beyond the relational benefit – loyalty relationship. Moreover, such studies are limited in hotel restaurant settings. In particular, there is a dearth of research on the interplay of relational benefits, customer emotion, customer satisfaction and customer voluntary performance. This study, therefore, developed and tested a framework linking relational benefits, customer emotion, customer satisfaction, and customer voluntary performance such as loyalty, participation, and cooperation in a hotel restaurant setting. Results, utilizing 264 consumer responses from a survey based on 27 deluxe hotel restaurants in South Korea revealed that confidence benefits and social benefits have a significant positive influence on consumer emotion which in turn positively influenced customer satisfaction, loyalty, cooperation, and participation. Among the three relational benefits, only confidence benefits influenced customer satisfaction significantly and positively. Additionally, customer satisfaction only influenced loyalty and cooperation but not participation in a hotel-restaurant setting. The results indicate that high-income earners do not care about special treatment such as coupon and are likely to bother active participation. Numerous takeaways are offers for hotel-restaurant managers and operators. Hotel restaurant managers should pay more attention to managing customers' emotional experiences to increase customer satisfaction and positive attitude toward them. In that way customers can establish a long-term relationship with hotel restaurant. Also, loyalty can be enhanced by rewarding customers who provide a constructive suggestion or comment for the well-being of the hotel restaurant.

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**Title:** Energy utilization of various oil sources fed to broilers from 10 to 20 days of age.

**Primary Author (and presenter):** Lee, Derrell, T

**Additional Authors:** Brengendahl, Kristjan; McCafferty, Clinton; Kriseldi, Ruben and Dozier, William.

**Department:** Poultry Science

**College/School:** College of Agriculture

**Description:**

An experiment was conducted to determine nitrogen-corrected apparent metabolizable energy ( $AME_n$ ) and lipid digestibility of various oil sources fed to broilers from 10 to 20 d of age. Seven hundred fifty-six Ross × Ross 708 male broilers were distributed in 84 battery cages at 1 d of age (9 birds/cage). Broilers were fed a common starter diet formulated to contain 3,053 kcal  $AME_n$ /kg with corn and soybean meal as primary ingredients from 1 to 10 d of age. Broilers received 1 of 7 dietary treatments (12 reps/treatment) consisting of 94% corn-soybean meal basal diet and 6% test oil source from 11 to 20 d of age. Oil sources were soybean oil, corn-soy blend acidulated soapstock (AS) oil, palm-soy blend AS oil, distillers corn oil, flax oil, and canola oil. The control diet consisted of dextrose, which was used to determine  $AME_n$  of various oil sources. During days 11 to 17, birds were allowed to adapt to the experimental diets, followed by 3 (24 hour) total excreta collection periods to determine lipid digestibility and  $AME_n$  of each oil source. Growth performance of broilers was not affected ( $P > 0.05$ ) by dietary lipid sources. Apparent metabolizable energy of soybean oil, corn-soy blend AS oil, palm-soy blend AS oil, distillers corn oil, flax oil, and canola oil were 8,869, 8,396, 7,997, 8,836, 8,588, and 7,871 kcal/kg, respectively. Both  $AME_n$  and  $AME_n$  to gross energy percentage of soybean oil and distillers corn oil were higher ( $P < 0.001$ ) than other dietary lipid sources. Additionally, canola oil had lower ( $P < 0.001$ )  $AME_n$  and  $AME_n$  to gross energy percentage, respectively, compared with soybean oil. Lipid digestibility of soybean oil was higher ( $P < 0.001$ ) than corn-soy blend AS oil and palm-soy blend AS oil, but distillers

corn oil, flax oil, and canola oil were similar ( $P > 0.05$ ) to soybean oil. These data demonstrated these alternative lipid sources have acceptable AME<sub>n</sub> for growing broilers.

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**Title:** Development of Interpenetrating Polymer Network (IPN) Materials for Road Repair

**Primary Author (and presenter):** LeGrand, Craig BJ,

**Additional Authors:** Thorne, David; Celestine, Asha-Dee

**Department:** Aerospace Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Interpenetrating Polymer Network (IPN) materials comprise of two or more polymer networks laced together on the molecular scale. These IPNs merge the properties of two or more polymers, producing a highly specialized material that has better mechanical and/or optical properties than the individual polymers. The focus of this research is to determine whether it is possible to increase the strength of asphalt concrete by reinforcing it with an IPN composite. A majority of roads in the USA are made of asphalt which is naturally brittle and cracks easily under extreme weather conditions. As such asphalt requires extensive amounts of repairs and maintenance. Currently, US state transportation agencies spend 80% of their annual budget toward road maintenance. Increasing the overall flexural strength of asphalt will greatly reduce these maintenance costs.

Our preliminary work examined the behavior of IPN-based composites. Carbon fiber composites with two types of matrices were fabricated using a hand layup method. Flexural, and tensile tests were done on composite specimens of brittle commercial Vinyl Ester (VE), and an IPN of VE and ductile polyurethane (PU). The strength, and flexural/tensile modulus were measured and recorded. Our results showed that the flexural behavior of the IPN composites were similar to that of the VE composites. However, the VE composites performed much better than the IPN composites in tensile tests.

The next steps for the IPN research include conducting impact tests to determine the effect of the PU on the impact properties of vinyl ester. The main objective is to understand IPN behavior and then compose an IPN that is greater in strength compared to other commercial polymers. These IPNs will then be integrated into asphalt to strengthen its overall flexural, and impact strength.

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**Title:** The biofluid mechanics of expiratory central airway collapse in patients with chronic obstructive pulmonary disease.

**Primary Author (and presenter):** Lenzie, Andrew, R

**Additional Authors:** Raghav, Vrishank

**Department:** Aerospace Engineering

**College/School:** Samuel Ginn College of Engineering, Auburn University

**Description:**

Over 11 million people in the US suffer from chronic obstructive pulmonary disease (COPD), the third leading cause of death. It is a progressive disease that irritates, inflames, and weakens the lungs; producing an excess of mucus obstructing the lungs making breathing difficult. Smoking is the primary cause of COPD; with no cure, much of the medicine is preventative.

It has been reported that a collapse of the central airway of greater than 50% is associated with cigarette smoking and COPD. Specifically, the collapse occurs upon exhalation. The issue has been named expiratory central airway collapse (ECAC). This has been shown to result in an overall reduction of respiratory health of the COPD patient. However, it is unknown if this airway collapse results in additional resistance to air flow. To this end, the hypothesis was pursued is that this collapse results in additional resistance to air flow and hence amenable to interventional therapy.

These questions are difficult to investigate *in vivo* due to several confounding factors. Therefore, we have built a bench-top lung simulator to conduct these studies. The lung simulator reproduces physiological flow rates and pressures in the lungs. The central airway is modelled using a flexible tube which collapses under certain applied pressures. These pressures are applied with an air-tight chest cavity box designed and constructed in shop on campus. Pressure is applied with a hand pump to the box which collapses the tubing. A reservoir of water is connected by piping and is three feet above the pump and box. Water is pumped through with a bladder pump and compressed air to simulate the flow through the central airway. This allows for testing how collapse of the trachea adds to the overall resistance to flow in the lungs. This study will help physicians determine corrective measures by evaluating the effectiveness of interventional therapies; such as stenting of the trachea to stop the airway from collapsing.

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**Title:** Trends and patterns of potentially avoidable hospitalizations and emergency department visits among Medicare beneficiaries in 2002-2012

**Primary Author (and presenter):** Li, Chao

**Additional Authors:** Fahim, Shahariar Mohammed; Huo, Nan; & Qian, Jingjing

**Department:** Health Outcomes Research and Policy

**College/School:** Harrison School of Pharmacy

**Description:**

The objective of this study is to examine the trends in prevalence and patterns of potentially avoidable hospitalization and ED visits related to COPD and CHF, respectively, among the Medicare Beneficiaries, overall and by beneficiary characteristics (age, sex, race and region). A serial cross-sectional analysis, using the Medicare Current Beneficiary Survey (MCBS) Cost and Use data from 2002-2012, was performed. Study populations include nationally representative fee-for-service Medicare beneficiaries who resided in community settings and completed the survey in 2002-2012. COPD and CHF diagnoses were identified in the linked Medicare administrative claims data. Beneficiaries' age, sex, race and region were identified from the MCBS survey data. Simple linear regression models were applied to test for trends at a 2-sided  $P$  value  $<.05$ . Among the 10,007 COPD Medicare beneficiaries (weighted average  $n=3.3$  million/year) identified over the 11 years' time period, the annual prevalence of potentially avoidable hospitalizations for a respiratory diagnosis significantly decreased from 24.6% in 2002 to 12.2% in 2012 (trend  $P<0.001$ ). These trends significantly declined across different age, sex, race and region subgroups, except for beneficiaries younger than 65. Among the 74,157 community Medicare beneficiaries identified over time (weighted average  $n=24.5$  million/year), the annual prevalence of potentially avoidable ED visit for CHF also significantly decreased from 2.5% to 2.4% (trend  $P=0.033$ ). Trends in potentially avoidable ED visits for CHF remained stable across most beneficiary subgroups but declined in beneficiaries who aged 65 and older ( $P=0.022$ ), were females ( $P=0.02$ ) and non-whites ( $P=0.005$ ). Overall, trends in prevalence of potentially avoidable hospitalizations for a respiratory diagnosis and CHF ED visits among Medicare beneficiaries declined significantly in 2002-2012.

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**Title:** Resveratrol and/ or exercise training on Amyloid  $\beta$  and neurotrophic factors in Alzheimer's disease mouse model

**Primary Author (and presenter):** Li, Rongzi<sup>1</sup>

**Additional Authors:** Rasool, Suhail<sup>1</sup>; Zhang, Yuxian<sup>1</sup>; Glabe, Charles<sup>2</sup>; Thangiah, Geetha<sup>1</sup>; Anderson, Miranda<sup>3</sup>; Broderick, Tom, L.<sup>3</sup>; & Jeganathan, Ramesh<sup>1</sup>

**Department:** <sup>1</sup>Department of Nutrition, Dietetics, and Hospitality Management, <sup>2</sup>Department of Molecular Biology and Biochemistry, <sup>3</sup>Department of Physiology Laboratory of Diabetes and Exercise Metabolism

**College/School:** <sup>1</sup>Auburn University, <sup>2</sup>University of California, Irvine, <sup>3</sup>Midwestern University Arizona College of Osteopathic Medicine

**Description:**

Type 2 diabetes mellitus (T2DM) is a complex metabolic disease affecting about 10% of the population worldwide. Many recent studies indicated that T2DM in midlife is associated with an increased risk of developing Alzheimer's disease (AD) in later life. Approximately 5 million people in the United States and more than 30 million worldwide are living with AD. Resveratrol is a polyphenolic phytoalexin known to exhibit anti-diabetic and neuroprotective effects in several experimental models, and regular exercise is protective against metabolic diseases. In this study, the effects of resveratrol supplementation and exercise training on biomarkers of AD pathology were examined in the 3xTg-AD mouse model. Two-month-old male 3X-Tg mice were either fed with resveratrol, subjected to aerobic exercise training, or both. Resveratrol (4g/kg) was incorporated into food pellets and exercise training was performed on a treadmill using an incremental training protocol minute corresponding to ~80% VO<sub>2</sub>. After 4 months of treatment, mice were sacrificed and brain tissue was analyzed. Our results show that resveratrol treatment with or without exercise attenuated neuroinflammation, reduced the toxicity of amyloid  $\beta$  (A $\beta$ ) oligomers, upregulated the expression of brain-derived neurotrophic factor (BDNF), postsynaptic density protein 95 (PSD95), and suppressed neuronal autophagy in 3xTg mice. Resveratrol in combination with exercise training displayed greater benefits in reducing toxic conformational species of A $\beta$  and resulted in higher expression levels of neurotrophic factors in 3xTg mice. The results of this study indicate neuroprotective effects of resveratrol and exercise in the 3xTg mouse model of AD.

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**Title:** Determination of microbiome in *Escherichia coli* O157:H7 contaminated commercial salads using 16S rDNA genomic sequencing

**Primary Author (and presenter):** Liao, Chao

**Additional Authors:** Wang, Luxin

**Department:** Poultry Science

**College/School:** College of Agriculture

**Description:**

The aim of this study is to monitor dynamic changes of microbiome and reveal the interaction between native microbiota and contaminated *Escherichia coli* O157:H7 in spring mix salads of three brands (A, B, and C) at 4°C for 15 days. In this study, the TSA and anaerobic agar plates were used to obtain population of total aerobic bacteria and anaerobic bacteria in salad products, respectively. The 16S rRNA sequencing was applied to sequence 36 of DNA samples extracted from salads at day 0, 5, 10, and 15 points. Moreover, the salads at day 0 (E0) and 15 (E15) were inoculated with *E. coli* O157:H7 and then was stored at 4°C for 15 days. Another 36 of DNA samples extracted from contaminated salads at day 5 and day 10 were sequenced. Over the cold storage, the total aerobic bacteria and anaerobic bacteria kept the level at 8 Log CFU/g and 6 Log CFU/g, respectively. However, the amount of *E. coli* O157:H7 in E0 and E15 salads presented significant decrease ( $P < 0.05$ ) for reduction of 2 and 1.5 Log CFU/g. For 16S rRNA sequencing analyses, the OTUs of microbiome in salads were assigned to four main phyla including Firmicutes, Actinobacteria, Proteobacteria, and Bacteroidetes. For genus level, the Top 3 in salads were *Flavobacterium* (21.23% to 64.16%), *Pseudomonas* (12.95% to 35.55%), and *Janthinobacterium* (4.10% to 25.67%). The alpha diversity increased over the cold storage days and inoculation of *E. coli* O157:H7. For beta diversity analysis, salads were significantly separated by brands and inoculation time of *E. coli* O157:H7 (E0 and E15) ( $P < 0.05$ ), but not by days in PcoA. Above all, inoculation of *E. coli* O157:H7 presented the most significant effect on the composition of bacterial community in salads followed by the *E. coli* O157:H7 inoculation day (E0 and E15), brands (A, B, and C), and day factor (day 0, 5, 10, and 15). Based on these results, the 16S rRNA sequencing can be a robust and reliable molecular tool for detection of pathogens, risk assessment, and food traceability.

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**Title:** Cardiovascular-Protective Effects of Proanthocyanidins  
**Primary Author (and presenter):** Llivina, Graham C.  
**Additional Authors:** Calderón, Angela I.; Waguespack, Megan M.  
**Department:** Auburn University Harrison School of Pharmacy  
**College/School:** Auburn University

**Description:**

The leading cause of death worldwide is cardiovascular disease. Cardiovascular diseases include myocardial infarction, stroke, cardiomyopathy, aortic aneurysms, hypertension, and heart failure. Because of its enormous societal burden, there is growing interest in dietary intervention to mitigate the severity of cardiovascular disease. Proanthocyanidins—polyphenolic compounds found in extracts from grape skins, grape seeds, chocolate, pomegranates, bilberries, cranberries, and other plant-derived sources—have shown promise in preventing cardiovascular disease. This literary research project focused on the role that proanthocyanidins A1, B1, B2, B3, B4, B5 and B6 play in mitigating the risk of cardiovascular disease in humans and lab rats. The goal of this project was to examine the polyphenolic content in several botanical compounds with high levels of proanthocyanidins—including, but not limited to, *vinis vinifera*, chocolate, pomegranates, cranberries and bilberries—and determine if their cardioprotective effects on lab rats, human test subjects and hamsters constituted were statistically significant. Our information—compiled using research-specific search engines such as PubMed and SciFinder—was filtered for content and used on the basis of the research strength. Our findings indicated that proanthocyanidin extracts from grape seeds, grape skins, cranberries, bilberries, pomegranates and cocoa demonstrated significant benefits on cardiovascular health markers in humans and animals. Beneficial effects include decreases in total cholesterol, total triglyceride and total lipid levels as well as reductions in blood pressure, oxidative stress levels and inflammatory markers. Studies testing the cardioprotective effects of proanthocyanidins invariably indicate a proportional increase in proanthocyanidin intake and cardiovascular health. We believe that clinical research into the value of proanthocyanidins in the near future is warranted.

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**Title:** Investigation of self-folding origami structures  
**Primary Author (and presenter):** Long, Ryan, M  
**Additional Authors:**  
**Department:** Aerospace Engineering  
**College/School:** College of Engineering

**Description:**

We explored the self-folding capacity of pre-strained shape memory polymer (SMP) sheets to produce functional devices and structures via self-folding origami. Self-folding samples are prepared by printing an ink pattern on the SMP sheet using a desktop, inkjet printer, and then trimming the sample to the desired size. Upon exposing the sample to infrared light, the patterned regions heat above the glass transition temperature of the material. This causes the material pre-strain to relax. As a result of the localized relaxation, the material folds into a predefined shape based on the ink pattern. We developed the Functional Origami Light Deformer Initiated by Transition (FOLDIT) experimental apparatus to study further the self-folding behaviour of SMP sheets. This device incorporates a heated surface for preheating the sample and an IR lamp to initiate folding. Further, the device can be easily modified to evaluate alternate heat sources and test fixtures. The device was validated by comparison to previous self-folding experiments. After validation, we evaluate the use pre-strained polystyrene SMPs to fold multipurpose origami and kirigami patterns that are capable of transforming and collapsing themselves in response to heat. One such folding method is called Miura-ori, which is a tessellated pattern that would be a likely candidate for making a

linear actuator or a collapsible solar panel. Beyond our study of the self-folding behaviours of pre-strained polystyrene, we performed an initial investigation of other SMP materials for future use in self-folding origami. This investigation develops a link between the ancient art of folding paper and space exploration. Eventually, by getting a better understanding of the self-folding behaviour of various SMPs, we can determine how to most effectively use these materials to fabricate shapes capable of bearing loads or functioning as tools, actuators, or even spacecraft components.

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**Title:** Evaluation of açai and maca extracts for CYP3A4 enzyme induction

**Primary Author (and presenter):** Lopez, Elizabeth

**Additional Authors:** Zhang, Yilue; Abbot, Kodye; Pondugula, Satyanarayana; & Calderon, Angela I.

**Department:** Drug Discovery and Development

**College/School:** Harrison School of Pharmacy

**Description:**

The most abundant liver cytochrome P450 isoform is CYP3A4, an enzyme that metabolizes most anticancer agents. Evidently, patients consume botanical dietary supplements (BDS) to complement anticancer drugs. However, BDS increase CYP activity and metabolic processing and decrease the efficacy of conventional drugs. This study investigated CYP3A4 induction due to *Lepidium meyenii* Walpers (maca) and *Euterpe oleracea* Mart. (açai) extracts and explored their impact on metabolic clearance rate and toxicity of anticancer drugs in human hepatocytes. Methanol and acidic methanol extracts of açai and maca underwent parallel artificial membrane permeability assay (PAMPA) to determine passive intestinal absorption and bioavailability of CYP-inducing compounds in the extracts. Donor and acceptor sites of the PAMPA plate were chemical fingerprinted to identify extent of absorption for CYP-inducing compounds. Extracts were dissolved in DMSO. DMSO concentration was optimized to ensure extract solubility and to control for toxicity caused by DMSO to CYP3A4. After human hepatocytes were treated with varying concentrations of extracts, cDNA synthesis, mRNA extraction and qPCR were used to measure mRNA expression of CYP3A4 due to extracts compared to the control. Induction assays showed cytotoxicity after 20 hours in hepatocytes treated with 1.5 ug/uL açai methanol and acidic methanol donor sites of PAMPA. Açai methanol extract at 1.5 ug/uL showed significant CYP3A4 induction after PAMPA; maca extract showed low inhibitory activity. This suggests that consuming açai supplements may increase metabolic clearance of anticancer drugs and decrease the efficacy of chemotherapy.

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**Title:** Personality and work-life balance: The influence of affect

**Primary Author:** Lorys, Anna J.

**Additional Author:** Dikosavljevic, Andrea

**Department:** Psychology

**College/School:** College of Liberal Arts

**Description:**

The employment of workers who are able to perform their tasks in an exceedingly satisfactory manner while achieving work-life balance (WLB) has become significantly important to organizations. This study aimed to investigate the relationships between two of the most successful predictors of employee performance: conscientiousness and neuroticism. Despite calls from the popular press of personality affecting WLB (Sprouse, 2016), there has been no empirical study to bridge these areas together. Conscientiousness was hypothesized to positively relate to perceptions of WLB, while neuroticism was thought to negatively relate to WLB (e.g., Costa & McCrae, 1980; Hogan, 1998). Additionally, affect may mediate the relationship between personality variables and work attitudes (Kafetsios & Zampetakis, 2008). Therefore, we posited that positive affect will mediate the relationship

between conscientiousness and WLB and negative affect will mediate the relationship between neuroticism and WLB. Through a demographically diverse sample, surveys were collected at two time points using Amazon's Mechanical Turk. We found partial to full support for all hypotheses. More specifically, conscientiousness was positively related to WLB perceptions while neuroticism was negatively related to WLB perceptions. Additionally, positive affect did mediate the relationship between conscientiousness and WLB effectiveness; however, positive affect did not mediate the relationship between conscientiousness and WLB satisfaction. On the other hand, negative affect did mediate the relationship between neuroticism and WLB effectiveness and satisfaction. Implications for organizations and future directions are included in the discussion.

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**Title:** Characterization of ErbB4 partial agonists: Putative targeted melanoma therapeutics

**Primary Author (and presenter):** Lucas, Lauren

**Additional Authors:** Cullum, Richard; Senfeld, Jared; Harris, Mackenzie; Piazza, John; Neel, Logan; Gupta, Ram; & Riese, David

**Department:** Drug, Discovery, and Development

**College/School:** Harrison School of Pharmacy

**Description:**

Gain-of-function mutations in the ErbB4 receptor tyrosine kinase have been found in a significant fraction of melanoma cell lines that are dependent on ErbB4 for proliferation. However, there is a scarcity of therapeutics for treating these ErbB4-dependent tumors. Our drug discovery approach is based on the observation that the Q43L mutant of the ErbB4 agonist Neuregulin 2beta (NRG2b) functions as a partial agonist/antagonist at ErbB4. NRG2b/Q43L stimulates ErbB4 tyrosine phosphorylation, fails to stimulate ErbB4-dependent cell proliferation, and competitively antagonizes agonist stimulation of ErbB4-dependent cell proliferation. ErbB4 partial agonists that function as antagonists at ErbB4 may hold promise as targeted therapeutics for ErbB4-dependent melanomas. An automated phospho-ErbB4 sandwich ELISA and automated, high-throughput screening (HTS) proliferation assays were developed and deployed to identify small-molecule compounds that are likely to function as ErbB4 partial agonists. The search revealed 3 small molecules capable of specifically inhibiting agonist-induced ErbB4-dependent cellular proliferation and 3 small molecules that inhibit both ErbB4 and IL3 (Interleukin-3)-dependent cellular proliferation via an assumed shared mechanism of action. This assumption is based on similarity of dose dependent response to small-molecule inhibition of receptor-dependent proliferation despite agonist induced cell proliferation. Due to the lack of potency of the specific molecules, they are not tested further. The most potent molecule of those inhibiting both ErbB4 and IL3-dependent cell proliferation (AU-39) is being tested to determine mechanism of action by probing for activity of downstream signalling effectors shared by ErbB4 and IL3 receptor. Molecules that are partial agonists for both ErbB4 and IL3 receptor hold promise as targeted therapeutics for tumours such as Melanoma and others that are dependent on signalling effectors downstream of both ErbB4 and IL3 receptors.

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**Title:** PPAR $\gamma$  agonist attenuates  $\beta$ -Amyloid by modulating amyloidogenic pathway in an *in vitro* model

**Primary Author (and presenter):** Lynd, Tyler, O

**Additional Authors:** Govindarajulu, M.; Briggs, G.; Ramesh, S.; Majrashi, M.; Suppiramaniam, V.; Moore, T.; & Dhanasekaran, M.

**Department:** Department of Drug Discovery and Development

**College/School:** Harrison School of Pharmacy

**Description:**

Pioglitazone is a PPAR $\gamma$  agonist known to exhibit antioxidant and neuroprotective effects in several experimental models. Amyloid  $\beta$  peptide (A $\beta$ ) is one of the pathological hallmarks of Alzheimer's disease (AD) characterized by its accumulation into extracellular senile plaques in the brain leading to cognitive impairment and neuron death. The present study evaluates the cytoprotective actions of pioglitazone on the amyloidogenic pathway. Cultured APP-expressing CHO cell line was rescued from an insulin positive control. Hyperinsulinemia exacerbates the manifestation of AD through reducing the suppression of APP processing. CHO-APP cells treated with insulin exhibited oxidative stress as seen by increased ROS generation and lipid peroxidation. Furthermore, insulin treatment stimulated A $\beta$  production in a dose-dependent manner by increasing BACE1 expression and activity. Interestingly, pioglitazone treatment significantly exhibited antioxidant activity, increased mitochondrial complex I and complex IV activity and reversed insulin-mediated effects by reducing BACE1 expression, BACE1 activity, A $\beta$ 1-40 and A $\beta$ 1-42 levels. This resulted in enhanced cell morphology and improved cell viability. These findings highlight the modulatory effects of pioglitazone on the *in vitro* amyloidogenic pathway, providing evidence for potential neuroprotective effects.

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**Title:** Experiential urbanism: an unaverage approach to understanding cities

**Primary Author (and presenter):** Maggi, Lisa, L

**Additional Authors:**

**Department:** Architecture, Planning, and Landscape Architecture

**College/School:** College of Architecture, Design, and Construction

**Description:**

Based on a close reading and analysis of Jean-Paul Clebert's *Paris Vagabond*, my presentation aims to discuss how the architects in the formalized world of mid-century Modernism and the laymen residents of a city had different ways of dealing with urban settings. In doing so, the former's Modernist housing projects (criticized by Clebert) and the latter's idiosyncratic use of space will be analyzed and compared. Mid-century urban design was not characterized by a concern for the "unaverage," or unique, aspects of a city; rather, they tried to standardize cities through design ideals such as the International Style. Though not a designer, Clebert values and discusses in detail the peculiarities of spaces and functions concocted by the laymen residents – an effort which Modernists sought to homogenize. In her book, *The Death and Life of Great American Cities*, the urbanism theoretician, Jane Jacobs stresses the importance of the idiosyncrasies of street life. She argues that it is these idiosyncrasies rather than numbers and statistics, as the Modernist urban planners and architects emphasized, that are the measure of a city. This presentation contends that when read together, both readings give insight towards a new path we as urban designers should take when dealing with the complex settings found within urban environments. This path is becoming more relevant as incoming generations choose where to settle and build careers based on a city's complexity in culture and spatial settings rather than statistics.

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**Title:** Image analysis of sub-gross stains for a feline neurodegenerative disease

**Primary Author (and presenter):** Maguire, Annie S.

**Additional Authors:** Gray-Edwards, Heather; Ellis, Lauren; Voss, Taylor; Sena-Esteves, Miguel; & Martin, Douglas

**Department:** Anatomy, Physiology and Pharmacology

**College/School:** College of Veterinary Medicine

**Description:**

GM2 gangliosidosis is a lysosomal storage disease that results in the deficiency of  $\beta$ -hexosaminidase (Hex) enzyme and subsequent accumulation of GM2 ganglioside in lysosomes. The

feline model most closely represents the infantile form of the human disease, which typically causes the death of affected children between 3-5 years old. To treat affected cats in preclinical studies, feline Hex was delivered via intracranial injections of adeno-associated viral (AAV) vector into the thalamus and deep cerebellar nuclei. Tissues from the central nervous systems (CNS) of treated cats are routinely stained with Naphthol (for Hex activity), and PAS (Periodic acid-Schiff, for lipid storage) to determine the impact of treatment in specific CNS regions. However, due to the monochromatic nature of these stains, quantitative and qualitative image analysis are indicated to maximize the understanding of gene therapy treatment. Naphthol and PAS-stained slides of CNS tissues from normal, untreated, and treated cats were scanned on a standard flatbed scanner, and the images were imported into ImageJ software. For qualitative analysis, brightness and contrast of each image was auto-enhanced by ImageJ (with an internal standard), then a thermal Lookup Table was applied to create a heat map. For quantitative analysis, each pixel was categorized using a standard intensity threshold into either stained or unstained, and then tissue or background. Heat maps enhanced qualitative perception of stained tissue by emphasizing subtle differences in stain intensity. The quantitative method was validated through regression analysis comparing these results to specific activity of Hex previously determined by quantitative assays with a synthetic substrate. Image analysis of sub-gross stains is a valid and useful method for describing the pathology of GM2 and determining the success of efforts to treat it.

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**Title:** Evaluation of differential cytotoxic effects of Tri-Fluoro-Methyl-Phenyl-Piperazine derivatives

**Primary Author (and presenter):** Majrashi, Mohammed, A.

**Additional Authors:** Almaghrabi, M.; Desai, D.; Fujihashi, A.; Clark, C.R.; Deruiter, J.; & Dhanasekaran, M.

**Department:** Drug Discovery and Development

**College/School:** Harrison School of Pharmacy

**Description:**

Designer drugs, which are structural analogues of drug of abuse, are tremendously dangerous and harmful to the current and future society. The use of designer drugs has increased in the United States and around the world. Their serious threat arises from the false perception of safety that the designer drugs gained because of the shortcoming in the legislative system. Currently, TFMPP derivatives are being misused with limited reports on its harmful effects. Our present study was to investigate the differential cytotoxic effects of the designer drug- Tri-Fluoro-Methyl-Phenyl-Piperazine derivatives (2, 3 and 4 TFMPP). In this study the differential cytotoxic effects of the designer drug- Tri-Fluoro-Methyl-Phenyl-Piperazine derivatives (2, 3 and 4 TFMPP) were evaluated in N27 rat dopaminergic neural cells and HT-22 mouse neuronal cells using MTT assay. All statistical analyses were performed using the Prism-V software (La Jolla, CA, USA). All data are expressed as means  $\pm$  SEM. Statistical analyses were performed using one-way analysis of variance (ANOVA) followed by an appropriate post-hoc test including Tukey's and Dunnett's method ( $p < 0.05$  was considered to indicate statistical significance). TFMPP derivatives showed significant cytotoxicity in HT-22 mouse neuronal cells as compared to N27 rat dopaminergic neural cells. Furthermore, TFMPP derivatives in HT-22 mouse neuronal cells had significantly higher neurotoxic effect as compared to the endogenous toxins, glutamate and hydrogen peroxide. The social abuse of designer drugs can result in chronic brain damage resulting in irreversible movement and memory disorders.

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**Title:** Sediment fingerprinting to identify sources of in-stream sediments in an urban watershed

**Primary Author (and presenter):** Malhotra, Kritika

**Additional Authors:** Lamba, Jasmeet; Srivastava, Puneet; & Shepherd, Stephanie

**Department:** Biosystems Engineering

**College/School:** College of Agriculture

**Description:**

Excessive delivery of fine-grained sediment and sediment-bound nutrients to surface waters results in water quality impairment. Information on the relative contribution of different sources contributing sediment to river systems is a prerequisite to implementing efficient management practices. In this study, we used sediment fingerprinting technique in an urbanized, 31 km<sup>2</sup> Moore's Mill Creek watershed to quantify the relative contribution of surface (construction sites) and subsurface (stream banks) sources to in-stream sediment. This technique is based on linking the physical or geochemical properties of the in-stream sediment to their corresponding sources within the watershed and thereby determine relative contribution from different sources. Results on the relative contribution from different sources to in-stream sediment will be presented.

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**Title:** Neuropeptide Y and Dipeptidyl Peptidase IV in Pre- and Post-Menopausal Women.

**Primary Author (and presenter):** Mann, Elise, K.

**Additional Authors:** Kluess, Heidi; Neidert, Leslie; La Mantia, Anna; Sandage, Mary; Plexico, Laura

**Department:** Department of Communication Disorders

**College/School:** School of Kinesiology

**Description:**

The purpose of this study was to investigate changes in neuropeptide Y (NPY) protein and dipeptidyl peptidase IV (DPP-IV) activity in the plasma and saliva in normally cycling women and women after menopause. We recruited seven premenopausal women and seven post-menopausal women for the study. Blood via venipuncture and saliva samples were taken at each point in the menstrual cycle (pre-menopausal) or once per week (post-menopausal) for 2 months. Blood and saliva were analyzed for estrogen, neuropeptide Y using ELISA's and DPP-IV activity using a fluorometric assay. Plasma  $\beta$ -estradiol was an average of  $96.45 \pm 57.04$  pg/ml over 2 cycles in the pre-menopausal group and  $1.72 \pm 0.35$  pg/ml over 2 months in the post-menopausal group ( $p < 0.05$ ). In the pre-menopausal group, there were no significant differences in saliva or plasma NPY or DPP-IV over the cycle. For the post-menopausal group, salivary NPY and DPP-IV did not change over 2 months. Plasma NPY was lowest in the middle 2 weeks (average:  $0.52 \pm 0.10$  ng/ml) compared to the first and 4th weeks (average of week 1 and 4:  $0.60 \pm 0.14$  ng/ml;  $p < 0.05$ ). Plasma NPY in postmenopausal women was higher overall ( $0.56 \pm 0.13$  ng/ml) compared to pre-menopausal women ( $0.30 \pm 0.11$  ng/ml;  $p < 0.05$ ). Plasma DPP-IV activity was unchanged by time in the post-menopausal group. Saliva DPP-IV and saliva NPY in the pre-menopausal group had a significant negative correlation ( $R = -0.95$ ;  $p < 0.05$ ). We found that saliva measures of NPY and DPP-IV activity are poor estimates of plasma concentrations and activities. Differences in plasma NPY concentrations between the groups and the relationship between salivary NPY and DPP-IV suggests that there are some unique differences between these groups.

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**Title:** Serving survivors of institutional abuse

**Primary Author (and presenter):** Marberry, Katie

**Department:** Sociology, Anthropology, and Social Work

**College/School:** College of Liberal Arts

**Description:**

This research seeks to answer the question "What are effective strategies for social workers to best serve survivors of institutional abuse?" Institutional abuse is prevalent throughout our society, from "self-help" group Nxivm that brands and blackmails the women that join its ranks to Michigan State

University's and USA Gymnastics' horrific oversight of Larry Nassar's abuse of hundreds of girls and women. This topic is significant to social work practice because institutional abuse can happen anywhere, including schools and organizations of long established religion. We think of cults as a sensationalized phenomenon that enraptures public imagination but rarely happens in the real world. On the contrary, cultlike abuse covertly takes place in a variety of commonplace, innocuous institutions. Therefore, social workers must be prepared to serve clients who have experienced this form of control and brainwashing based abuse. This study conducted a literature review on therapeutic services for survivors of institutional and cult abuse, to inform a poster presentation in a graduate course. The literature showed that survivors need a humanistic, open ended therapeutic approach that allows for long term treatment. Survivors benefit from group therapy, and a psychodynamic approach can rebuild dysfunctional schemas to prevent them from re-entering an abusive institution. Social workers must also be sensitive to individual triggers of clients, and be mindful of the potential for vicarious traumatization of themselves as workers. By understanding approaches to trauma caused by institutional abuse, social workers will be better able to serve clients who have survived a controlling religious, educational, social, or therapeutic environment.

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**Title:** Viral challenge impairs learning and memory in a fear-conditioning paradigm

**Primary Author (and presenter):** Martens, Brannan William

**Additional Authors:** Heslin, Ryan; Setti, Sharay; Jeminiwa, Bamidele; & Reed, Miranda

**Department:** Drug Discovery and Development

**College/School:** Harrison School of Pharmacy

**Description:**

A body of clinical and experimental evidence has demonstrated that aberrant cerebral insulin signalling is the initial event in the most frequently diagnosed form of Alzheimer's disease, sporadic Alzheimer's disease (SAD). We have recently demonstrated that challenge with a viral mimic, polyinosinic-polycytidylic acid (PIC), induces a robust hippocampal hyperexcitability. Because hippocampal hyperexcitability correlates with cognitive impairment and predicts development of AD, and viral infections are a risk factor for AD, we next examined whether PIC challenge exacerbates deficits in a preclinical model of SAD. SAD was induced by intracerebroventricular injection of streptozotocin (STZ) or vehicle (aCSF). Mice were injected with either PIC or saline at 5 different time points, and their body weights recorded and locomotive behavior measured as an indicator of successful injections. Memory deficits were tested in a contextual fear-conditioning paradigm. For training, mice were introduced to a context consisting of peppermint oil and three shocks (0.7mA, 2s shocks). Twenty-four hours later, hippocampal-dependent memory was tested by reintroducing the mice to the training context, without the shocks, and measuring freezing behavior. STZ mice that had been challenged with PIC showed the most significant decrease in freezing behavior, relative to STZ mice with no viral challenge, non-STZ mice with PIC challenge, and the saline-treated controls. These findings may aid in future therapeutic targets to prevent these exacerbations induced by viral infections from further cognitive impairment.

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**Title:** Direct and indirect discrimination: The role of vicarious racism on disease outcomes among African American women with systemic lupus erythematosus

**Primary Author (and presenter):** Martz, Connor D.

**Additional Authors:** Fuller-Rowell, Tom; Nuru-Jeter, Amani M.; Spears, Erica; Hunter, Evelyn; Lim, S. Sam; Drenkard, Chrisina, M.; & Chae, David H.

**Department:** Human Development and Family Studies

**College/School:** College of Human Sciences

**Description:**

Vicarious racism is characterized as the secondhand exposure to racism or racial discrimination. Previous research on direct interpersonal discrimination has established a consistent relationship with adverse health outcomes, yet research on the secondhand exposure to discrimination is limited. We examined associations between interpersonal discrimination, vicarious racism, and cumulative disease damage among African American women with systemic lupus erythematosus (SLE). We used ordinal least squares regression models to examine SLE damage among 438 African American women in metropolitan Atlanta, Georgia recruited to the BeWELL Study. After controlling for demographic, socioeconomic, and health-related covariates, greater reports of interpersonal discrimination were associated with worse SLE damage, while greater experiences of vicarious racism were associated with lower scores of SLE damage. Results suggest that direct experiences of interpersonal discrimination may contribute to worse SLE damage. Exposure to vicarious racism may buffer the effects of interpersonal discrimination, in line with the personal/group discrimination discrepancy. Future research may further examine the nuanced relationship between direct experiences and secondhand exposure to discrimination and racism.

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**Title:** Thermal simulation of large Ti-6Al-4V parts during laser-powder bed fusion

**Primary Author (and presenter):** Masoomi, Mohammad

**Additional Authors:** Shamsaei, Nima & Thompson, Scott

**Department:** Mechanical Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Laser-powder bed fusion (L-PBF) is an additive manufacturing method that employs a directed laser to fabricate parts layer by layer from powder feedstock. The mechanical response and fatigue life of such parts are directly affected by the thermal history experienced during fabrication. A major challenge developing a model that can produce reliable knowledge at the overall scale of the desired part and build-process to inform engineering decisions. There can be kilometers of laser travel length and thousands of powder layers in a single build, thus presenting a computational challenge. In this study, a numerical model is employed for predicting the temperature distribution, local temperature gradients and cooling rates in Ti-6Al-4V parts during their L-PBF. To be useful, the simulation was done in a reasonable amount of time while retaining sufficient physical fidelity so as to yield trustworthy results. Additionally, the gas inside the chamber was modeled and convective and radiative heat flux were calculated directly from the simulation. The study demonstrates a unique means to model the L-PBF quickly, i.e. through adaptive mesh refinement, which localizes more resolution in the vicinity of the active material transformation. In addition, the study demonstrate a method that can ‘lump’ multiple layers together while employing an ‘effective’ laser beam. The model has been validated using experimental melt pool measurements from the literature.

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**Title:** Evaluation of training volume, dietary intake, and energy balance in Army IET

**Primary Author (and presenter):** McAdam, Jeremy S.

**Additional Authors:** McGinnis, K.; Ory, R.; & Sefton, J.

**Department:** Kinesiology

**College/School:** College of Education

**Description:**

The purpose of this study was to evaluate training volume and dietary intake, and estimate energy balance in Army Initial Entry Training (IET) soldiers. Dietary intake was assessed by collecting diet logs for 3 meals on each of 3, non-consecutive days during the first week of IET. Training volume was measured across 13 weeks using Actigraph wGT3X accelerometers. A total of 111 (mean  $\pm$  SD, age = 19

$\pm 2$  years, mass = 71.6.  $\pm 12.4$  kg) male trainees were monitored and completed diet logs; monitoring occurred at all time, with 12 soldiers assessed each week. Energy expenditure estimates were calculated using metabolic equivalents and actigraph reported intensities and duration. On average IET soldiers daily accumulated 273  $\pm$  62 min low, 107  $\pm$  42 min moderate, 26  $\pm$  22 min vigorous, and 10  $\pm$  21 min of very vigorous intensity physical activity across 13 weeks of training. Estimated overall energy expenditure was 3184  $\pm$  460 calories per day with a negative net energy balance of -540  $\pm$  895 calories. Regression analysis revealed body weight was a significant predictor (adj.  $R^2 = 0.5512$ ,  $p < 0.001$ ) for negative energy balance. For every 1-kilogram increase in body mass, energy balance became more negative by 52.4 calories. IET is a physically demanding environment with large volumes of training and high energy expenditures. IET soldiers are likely exposed to chronic net negative energy balance, those weighing more are at an elevated risk. Nutritional strategies including supplementation may be needed to meet the calorie demands of training.

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**Title:** Writing assignment assessment in interior design: An action research project

**Primary Author (and presenter):** McCann, Abbi-Storm

**Additional Authors:** Parson, Laura

**Department:** Consumer and Design Sciences

**College/School:** College of Human Sciences

**Description:**

Compared to similar programs nationally, Auburn University Interior Design program graduates have ranked low in written communications. In an attempt to improve the writing abilities and scores, this action research project is implementing writing early in the program. In this action research study, we explore the process of implementing a series of writing assignments in the sophomore CADS 2500 course, a required course for interior design majors. Through this study, we hope to describe the process of implementing writing assignments that align with course content goals and provide specific writing instruction and assess the effectiveness of the instructional intervention. First, we will add three descriptive language writing assignments into the sophomore interior design course CADS 2500 with due dates approximately every month during the Spring 2018 semester. In addition to the written assignments, students will also participate in weekly discussion board posts where they will respond to a written prompt and practice giving feedback to their peers to help them develop the writing skills that they will need for the formal written assignments. The written assignments will be submitted without the student's name in canvas. Separate from the grading process, those blinded papers will be assessed using a rubric that measures written communication skills for research purposes. There will be no identifying information on any submitted assignment; only the rubric will be analyzed as a part of this study. The main focus of this work will be on the process of implementing a writing intervention in an interior design classroom.

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**Title:** Prospective associations between peer stress and voluntary coping responses: The moderating role of involuntary responses to peer stress

**Primary Author (and presenter):** McConnell, Leanna M.

**Additional Authors:** Erath, Stephen

**Department:** Human Development and Family Studies

**College/School:** Human Sciences

**Description:**

Peer problems (peer victimization and rejection) generally predict less engaged and more disengaged voluntary coping responses. Peer stress may make it particularly difficult to cope effectively

due to the chronic nature of peer stress. Whether peer stressors undermine effective voluntary coping responses may depend on how children respond automatically, or involuntarily. The present study examines whether the association between peer stress and voluntary coping responses may be moderated by involuntary responses to peer stress. Data were collected from 123 early adolescents when they were initially in the fifth and sixth grades and again ten months later after the transition to middle school. Peer victimization and rejection were measured by adolescents, parents, and teachers. Voluntary coping responses include self-reported coping with lab-based peer-evaluative stress in real time and self-reported coping with peer stress in general. Involuntary physiological responses to peer-evaluative stress in the lab were objectively measured via skin conductance level reactivity (SCLR) a marker of the sympathetic branch of the autonomic nervous system (ANS), and respiratory sinus arrhythmia reactivity (RSAR), a marker of the parasympathetic branch of the ANS. Subjectively-measured involuntary responses to peer stress were self-reported (e.g., rumination, escape). Regression analyses will be performed to examine whether peer stress predicts voluntary coping strategies across the transition to middle school. Furthermore, measures of involuntary responses to peer stress will be examined as moderators of that association. It is hypothesized that peer stress will predict less engaged and more disengaged coping responses for adolescents with higher levels of subjective involuntary responses to stress. Peer stress will predict more engaged and less disengaged coping responses for adolescents with lower levels of physiological responses to stress (i.e., SCLR and RSAR).

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**Title:** Influence of Varying Environmental Temperatures on Individuals with Persistent Cold Hands

**Primary Author (and presenter):** McDaniel, Jackson H.<sup>1</sup>

**Additional Authors:** Pascoe, David<sup>2</sup>; Roberts, Franklin<sup>1</sup>; Munford, Petey<sup>2</sup>; Taylor, Catherine<sup>1</sup>

**Department:** BMSC<sup>1</sup>, KINE<sup>2</sup>

**College/School:** COSAM<sup>1</sup>, COE<sup>2</sup>

**Description:**

Some individuals experience “cold hands” (CHI) when exposed to a thermoneutral environment (18-25°C). While our normative control (NC) presented with a mean hand skin temperature (MHST) of  $30.24 \pm 2.33^\circ\text{C}$ , the CHI presented with hand temperatures of  $25.89 \pm 1.57^\circ\text{C}$  in a thermally comfortable environment. This represents a  $4.35^\circ\text{C}$  difference in hand temperature within the same environmental conditions. While these individuals are aware of their “cold” acral tissues (tissues anatomically designed for heat transfers) for long durations, none were able to associate a cause that elicits the response. The study investigated acral hand tissue response to varying temperatures (10-32°C). The participants were college aged and apparently healthy as determined from a questionnaire. The individuals were scheduled for five randomly assigned environmental sessions at 10, 16, 21, 26, 32°C with 35% relative humidity. Sessions were separated by 24 hours and performed during the same time of day. Environmental exposure consisted of standing in the environmental chamber while infrared images of the anterior and posterior hands were taken after an equilibration period and 20 minutes post. A rectal probe recorded core temperature at 0, 10, and 20 minutes. A significant difference between NC and CHI participants was observed when comparing the MHST across all intervention chamber temperatures. Significant differences in MHST were observed between groups at both 16 and 21°C, but not at the coldest and warmest temperatures. We suspect that the abnormal participants’ lower temperature in the hands at thermoneutral environmental conditions indicate some level of vasospasm. We do not know the mechanism(s) behind the CHI response. Our data indicates a progressive increase in MHST as the environment becomes warmer in the NC. In contrast, the CHI remained relatively unchanged until the environment reached 26°C, from which the hand temperatures became similar between groups.

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**Title:** Impact of protein or carbohydrate supplementation on musculoskeletal injury rates, severity and training days missed in initial entry training

**Primary Author (and presenter):** McGinnis, Kaitlin D.

**Additional Authors:** McAdam, Jeremy; Young, Kaelin; Lockwood, Chris; Roberts, Michael; & Sefton, JoEllen

**Department:** Kinesiology

**College/School:** College of Education

**Description:**

High musculoskeletal injury (MSI) rates in Army initial entry training (IET) affects medical costs, soldier health and national security. A placebo controlled, double-blind study, with historical data assessed if protein (PRO) and/or carbohydrate (CHO) supplementation affects MSI rates, severity and training days missed. IET Soldiers were divided into four groups: 1) 1 PRO, 2) 1 CHO, 3) 2 PRO or 4) 2 CHO shakes per day. PRO or CHO shakes were consumed after physical training and before bed, or before bed only. Non-matched pairs group averages were used for comparison to 2015/2016 historical data, during the same training months within the same unit. Odds Ratio, Chi-square and Wilcoxon ranked-sum test compared supplementation to no-supplementation, number of shakes, and PRO to CHO shakes. There was no difference between 1 PRO or 1 CHO shake for MSI rates ( $\chi^2=1.15, p=0.28$ ), severity ( $\chi^2=0.18, p=0.67$ ) or training days missed ( $W=150.5, p=0.49$ ). There was no difference between 2 PRO or 2 CHO shakes for MSI rates ( $\chi^2=0, p=1.0$ ), severity ( $\chi^2=0, p=1.0$ ) or training days missed ( $W=12, p=1.0$ ). There was no difference between drinking 1 or no shakes on MSI rates ( $\chi^2=1.33, p=0.25$ ), severity ( $\chi^2=0.07, p=0.80$ ) or missed training days ( $W=1895, p=0.35$ ). Soldiers with no supplementation were 5x more likely to sustain an MSI than Soldiers drinking 2 shakes ( $\chi^2=58.48, p<0.001$ ). Soldiers consuming no shakes were 4x more likely to miss training due to MSI than Soldiers drinking 2 shakes ( $\chi^2=9.73, p=0.003$ ). Additionally, Soldiers drinking no shakes missed 5 more training days than soldiers drinking 2 shakes ( $W=6059.5, p=0.02$ ). Soldiers drinking 1 shake were 3x more likely to sustain a MSI than Soldiers that drank 2 shakes ( $\chi^2=9.55, p=0.002$ ). There was no significant difference between 1 or 2 shakes for severity ( $\chi^2=0.04, p=0.85$ ) or training days missed ( $W=79.5, p=0.21$ ). Increasing IET Soldier's caloric intake, regardless of shake type, positively impacted MSI rates, severity and missed training days.

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**Title:** The morphology of two unknown ectoparasites found on black-and-whited ruffed lemurs (*Varecia variegata*) and grey mouse lemurs (*Microcebus murinus*) in Madagascar

**Primary Author (and presenter):** McGirt, Shakara, K

**Additional Authors:** Durden Lance; Zohdy, Sarah

**Department:** Forestry and Wildlife

**College/School:** School of Forestry and Wildlife Sciences

**Description:**

Lemurs are non-human primates endemic to the island of Madagascar. Due to habitat loss they are the most endangered mammal group in the world. Few studies have investigated the ectoparasites of lemurs, which are similarly threatened as their hosts are. Here we morphologically describe the ectoparasitic mites found on black-and-white ruffed lemurs (*Varecia variegata*) and grey mouse lemurs (*Microcebus murinus*) using scanning electron microscopy (SEM). We imaged Atopomelid mites from mouse lemurs and Mesostigmatid mites from ruffed lemurs that are previously undescribed (from the collections at LA Durden). Females and males of both species were imaged. The Atopomelid mite is about 2 micrometers in size, it has an elongated body, visible reproductive organs, and 8 legs. The Mesostigmatid mite is about 700 micrometers in size, has a round thick dorsal shield, flat body, 2 antennae, and 8 legs. Images will be used to further describe these ectoparasite species, and to better understand their relationship with lemurs.

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**Title:** Assessing Interobserver Replicability in the Scoring of Enteseal Marking through 3D Technology

**Primary Author (and presenter):** McLaughlin, Kyle, W

**Additional Authors:** 2<sup>nd</sup> Shuler, Kristina

**Department:** Anthropology

**College/School:** Sociology, Anthropology, and Social Work

**Description:**

This research assesses replicability in the scoring of entheses using standard visual methods on dry bone, 3D-scans, and 3D-prints from the appendicular skeleton. 42 entheses (subscapularis, pectoralis major, extensor carpi radialis longus, quadriceps femoris, and soleus) from the Newton Plantation osteological series were scored from seven bones that were used to create three identical scoring sets: dry bones and corresponding 3D-scans and 3D-replicas. NextEngine© scans (29K resolution) were printed via Makerbot Replicator©. Enteses were then scored independently by two observers of varying experience levels using a set of standards.

Percent agreement (57%) was identical for dry bones and 3D-scans with attachment sites combined. 3D-prints had slightly lower agreement between observers (54%). Agreement between scorers ranged from 50%-65% across attachments. The highest agreement was seen in soleus and lowest in quadriceps femoris. Overall, agreement was low for both the Hawkey and Merbs (55%) and Villotte (57%).

Low replicability may stem from subjectivity in scoring, although experience did not seem to impact agreement. Small samples scored within a brief (one-hour) period may have had the greatest influence, and intraobserver scoring may shed further light on this. In sum, this preliminary study does not suggest a major difference using entheses from real bone, versus 3D technology to assess, or between observers, though the results continue to suggest the need for refined scoring methods.

**Title:** A nurse-led intervention to improve cancer-related pain management

**Primary Author (and presenter):** McLeod, Hope T.

**Department:** School of Nursing

**College/School:** Auburn University of Montgomery

**Description:**

Managing cancer pain requires a comprehensive, multidimensional approach and presents a unique challenge. Strong evidence was found from a literature search to support the use of psychoeducational interventions that include educational, skill-building, and nurse-coaching elements. The use of these nurse-led interventions is believed to result in improvement in knowledge deficits regarding pain management, improved overall pain scores for cancer-related pain, improved patient satisfaction with their pain management, and improved quality of life for the patient experiencing cancer-related pain. This project will test the use of nurse-led interventions to improve cancer-related pain management in an outpatient oncology setting at The Cancer Center of East Alabama. Participants are adult oncology patients who are experiencing cancer-related pain. Participants will complete initial questionnaires to evaluate their knowledge of cancer pain management and to examine their current pain levels and quality of life. Participants will then receive the intervention sessions, which will consist of four weekly visits (either by phone or in person) with the project leader. During these sessions, participants will be taught to use a pain diary, taught non-pharmacologic pain management strategies, provided educational materials targeted at addressing any knowledge deficits identified, and provided with coaching on topics such as how to communicate with their provider regarding their pain management. At the conclusion of the project, participants will again complete the questionnaires. Outcomes measured will be pain levels, patient satisfaction with pain management, and quality of life. Measurement tools will be the Brief Pain Inventory (short form) and the Family Pain Questionnaire. The

results of this project will be used to determine the usefulness of implementing these interventions on a larger scale to provide improved pain management and quality of life for oncology patients.

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**Title:** Exploiting active-site tryptophans for off-pathway electron transfer: Preserving the activity of peroxide detoxifying enzymes

**Primary Author (and presenter):** McWhorter, Kirklin, L.

**Additional Authors:** Xu, Hui; Goodwin, Douglas

**Department:** Department of Chemistry and Biochemistry; Auburn, AL

**College/School:** College of Science and Mathematics

**Description:**

A near universal response of higher eukaryotes to infection is the production of large amounts of hydrogen peroxide as part of elaborate pathogen killing mechanisms. Catalase-peroxidase (KatG) is central to the defense of many pathogens against this assault. KatG stands out among H<sub>2</sub>O<sub>2</sub>-degrading enzymes because it uses two mechanisms to do so, catalase and peroxidase. Also, against all expectations that these two activities would be mutually antagonistic, we have shown that peroxidatic electron donors (PxEDs) *enhance* catalase activity by an order of magnitude. This synergistic cooperation requires efficient handling of off-mechanism electron transfer events. We have shown that an active-site tryptophan, Trp321, is a key amino acid for this process. Even in the absence of a PxED, Trp321 ensures that off-pathway electron transfer is handled to the greatest extent possible, thereby sustaining H<sub>2</sub>O<sub>2</sub> decomposition. Another striking feature of KatG is the large number of tryptophans in its structure; along with Trp321, three others are close to the active site, most prominently Trp412. The purpose of this study was to investigate other potential routes for off-pathway electron transfer. We used site-directed mutagenesis to replace Trp412 with non-oxidizable phenylalanine (i.e., W412F KatG). The W412F variant exhibited behavior nearly identical to W321F KatG in almost every respect. These data suggest that both residues (Trp 321 and Trp 412) may work in tandem to resolve off-catalase electron transfer events and preserve enzyme activity to maximize its ability to detoxify H<sub>2</sub>O<sub>2</sub>. Given the extensive use of KatG by pathogenic bacteria and fungi, these mechanistic features may have important implications for understanding the chemical warfare that rages between pathogens and their hosts.

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**Title:** Forecasting corn yields using remote sensing data and subseasonal weather forecasts

**Primary Author (and presenter):** Medina, Hanoi

**Additional Authors:** Tian, Di

**Department:** Crop, Soil and Environmental Sciences

**College/School:** School of Agriculture

**Description:**

Accurate and timely prediction of crop yields is important for decision making regarding food marketing strategies and crop insurance policies. Here we introduce a framework for predicting county-level corn yields using machine learning approaches with Moderate-resolution imaging spectroradiometer (MODIS) data and subseasonal climate forecasts from global extended-range numerical weather prediction models. The county-average yields from the USDA National Agricultural Statistics Service (NASS) are predicted using Random Forests (RF) and deep neural networks (DNN) techniques, with the inputs from MODIS NDVI and EVI layers at 16-day intervals and 500-m resolution over July and August, as well as daily retrospective forecasts of temperature, radiation, precipitation, evapotranspiration, and soil moisture over September. The models are cross-validated over 17 years, from 2000 to 2016. The predicting ability of the input climate variables is also evaluated. Since MODIS data

and sub-seasonal forecasts have global coverage, this framework based on the efficient machine learning techniques can provide accurate crop production estimations prior to harvest in any regions of the world.

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**Title:** Susceptibility and tolerance of loblolly pine to *Leptographium terebrantis*

**Primary Author (and presenter):** Mensah, John K.

**Additional Authors:** Sword Sayer, Mary A.; Nadel, Ryan L.; Matusick, George; Fan, Zhaofei; & Eckhardt, Lori G.

**Department:** Forestry

**College/School:** School of Forestry and Wildlife Sciences

**Description:**

*Leptographium terebrantis* is an opportunistic root pathogen commonly associated with loblolly pine (*Pinus taeda* L.) stands that are undergoing a loss of vigor in the southeastern US. In order to understand the relationship between *L. terebrantis* inoculum density and host physiology, an artificial inoculation study was conducted in a five-year-old naturally regenerated loblolly pine stand over a 24 week period in a completely randomized design. *L. terebrantis* caused sapwood occlusions that increased in severity as inoculum density increased. The occlusions significantly reduced water transport through the stem but did not interfere with fascicle-level stomatal conductance or induce moisture stress in the saplings. The resilience of stomatal conductance among pathogen-infested saplings is attributed to the growth and hydraulic function of new sapwood that developed after artificial inoculation. Results demonstrate that faster-growing families of loblolly pine may be capable of tolerating the vascular root disease when the formation of new sapwood is supported by sustained crown health.

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**Title:** Digging our own history: AUM tenant house archaeology

**Primary Author (and presenter):** Micher, Alexandra E.

**Additional Authors:**

**Department:** Sociology, Anthropology, and Geography

**College/School:** College of Public Policy and Justice- Auburn University at Montgomery

**Description:**

Prior to its founding in 1967, Auburn University at Montgomery's (AUM) campus lands were agricultural fields. These lands were once a part of the 20<sup>th</sup> century McLemore Plantation and were cultivated by tenant farmers through the 1960s. In Spring 2017, AUM students conducted archaeological excavations around the single surviving tenant house, which dates to circa 1930. Students found several artifacts associated with the people who occupied the house, giving a glimpse into their daily lives, including what they ate and drank, the health products they used, and pastimes they may have had. Additionally, spatial distribution of artifacts provided information about their use of the surrounding yard. This distribution, census records, and haint blue paint on walls provide evidence of the occupants' African ancestry. This poster provides information about the recovered artifacts, giving us a better understanding of the daily lives of tenant farmers. Additionally, information about the yard usage provides evidence of social and spiritual significance, based on cultural and ethnic background of occupants.

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**Title:** Harnessing solar energy for self-folding origami

**Primary Author (and presenter):** Miller, Noah S.

**Additional Authors:** Mailen, Russell W.

**Department:** Aerospace Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Self-folding origami has generated significant interest in recent years for its ability to convert flat, patterned substrates into three-dimensional shapes. Applications for self-folding origami include self-deploying shelters, containers for food and water, and biomedical devices. Polystyrene shape memory polymer sheets that can be printed on using a desktop printer may be used for self-folding origami. These sheets shrink to approximately half their size when heated above their glass transition temperature of 103°C. Self-folding using this material has been demonstrated in a laboratory setting by using infrared heat lamps to locally increase the temperature of the polystyrene sheets through local light absorption of patterned regions. This causes the sample to fold into a pre-determined shape. Unfortunately, the need for electrical power and the cost of the test apparatus are prohibitive. We address these limitations by utilizing inexpensive materials, such as cardboard and aluminum foil, to harness the energy of the sun and produce the same self-folding end-result of the heat-lamp apparatus. Our apparatus utilizes aluminum foil to reflect sunlight and uniformly heat a sample platform. This platform supports the self-folding sample and brings the material close to the folding temperature. The reflective area is oriented at an angle where it can reflect as much light as possible onto the platform. A convex lens above the platform focuses a portion of the light onto a sample placed on the heated platform. The focused light raises the temperature of the sample, initiating the self-folding process. We will evaluate multiple designs due to the low cost of materials and manufacturing. The initial prototype consists of a pentagon shaped reflector; however, we will build additional devices to evaluate the effects of reflector area, orientation, and shape. With further testing, we will demonstrate the potential of self-folding origami in remote locations.

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**Title:** Effect of statistical polythiophene copolymer microstructure on physical and optoelectronic properties

**Primary Author (and presenter):** Minkler Jr., Michael, J.

**Additional Authors:** Beckingham, Bryan S.

**Department:** Chemical Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

In recent years, interest in conductive polymers for application to organic-based electronics has grown immensely. Polythiophenes are an important class of conducting polymers that are widely studied due to their well-controlled synthesis, tuneable microstructure, and favorable optoelectronic and solid-state properties. The properties of polythiophenes can be greatly manipulated based on their microstructure (i.e. the molecular structure of the repeat unit or distribution of different repeat units). In order to gain a better understanding of how molecular structure can be used to engineer desirable material properties in polythiophenes, a series of statistical copolymers of 3-hexylthiophene (3HT) and unsubstituted thiophene are synthesized in varied comonomer compositions and their optoelectronic and solid-state properties characterized. We choose these two monomers as 3HT has been highly studied, commercialized and used in a broad range of devices due to its processability and good optoelectronic properties and unsubstituted thiophene while less prevalent due to its poor solubility, has superior optoelectronic properties compared to 3HT. We characterize the molecular structure of synthesized copolymers via <sup>1</sup>H NMR spectroscopy and gel-permeation chromatography, optoelectronic properties with UV/Vis spectroscopy and the Spano Model, and solid-state properties using differential scanning calorimetry, thermogravimetric analysis and X-ray diffraction. Copolymer melting transitions vary with copolymer composition; however do not behave analogous to previously studied polythiophene copolymers that display melting temperatures that are a smooth function of the homopolymer melting temperatures. This trend is also observed in the UV light absorption spectra and corresponding optical band gap and is likely due to a shift in the structure of the crystalline unit cell for these copolymers.

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**Title:** Effects of U.S. federal and state generic drug policies on drug use, spending, and patient outcomes: A systematic review

**Primary Author (and presenter):** Mishuk, Ahmed Ullah

**Additional Authors:** Fasina,, Ifedolapo & Qian, Jingjing

**Department:** Health Outcomes Research and Policy

**College/School:** Harrison School of Pharmacy

**Description:**

Generic drug use has increased substantially over the last decade in the U.S. The aim of this study is to evaluate the effects of federal and state generic drug policies. A Systematic search was performed in June 2017 to retrieve potentially relevant studies using PubMed, Web of Science, PsycINFO, and Business Source Premier. Search was limited to the articles published in English, included human in the U.S., and included at least one outcome measure related to healthcare service utilization, spending, or patient outcomes. Total 4177 citations were identified, and 34 met eligibility criteria. Prior Authorization (PA) policies had shown to increase less expensive generic use, reduced spending without causing deterioration in patient's health-related quality of life. However, PA policies may result in increased non-adherence. Medicare prescription plan's generic drug benefits appeared to increase generic use and generate savings. However, limited access to brands may increase gaps in medication use and hospitalization risk. In general, state generic substitution laws had increased generic use and savings. But, states requiring consumers to provide consent prior to generic substitution had lower generic use. Medicare/Medicaid coverage cap policies were associated with increased out-of-pocket spending/reduced prescription use, and reduced prescription spending. Lowering cost-sharing was associated with increased use and better adherence. Implementation of Medicare Part D was found to decrease prescription spending, but had mixed evidence in overall generic use. However, policies such as generic coverage and generic substitution provision under Medicare Part D significantly reduced out-of-pocket spending, increased generic use, and decreased expenditure. Finally, early evidence showed reduced consumer's out-of-pocket spending after the Affordable Care Act. In conclusion, Policies targeting to increase generic use have resulted in reduced spending.

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**Title:** The fine structure of the tentacular apparatus of *Mnemiopsis leidyi*

**Primary Author (and presenter):** Mitchell, Dorothy G.

**Additional Authors:** Dong, Gen; Turtorro, Zeferin; Moss, Anthony G.

**Department:** Biological Sciences

**College/School:** College of Science and Mathematics

**Description:**

Ctenophores have recently attracted much attention because several multigenetic molecular analyses have proposed Phylum Ctenophora to be the sister taxon to all other animals (Science 342:1242592; Nature 510:109). The common Western Atlantic ctenophore *Mnemiopsis leidyi* is currently the object of intense ecological and physiological study. The tentacular apparatus of ctenophores is critical to feeding and very likely bears a diversity of sensory functions. The tentacular apparatus is composed of the tentacular bulb and affiliated tentacles or tentilla, which undergoes profound changes during metamorphosis during development of the adult ctenophore. We use correlative light and electron microscopy in conjunction with fine extracellular probe recording (c.f. Dong et al., this meeting) to demonstrate structure/function relationships within the *M. leidyi* tentacular bulb. Selected major features include: 1) unattached oral end of the bulb, including the canal; 2) what we interpret as a food absorptive layer of cells, confirming a recent report (Curr Biol 26:2814); 3) A distinct structural feature that we

interpret to be bulb neuropile; 4) A region of tentillar longitudinal fission and growth (TLFG) that moves laterally to either side of the bulb to 'feed' tentacular structure within the feeding groove; 5) a variety of unknown cell types at different stages of differentiation.

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**Title:** Investigating the scholl reaction for PI- extension of strained benzenoid macrocycles to PAH-containing macrocycles

**Primary Author (and presenter):** Mitra, Nirmal Kumar

**Additional Authors:** Merner, Bradley L.

**Department:** Chemistry and Biochemistry

**College/School:** College of Sciences and Mathematics

**Description:**

The conversion of curved benzenoid units into polycyclic aromatic hydrocarbon (PAH) units represents a strategy for the bottom up chemical synthesis of carbon nanotubes (CNTs). Macrocylic carbon nanohoops, known as cycloparaphenylenes (CPPs), containing curved aromatic rings have been synthesized, however, their conversion into PAH segments of CNTs has been challenging. CPPs represent the smallest possible horizontal segment of CNTs and are, in principle, ideally suited as diameter defining templates for the synthesis of monodisperse CNTs. This presentation will discuss the use of oxidative aryl coupling reactions in facilitating the pi-extension required to convert curved benzenoid units into curved PAH units.

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**Title:** An *Operando* Raman study on the oxidation of V<sub>2</sub>C MXene material: First insights on the production of hydrogen from water at low temperature

**Primary Author (and presenter):** Moncada, Jorge A.

**Additional Authors:** Adams, Reid; Vahid Mohammadi, Armin; Beidaghi, Majid; Carrero, Carlos A.

**Department:** Chemical Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Today more than 90% of hydrogen is generated from thermal energy through reforming/gasification of fossil fuels, a non-renewable feedstock. Additionally, the thermal dissociation of water can be achieved at temperatures higher than 900 °C by utilizing a catalyst as a means for hydrogen production. By using a customized setup to perform *Operando* Raman spectroscopy studies, we have encountered unique preliminary and reproducible results in which we obtained hydrogen from water at temperatures between 300 and 700 °C. As this is a significant reduction in the requisite operating temperature, our new catalytic approach using V<sub>2</sub>C MXene materials could significantly reduce the amount of energy the reaction requires. The thermo-catalytic behaviour of V<sub>2</sub>C towards the H<sub>2</sub> evolution reaction was evaluated using *Operando*-MS Raman Spectroscopy. During the dehydration treatment, a considerable high amount of water was realised from the material and a remarkable increase in H<sub>2</sub> production was observed from 350 °C and persisting up to 700 °C. To confirm the splitting of the water contained within the MXene's structure, we dehydrated the material overnight and performed the reaction in continuous, feeding different gases and water vapour at different temperatures. Interestingly, hydrogen evolution was again observed, confirming the material activity for producing hydrogen. Importantly, V<sub>2</sub>C MXene material shows activity for thermo-catalytically splitting water at much lower temperature than thermochemical processes, opening a new and attractive research area to explore. In this poster, we will show a compilation of the most relevant results encountered so far, highlighting the challenges we still need to overcome to come up with a viable "game-changer" material for the production of hydrogen from water.

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**Title:** CZTS electrode for photoassisted charging and discharging of Polysulfide Bromide Redox Flow Battery

**Primary Author (and presenter):** Mondal, Animesh

**Additional Authors:** Radich, James

**Department:** Chemical Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

The increased dependency for our energy needs on solar energy requires large scale energy storage system as the source is often intermittent. Redox Flow Battery (RFB) are very successful at storing the energy at large scale in a cost effective, safe and efficient environment. We took a unique approach for simultaneous solar energy conversion and storage by introducing a K doped CZTS ( $\text{Cu}_2\text{ZnZnS}_4$ : K) photoelectrode in a Polysulfide-Bromide RFB. The photo-assisted reduction of Polysulfide generating stable  $\sim 0.3 \text{ mA/cm}^2$  photocurrent corresponds to the charging of the battery. The usage of the same electrode to discharge the battery eliminated the need for an extra electrode. The catalytic effect of  $\text{Cu}^+$  has been exploited for improve electrochemical performance of the electrode.

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**Title:** A systematic review of acute sports-related concussion assessments

**Primary Author (and presenter):** Moody, Justin R.

**Additional Authors:** Feiss, Robyn & Pangelinan, Melissa

**Department:** Kinesiology

**College/School:** College of Education

**Description:**

The aim of this project was to systematically review the current assessments selected for acute sports-related concussion. The five electronic databases searched were: Academic Search Premier, CINHALL, MEDLINE, PsycINFO, and SPORTDiscus. Studies included in the review were English-language, peer-review published studies of acute (<72 hours) concussion assessments. The studies included those involved in recreation, sport, or military activity at the time of injury. 32 studies met full inclusion criteria (out of 321 evaluated); 28 studies provided sufficient data to be included in the descriptive statistics of the assessments. These studies were then organized by assessment name (and version), number of studies that employed the assessment, age, and sex of the participants. A total of 11 different acute assessments were used and 6 of these assessments were used in 3 or more studies. These assessments had many common features (e.g., concentration, visual processing, sign/symptoms, and memory), while other domains were not consistently evaluated (e.g., balance, language, eye movements). An evaluation of these 6 commonly used assessments revealed that only 12% of the population studied was female. The age range for these assessments was 9-67 years, although the majority of participants ranged in age between 18-35 years. Although there is a large number of assessments currently available, there is a need for a systematic "gold" standard concussion assessment to enable consistency across research and clinical outcomes. The female population is severely underserved and should be included in future studies. A large knowledge gap remains for youth concussion, which poses a difficult problem due to sensitive development periods and the lack of knowledge as to the effect of concussion on such periods.

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**Title:** Pupillometry as a tool to assess listening stress associated with learning a second language

**Primary Author (and presenter):** Moss, Hannah K.

**Additional Authors:** Krishnamurti, Sridhar; Baker, Gena; & Melton, Robert

**Department:** Audiology

**College/School:** College of Liberal Arts

**Description:**

University students in the U.S. generally are required to take credits toward foreign language learning. While this may be effortless for a native speaker of the language, most American students experience stress imposed by listening effort while listening to foreign language instructors in the classroom. The purpose of the current study was to assess the speech intelligibility and pupil dilation in university students learning Spanish as a foreign language. Both aspects were measured under normal rate and rapid rate (30% time compressed). Following IRB approval, we conducted a test protocol for 11 participants that included a pre-testing of pupillometry, a listening training, and a post-testing of pupillometry. Participants listened to normal rate and rapid rate sentences in Spanish that were previously recorded in a laboratory (Auditec) and were required to repeat the sentences back to the investigator to the best of their ability. During the speech intelligibility task, pupil dilation was concurrently measured by pupillometry (using a Micromedical VNG system) for each of the Spanish sentences. In effort to address the listening stress that English speakers face in learning a second language, we created an auditory training program for the participants designed specially to improve phonologic awareness and perception of speech rate. Participants attended three different one-hour training sessions. Following the completion of the listening trainings, the participants once again listened to the same pre-recorded normal rate and rapid rate sentences while pupil dilations were re-measured. Bigger pupil dilation is characteristic of task engagement and a significantly greater pupil dilation seen from pre-exposure to post-exposure supporting this finding. Exposure to Spanish linguistics rules increased task engagement as measured by pupil dilation and this supports the need for listening exposure in students learning Spanish as a second language.

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**Title:** Hypothalamic and brainstem inflammation via Angiotensin II-mediated TLR4 upregulation and microglial activation in neurogenic hypertension

**Primary Author (and presenter):** Mowry, Francesca E.

**Additional Authors:** Silva-Cutini, Mirian A.; Peadar, Sarah C.; Schwartz, Dean D.; Biancardi, Vinicia C.

**Department:** Anatomy, Physiology & Pharmacology

**College/School:** College of Veterinary Medicine

**Description:**

Dysregulation of Angiotensin II (AngII) in neurogenic hypertension is linked to low-grade inflammation. Toll-like receptor 4 (TLR4) has been shown to interact with AngII type-1 receptor (AT1r) on microglia, contributing to AngII-dependent microglial activation. Our goal was to elucidate whether AngII-AT1r-TLR4 crosstalk in the hypothalamic paraventricular nucleus (PVN) and rostral ventrolateral medulla (RVLM) contributes to maintaining neurogenic hypertension. Spontaneously hypertensive rats (SHR) were treated by oral gavage with AT1r-blocker (Losartan; 20mg/kg/day; 4 weeks; SHRLos) or vehicle, with age-matched WKY as control. Weekly tail-cuff blood pressure readings were taken throughout treatment. Protein expression of TLR4 and IBA1, a microglia marker, was determined by immunofluorescence (IF), and skeletal analysis was used to index microglia morphology. After 4 weeks, SHR mean arterial pressure (MAP) was significantly greater than WKY ( $155\pm 2$  vs  $100\pm 3$ ) and SHRLos ( $104\pm 2$  mmHg). Compared to WKY, PVN of SHR had a 41% increase in TLR4 protein density and microglial skeletal analysis showed a 21% decrease in end-points/frame, as well as a 34% decrease in total branch length/frame. In the RVLM of SHR, TLR4 and IBA1 densities were increased by 113% and 45%, respectively, compared to WKY. AT1r-blockade normalized both PVN and RVLM values in SHRLos to WKY levels. These findings implicate AngII in TLR4 upregulation and promotion of microglial activation in central sympathetic cardiorespiratory nuclei, likely contributing to the sympathoexcitation which is

characteristic of neurogenic hypertension. Future studies will examine functional interactions between AngII, TLR4, and microglia in promoting oxidative stress and low-grade chronic inflammation in neurogenic hypertension.

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**Title:** Birdsfoot trefoil (*Lotus corniculatus*) cover for Alabama cropping systems: Fungal diseases, susceptibility to nematodes, and efficacy of herbicides

**Primary Author (and presenter):** Moyer Jr., Hayden H.<sup>1</sup>

**Additional Authors:** Ni Xiang<sup>2</sup>, Kathy Lawrence<sup>2</sup>, Edzard van Santen<sup>3</sup>; & Joyce Tredaway, Joyce<sup>1</sup>

**Departments:** <sup>1</sup>Crop, Soil, and Environmental Sciences; <sup>2</sup>Entomology and Plant Pathology; <sup>3</sup>Agronomy Department,

**College/ School:** <sup>1,2</sup>Auburn University; <sup>3</sup>University of Florida

**Description:**

*Lotus corniculatus* (birdsfoot trefoil) is a common flowering plant in the pea family Fabaceae and native to Eurasia and North Africa. It is used in agriculture as a forage plant and also grown for pasture, hay, and silage due to its non-bloating properties; along with being used as a cover crop. Auburn University's breeding program for birdsfoot trefoil is attempting to extend the forage's geographic adaptation across the southern United States. Stand decline of the birdsfoot trefoil breeding lines due to fungal diseases and nematode pressure was observed at the Plant Breeding Unit of the E.V. Smith Research Center in Tallassee, Alabama in the 2015 season. We were able to isolate *Macrophomina phaseolina* from symptomatic plants. This pathogen causes stand decline, root rot, and charcoal rot in more than 500 crop and non-crop host plants. The successful completion of Koch's Postulates indicates *Fusarium oxysporum* is a causal agent of seedling disease resulting in stand decline of birdsfoot trefoil in Alabama. *Meloidogyne incognita* (root-knot nematode) had a higher population and reproductive factor and can increase *M. incognita* populations on three varieties of birdsfoot trefoil tested. Two herbicides (Butyrac 200 and Panoramic) reduced the fresh shoot mass of cultivars tested in our greenhouse trial along with the Pardee cultivar being the most susceptible to herbicide damage.

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**Title:** Prevalence of food insecurity among residents of 14 high obesity counties in Alabama

**Primary Author (and presenter):** Mukigi, Dorcas

**Additional Author:** Brown, Onikia

**Department:** Nutrition, Dietetics, & Hospitality Management

**College/ School:** College of Human Sciences

**Description:**

Recent statistics indicate that approximately 12% of American households are food insecure and 5% have very low food security. According to the recent reports from USDA, the rate of food insecurity in Alabama (18.2%) is greater than the national average. Within Alabama, there are counties (Wilcox, Greene and Dallas) with food insecurity rates greater than 30%. Alabama has the third highest adult obesity rate in the nation (35.7%) and it is projected that by 2030, Alabama could have statewide adult obesity rates above 60% if the current trends are not reversed. The purpose of this study was to assess the status of food security in 14 counties where adult obesity is greater than 40%. Mail delivered surveys including the United States Department of Agriculture's Household Food Security Survey Module, income, weight and height variables were sent to 5600 randomly selected households. Four hundred and nineteen completed surveys were returned, a 7.5% response rate. The prevalence of food insecurity was high in households with children (40%) as compared to households with adults only (27%). Forty one percent (41%) of the respondents were obese and 32% were overweight. Majority of the respondents (73%) were retired or unemployed and 37% had an income of ≤ \$ 19,000. Food insecurity and obesity are

important issues among residents of 14 high obesity counties in Alabama. There is need for evidence-based intervention strategies to reduce obesity and establishment of support systems to increase availability and accessibility of nutritious food.

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**Title:** Evaluation of  $^{137}\text{Cs}^+$  diffusion in prospective radioactive waste storage formations

**Primary Author and Presenter:** Mullett, Casey

**Additional Author:** Dr. Lauren Beckingham<sup>2</sup>

**Departments:** <sup>1</sup>Department of Biosystems Engineering, Auburn University, Auburn, AL

<sup>2</sup>Department of Civil Engineering, Auburn University, Auburn, AL

**College/School:** Samuel Ginn College of Engineering

### Description

While the nuclear power industry produces a large amount of power, it also produces a massive amount of spent fuel. This fuel, once used, needs to be stored in a system that contains the emitted heat and radioactivity. Currently, spent fuel is held in concrete and steel lined cylindrical containers. While these canisters are a promising solution for now, their design lifetime is only sixty years. Originally, they were designed to be permanently placed in a centralized containment center; however, this never came to fruition. One possible solution is a subsurface storage location; either as individual boreholes or in a large containment center. A clay repository is a proposed host formation due to clay's characteristic low permeability. The viability of this solution, however, requires understanding the migration of spent fuel and diffusion of radioactive material within the host formation. Here, the diffusion of radioactive  $^{137}\text{Cs}^+$  through Opalinus clay was evaluated. Radial transport of  $^{137}\text{Cs}^+$  from the canister is controlled by diffusion through aqueous pore solution, sorption to soil, radioactive decay and ion exchange with sodium. A differential equation was constructed to simulate the behavior of  $^{137}\text{Cs}^+$  through Opalinus clay due to these distinctive processes and a MATLAB model was developed to numerically simulate the spatial distribution and concentration of the  $^{137}\text{Cs}^+$ . The rate and extent of  $^{137}\text{Cs}^+$  migration will be used to determine how expansive the clay repository would need to be in order to properly contain the radioactive material. By changing model parameters to reflect specific potential storage sites, the viability of individual formations as repositories will be evaluated.

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**Title:** Comparing the lipid, renal, liver & hematological parameters as cognitive markers in cognitive deficient (streptozotocin and chemotherapeutics treated) rodent models

**Primary Author (and presenter):** Mullins, Claire E.

**Additional Authors:** Majrashi, M.; Ramesh, S.; Almaghrabi, M.; Desai, D.; Abbot, K.; Govindarajulu, M.; Fahoury, E.; Nadar, R.; Suppiramaniam, V.; Pondugula, S.; Dhanasekaran, M.

**Department:** Drug Discovery and Development

**College/School:** Harrison School of Pharmacy

### Description:

Mild Cognitive impairment (MCI) is a clinical condition between normal aging & dementia. Patients with MCI experience memory loss but do not meet the criteria for the diagnosis of clinically probable Alzheimer's disease. MCI occurs due to altered physiological functions, comorbid conditions or induced by therapeutic drugs & toxins. Chemotherapy-associated cognitive dysfunction, often referred to as "chemobrain," includes subjectively reported & objectively measured problems with cognition following chemotherapy. Hyperglycemia (Streptozotocin-induced diabetic models) also contributes to cognitive dysfunction. Chemotherapeutic (CT) group was treated with doxorubicin (2 mg/kg, IP) & cyclophosphamide (50mg/kg, IP) once weekly for 4 weeks. Hyperglycemia group received Streptozotocin 55mg/kg, once, IP. Blood samples were withdrawn & analyzed. There was significant increase in creatinine

kinase & LDH in CT model. Glucose levels were significantly increased in STZ group. With regard to BUN, there was significant increase in STZ model, however decrease in CT model. However, Triglycerides were significantly elevated both in STZ & CT treated animals as compared to control. The genetic & dietary modification can lead to interaction of the substance by itself or its metabolites with various cellular constituents which can cause substantial changes in hematological parameters leading to neurodegeneration resulting in MCI. Our study clearly shows that increase in triglycerides can be an initial potential marker for cognitive deficit. Thus, one of the non-invasive initial markers for assessing the MCI can be lipid, renal, liver & hematological parameters.

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**Title:** Adversarial Authorship, Sentiment Analysis, and the AuthorWeb Zoo

**Primary Author (and presenter):** Narayanan, Mina, J

**Additional Authors:** Gaston, Joshua; Dozier, Gerry; Cothran, Lisa; Chavez, Clarissa; Rossi, Marcia

**Department:** Department of Computer Science and Software Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Machine learning techniques such as entropy-based evolutionary clustering and evolutionary hill-climbing can be applied to identify authored pieces that are similar in style. The core technical idea is to characterize people's writing styles based on a set of stylometric features, which are used to detect and cluster similar samples. Even among a pool of writing samples from as many as one hundred thousand authors, an anonymous piece can be reverse-engineered to identify its author to varying degrees of accuracy. This provides a powerful approach to detect disparate accounts in social media that are controlled by the same human or robotic actor. Interestingly enough, this very same approach can also be used to anonymize a written piece, rendering it much harder to identify authorship.

Our work explores how sentiment analysis, as opposed to standard stylometric analysis, and the "biometric zoo" classifications of Doddington et al. can be used to construct author webs and classify authors based on their writing styles. The classifications depend on how well or how poorly people match to biometrics of themselves. By grouping authors together based on their sentiment analysis features, we determined that sentiment analysis alone may not yield high author identification rates. However, when combined with different features, sentiment analysis can assist in author identification and classification. This research can lead to the development of automated systems that can on the one hand identify authors who hide behind multiple social media accounts with malicious intent, and on the other advise an author of her writing style and help mask her identity online.

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**Title:** High performance conducting polymer coating for corrosion protection

**Primary Author (and presenter):** Nautiyal, Amit

**Additional Authors:** Cook, Jonathan Edwin & Zhang, Xinyu

**Department:** Chemical Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

The polypyrrole coating was electropolymerized on carbon steel using various sulfonic dopants. The effect of acidic dopants on passivation of carbon steel was investigated and compared the performance of produced coating. The type of dopants used were significantly affecting the protection efficiency of the coating against chloride attack that depends on size and alignment of dopant in the polymer backbone. Moreover, polyaniline coating was electropolymerized on stainless steel using sulfonic acids as dopants which were electrochemically exchanged with phosphates to enhance the corrosion protection efficiency of

the coating. The corrosion performance was better after exchange due to inhibition effect of phosphates on stainless steel.

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**Title:** The Core: Muscles of the Spine

**Primary Author (and presenter):** Nelson, Anne M

**Additional Authors:**

**Department:** The Department of Theatre

**College/School:** College of Liberal Arts/ Auburn University

**Description:**

*The Core: Muscles of the Spine* is a research project that interweaves the components of dance techniques with the knowledge of anatomy. This creative research project consists of a research paper, oral presentation with creative visual, and an experiential component focusing on specific core muscles and their importance to dance and dance technique. The methodology includes physical embodiment of dance technique and performance, dance conditioning, anatomical research through sources on anatomy and anatomy for dance, and personal experience and discovery through physical therapy and training. As a dance minor and nursing major recovering from a spinal cord injury and paralysis, this research has been integral in making connections between personal and professional goals, academic and creative scholarship. As the final requirement of the Advanced Dance Techniques course at Auburn, the research paper along with a brief oral overview, creative visual and movement study demonstrating an array of exercises and reflexes of the core musculature was constructed and presented to the class. At the symposium, this session will present the structure of the final project, as well as, a video sample of course material. Participants will be invited to engage in the movement work.

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**Title:** Community food assessment: Montgomery County, Alabama

**Primary Author (and presenter):** Nelson, Hallie, M

**Additional Authors:** None

**Department:** Department of Agricultural Economics and Rural Sociology

**College/School:** College of Agriculture

**Description:**

This research analyzes the food system of Montgomery County, Alabama to determine what factors contribute to conditions of chronic food insecurity in the area. Through interviews with twelve actors, two grocery store inventories, sociodemographic data, and agricultural census data, the main barriers to food security for the county residents are revealed. The findings of the research are presented through the frame of sustainability to determine the long-term viability of the food system in the areas of social equity, economic prosperity, individual health, and environmental quality. The main challenges in the food system are within the economic and environmental aspects, including struggling rural livelihoods, an inequitable built environment, and large production of waste. These challenges need to be addressed directly, but lack straightforward solutions. The economic and environmental problems contribute to an inequitable social structure and negative health impacts for low-income individuals, creating conditions for food insecurity to develop. More specifically, access to healthy foods and knowledge of how to prepare healthy meals appear to be the main sources of food insecurity for low-income households. Various goals and strategies collected from the interviews contribute to a shared concept of what steps should be taken in order to address chronic food insecurity. The most impactful goals and strategies for achieving this vision are aggregated into a table to enable community members and key actors to take action.

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**Title:** Environmental justice analysis of Atlanta, GA  
**Primary Author (and presenter):** Nelson, Steven  
**Additional Authors:** Djamba, James  
**Department:** Political Science  
**College/School:** College of Liberal Arts

**Description:**

The issue of environmental justice has been a topic of interest for both city planners and political scientists since the beginning of the modern environmental movement in the late 1960s. However, until recently studies have been limited in their ability to perform spatial analysis. The development of modern geographical information systems (GIS) provide scholars powerful tools for studying the issues and options relating to environmental injustice. This study provides an analysis of the spatial relationship between sources of industrial pollution and socially disadvantaged communities in the city of Atlanta Georgia. Geospatial data obtained for minority populations, poverty levels and industrial pollution sources are used to generate a map of the Atlanta metropolitan providing a spatial representation of socio-economic data and environmental pollution. The findings suggest that spatial inequality favouring socio-economically advantaged populations may exist within the city of Atlanta.

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**Title:** A new ligand for actinides: Coordination chemistry and entry into redox-active uranium complexes  
**Primary Author (and presenter):** Niklas, Julie E.  
**Additional Authors:** Farnum, Byron H., Gorden, John, D.; & Gorden, Anne E.V.  
**Department:** Chemistry & Biochemistry  
**College/School:** College of Sciences and Mathematics

**Description:**

Characterizing and probing the fundamental properties of actinide complexes, particularly those with lower metal oxidation states, is pertinent to our understanding of nuclear waste and its management. In seeking new ways to access and stabilize these lower-oxidation state species, a new redox-active Schiff base ligand framework, "phen-BIAN" (N,N'-bis(iminophenol)acenaphthene) has been established. This ligand system combines the redox-active  $\alpha$ -diimine backbone of Ar-BIANs with the mixed-donor O-N-N-O salen-type binding pocket. A series of transition metal and uranyl ( $\text{UO}_2^{2+}$ ) phen-BIAN complexes has been prepared and characterized through single crystal x-ray diffraction and electrochemical studies. Several unique features are observed for the uranyl complexes, including a variety of solvent-dependent solid-state structures with unusual contacts to chloroform and dichloromethane, and rich electrochemical behavior consistent with the formation of mixed valent U(VI)/U(V) and U(V)/U(IV) species in solution. These data suggest the phen-BIAN framework is a suitable tool for accessing and studying the coordination chemistry and redox behavior of lower-valent uranium complexes.

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**Title:** Comparing the rheo-optics of aqueous sulfonated cellulose nanocrystal and model cholesteric dispersions  
**Primary Author (and presenter):** Noor, Matthew M.  
**Additional Authors:** Saha, Partha & Davis, Virginia A.  
**Department:** Chemical Engineering  
**College/School:** Samuel Ginn College of Engineering

**Description:**

Aqueous dispersions of sulfonated cellulose nanocrystals (CNC) were investigated using cross-polarized optical microscopy both prior to shear and during post-shear relaxation. Sulfonated CNC produced via the sulfuric acid hydrolysis of biomass are an intriguing nanomaterial for several reasons: high specific strength, greater than 100 GPa Young's modulus, renewability, increasing commercial availability, and easy processability. Aqueous dispersions of these CNC readily form cholesteric (chiral nematic) liquid crystals (LCs); retention of this microstructure in solidified films enables them to have photonic properties. In contrast, sheared dispersions can be cast to form films with nematic-like microstructures that enables mechanical anisotropy. Similar behavior exists for model cholesterogenic mesogens such as hydroxypropyl cellulose (HPC). Understanding relative balance of chiral and shear forces on CNC dispersion microstructure is key to achieving the desired microstructure in films produced from these dispersions. This research compares the quiescent microstructures and relaxation dynamics of HPC and CNC dispersions using a Linkam shear cell and cross-polarized optical microscopy. A range of gap heights were used to evaluate the effects of confinement on the formation of the cholesteric helix after shear cessation. In addition to qualitative comparisons, changes in the degree of alignment relative to flow direction were quantified optical contrast measurements. Differences in the time scale of post-shear relaxation were evaluated based on the differences in rheological properties, mesogen size, and cholesteric pitch. These results were used to aid the development of a robust model for predicting the three-dimensional microstructure of cholesteric liquid crystals during post-shear relaxation.

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**Title:** Do adolescent's perceptions of their parents and attitudes about bullying influence bullying prevention?

**Primary Author (and presenter):** Norton, Jessica R.

**Department:** Human Development and Family Studies

**College/School:** College of Human Sciences

**Description:**

Evaluations of universal bullying prevention programs often find modest effects on adolescent bullying outcomes. Therefore, it may be advantageous for those in bullying prevention research to test differential effects of program outcomes via moderation. Given the research that links both parenting and bullying attitudes to adolescent bullying behaviors, bullying prevention programs should examine how these influences can affect program outcomes. This poster will present the moderating effects of adolescent perceived parenting on the relationship between adolescent bullying attitudes and the change in adolescent reported bullying behaviors after completing a bullying prevention program. The sample consisted of 87 seventh grade students who all completed the *Be SAFE* anti-bullying curriculum. Structural Equation Modeling was used to examine the interactive effects of adolescent perceived parenting and pre-program bullying attitudes on the change in reported bullying behaviors. Change in pre- and post-program bullying behaviors was assessed using latent difference score, which controlled for pre-program bullying behaviors. Authoritarian and rejecting parenting types were found to interact with pre-program bullying attitudes. Adolescents' perceptions of parenting and pre-program bullying attitudes, have an effect on program outcomes. These findings have implications for bullying prevention programs, and possibly other adolescent prevention programs. Understanding the interaction between distal factors, such as parenting and family, on the individual, can contribute to better program designs that include targeted approaches that will improve program effectiveness and adolescent outcomes.

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**Title:** Comparative effect of advances soy products or corn protein concentrate with porcine meal on growth, body composition, and distal intestine histology of Florida Pompano *Trachinotus carolinus*

**Primary Author (and presenter):** Novriadi, Romi

**Additional Authors:** Rhodes, Melanie & Davis, Allen, D

**Department:** Fisheries, Aquaculture and Aquatic Sciences  
**College/ School:** College of Agriculture

**Description:**

The present study was designed to investigate the utilization effect of advanced soy products or corn protein concentrate (CPC) in combination with porcine meal (PM) to completely replace poultry by-product meal (PBM) on growth, body composition and distal intestine histology of Florida pompano *Trachinotus carolinus*. Four experimental diets were formulated to be iso-nitrogenous and iso-lipidic basis, to contain 40% crude protein and 8% lipid. A reference diet contained 150 g kg<sup>-1</sup> PBM and 495 g kg<sup>-1</sup> soybean meal (SBM), and three test diets were formulated replacing PBM with 15 g kg<sup>-1</sup> of CPC (CPCD) and replacing all SBM and PBM with 535 g kg<sup>-1</sup> fermented soy (FSBMD) or 451.3 g kg<sup>-1</sup> enzyme-treated soy (ESBMD). All test diets were supplemented with 38 g kg<sup>-1</sup> of PM to serve as a hydroxyproline source. Diets were fed to apparent satiation to triplicate groups of Florida pompano juveniles. After 8 weeks of feeding, fish fed CPCD and ESBMD performed equally well in terms of final body weight, thermal growth and percentage weight gain in comparison to fish fed PBMD. Voluntary feed intake of fish fed FSBMD was significantly lower compared to other treatments. No significant differences were observed in proximate and mineral composition of whole pompano body across all the treatments. The results obtained in the present histological study showed no significant differences in the thickness of the distal intestine layer among treatments. Fish fed CPCD showed a significant widening of lamina propria with an increase of cellular infiltration and higher presence of goblet cells compared to other dietary treatment. Based on these results, 451 g kg<sup>-1</sup> enzyme-treated soy or combination of 150 g kg<sup>-1</sup> of CPC and 495 g kg<sup>-1</sup> SBM supplemented with PM can be utilized to develop a practical diet for juvenile Florida pompano without impacting growth, nutritive parameters and several distal intestine health parameters.

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**Title:** Diversity of *Corynespora Cassiicola* isolates from cotton and soybean based on cassiicolin-encoding genes

**Primary Author (and presenter):** Nunes Rondon, Marina

**Additional Authors:** Xiang, Ni; Koebernick, Jenny; & Lawrence, Kathy

**Department:** Entomology and Plant Pathology

**College/ School:** College of Agriculture

**Description:**

*Corynespora cassiicola* is a fungal pathogen with increasing importance across cotton and soybean producing countries and is responsible for target spot disease in these crops. A small protein of 27 amino acids named cassiicolin produced by *C. cassiicola* isolates has been reported as an essential effector for the pathogenicity. Currently, information is lacking on the genetic interaction between the pathogen *C. cassiicola* and cotton and soybean. This lack of information makes development of resistant cultivars by breeding programs difficult. The goal of this project is to detect the cassiicolin-encoding genes (*Cas1* to *Cas6*) from *C. cassiicola* isolates from cotton and soybean in Alabama. Cotton and soybean leaf samples were collected from different locations of Alabama. Fungal isolates obtained from the samples were identified by morphological characters and subjected to DNA extraction. All 85 isolates obtained were submitted to polymerase chain reaction with specific primers covering *Cas* sequences for known gene detection. Among the 85 *C. cassiicola* isolates of our collection, we found four different profiles of clusters for cotton and soybean based on cassiicolin-encoding genes. We found isolates collected from cotton with the absence of cassiicolin-encoding genes (*Cas0*) and *Cas2*. For isolates from soybean, four different gene combinations, *Cas0*, *Cas2*, *Cas6* and *Cas2+6* were found. All fragments amplified had around 750 bases of pairs. *Cas2* was the dominant gene regardless of the crop. Higher diversity was found in isolates sampled from soybean. Results generated from this project will be useful for further studies of *C. cassiicola* as a pathogen in cotton and soybean. In addition, the knowledge about

the pathogen diversity is fundamental to select isolates in a breeding program to screening resistant cultivars.

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**Title:** Microbiome analysis using a quantitative polymicrobial PCR method

**Primary Author (and presenter):** Odom, Sara E

**Additional Authors:** Rasmussen-Ivey, Cody, Liles, Mark

**Department:** Department of Biological Sciences

**College/School:** College of Science and Mathematics

**Description:**

Polymerase chain reaction (PCR) amplification and sequencing of the 16S ribosomal RNA gene is often used to determine the microbiome composition of an environmental sample. However, the current method contains inherent biases arising from variations in gene number and primer-template interactions across different species. The goal of this project is to develop a new primer set and PCR technique that reduces these biases in order to generate more detailed and accurate information from microbiome analyses. This is done by separating the linear and exponential stages of PCR amplification, which allows for the use of highly degenerate primers targeting the single copy gene *gyrB*. By targeting *gyrB*, biases arising from varying copy numbers can be reduced, and the greater sequence diversity allows for more detailed taxonomic classification.

Primers sets were developed by aligning *gyrB* sequences from genome databases. They were tested via primer mapping to verify and condense the primer sets before being tested on sample DNA in the lab. These primers are used during the first two cycles of PCR to generate amplicons with an attached linker sequence. The PCR product is cleaned to remove old primers and template DNA, and the remaining PCR cycles are run with the amplicons and primers targeting the linker sequence. Current results show that the new PCR primers are producing appropriately sized amplicons. Continuing work will involve amplicon sequencing and application of the method to mock microbial communities to compare the results to the standard 16S method. Should this technique work as expected, it will be a valuable tool for microbiome analysis, generating results that are accurately quantified and provide detailed taxonomic information about complex microbial communities.

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**Title:** The necessity for telegenetic counselling: Reaching the medically underserved through a cancer genetic research study

**Primary Author (and presenter):** Omeler, Sophonie M.

**Additional Authors:** Bishop, Madison R.; Huskey, Anna; & Merner, Nancy

**Department:** Pathobiology

**College/School:** College of Veterinary Medicine

**Description:**

Using a custom-designed gene panel, 14 clinically relevant breast and ovarian cancer genes, as defined by the National Comprehensive Cancer Network, have been assessed using an Alabama hereditary cancer cohort that was established using hospital and community-based recruitment. Unfortunately, over 60% of Alabama is medically underserved; thus, the recruitment efforts aimed to reach residents all over the state who would normally not have the opportunity to participate in a research study and provide the option to receive gene screening research results that can help make health decisions. To maximize this effort, an outreach project was established to provide telegenetic counselling to study participants through the University of Alabama at Birmingham (UAB) Genetic Counselling Clinic and the Alabama Department of Public Health (ADPH) Telemedicine program. Ultimately, individuals informed of a pathogenic variant can go to a local county health department and receive UAB

genetic counselling through telemedicine. IRB approval has been obtained at Auburn University and UAB; upon ADPH approval this effort will commence. As of December 2017, the cohort comprised of 242 individuals, including 160 cancer-affected probands and 82 additional family members. Upon gene panel screening 107 probands, of which 39 are African American (AA) and 68 are European American (EA), eight variants that were previously reported as pathogenic in ClinVar, a genetic database of the National Center for Biotechnology Information, were identified in eight different probands. Four of these variants were each identified in AA and EA probands, solving 10% and 6% of each respective ethnic group. Furthermore, other potentially pathogenic variants were detected but have either not been reported in ClinVar or have been reported in ClinVar as variants of unknown significance. These variants represent those that will be reported back to study participants to launch the telegenetic outreach project.

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**Title:** MXene 3D printed structure in energy storage application

**Primary Author (and presenter):** Orangi, Jafar

**Additional Authors:** Beidaghi, Majid

**Department:** Materials Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

A new family of two-dimensional (2D) materials, MXenes, with interesting electrochemical properties had been introduced in 2010, and their high potential as electrode materials for Li-ion capacitors has been recently demonstrated. However, limiting factors in exploiting the full potential of these electrode materials are the electrode assembly conventional methods for device fabrication. In the past few years, the research related to the development of electrochemical energy storage devices has led to the realization that improved performance can be achieved by assembling the 2D electrode materials into three-dimensional (3D) architectures instead of the conventional 2D “laminar” architecture. In this presentation, we present a simple, scalable, and yet efficient method to assemble 2D  $Ti_3C_2$  into ordered 3D and porous aerogel structures with high specific capacitances and rate capabilities. MXene aerogels were fabricated by directional freeze casting and showed high specific surface areas. The mechanical and electrochemical properties of the aerogels are dependent on the processing conditions including casting temperature and solution concentration, which in turn affect the porous structure of the aerogels. MXene aerogels show significantly high specific capacities (1200 mAh/g at 0.05 A/g), excellent rate capability (200 mAh/g at 10 A/g) and outstanding cycling performance for reversible lithium-ion energy storage. We believe that a broad range of applications including gas sensors can use the fabricated 3D MXene structures and achieve promising results.

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**Title:** Effect of 3D Printing Parameters on Material Behaviour

**Primary Author (and presenter):** Osinloye, Adedoyin, F

**Additional Authors:** Celestine, Asha-Dee

**Department:** Aerospace Engineering Department

**College/School:** Samuel Ginn College of Engineering

**Description:**

This study explored the benefits of 3D printing in our engineering society and the effects of key printing parameters on print quality and mechanical strength of 3D printed models. The goal of the study was to determine whether 3D printing practices can provide sufficient mechanical data for real world applications. Specimens of Polylactic acid (PLA) were printed using a Maker-Select desktop 3D printer. Print parameters were varied by using different in-fill densities, either 40%, 75%, or 100% and also different in-fill patterns such as hexagonal, triangular and rectilinear. Specimens were then tested in

flexure and tension to determine their mechanical properties. The results showed that higher infill densities resulted in better flexural and tensile strength, and modulus of elasticity. Improved properties were obtained with the rectilinear infill type specimens, regardless of the infill density. However, although the triangular and hexagonal patterned specimens had lower mechanical properties, they also had overall lower masses which may be a deciding factor for some applications. These results suggest that infill density and type are important parameters for design in the engineering industry where inexpensive, easy-to-manufacture plastic parts can be used as substitutes for other high cost materials.

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**Title:** Quest for healthy schools: Making Alabama schools healthier places to learn

**Primary Author (and presenter):** Page, Jamilah R

**Additional Authors:** Powers, Alicia R.; Parmer, Sondra M; Funderburk, Katie; & Struempfer, Barb

**Department:** Nutrition, Dietetics, and Hospitality Management

**College/School:** College of Human Sciences

**Description:**

Local organizations are effective intermediaries for national organizations seeking to influence local change. Alabama SNAP-Ed at Auburn University serves as an intermediary for the Alliance for a Healthier Generation (AHG) Healthy Schools Program using its *Quest for Healthy Schools* initiative. *Quest for Healthy Schools* seeks to influence nutrition and physical activity policies, systems, environments and practices in limited-resource schools. The pilot phase of *Quest for Healthy Schools* includes a non-experimental study to describe strengths and areas for improvement in nutrition and physical activity policies, systems, environments and practices. For *Quest for Healthy Schools*, Alabama SNAP-Ed at Auburn University partners with 19 schools across nine Alabama counties to support formation of a School Wellness Committee, completion of assessment tools and development and implementation an action plan based on assessment findings. The Healthy Schools Program assessment, a validated assessment of AHG, assesses a local school's policies, systems, environments and practices related to nutrition and physical activity. Descriptive statistics will be determined for each school, as well as, the aggregate of sampled schools. Appropriate comparative statistics also will be determined. *Quest for Healthy Schools* is the first intermediary agreement for school wellness in Alabama. Findings from this new, innovative collaboration among AHG, Alabama SNAP-Ed at Auburn University and local schools will provide key information on best practices for making schools healthier places to learn.

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**Title:** Creating a center on the edge

**Primary Author (and presenter):** Page, Sarah E.

**Department:** Architecture

**College/School:** College of Architecture, Design, and Construction

**Description:**

Downtown Mobile, Alabama is shifting from small lots of surface parking and industrial warehouses to large developments incorporating retail, corporate offices, and multi-family residential. It is the architect's role to facilitate the city's transition while preserving its culture. A new Downtown Development Code, *Keeping It Easy*, was explored through the construction of a site model and infilling empty lots according to the provided guidelines. It was discovered that while the code's intentions are to maintain the city's character, its requirements to preserve the existing scale limits the economic feasibility of new development. To test the coexistence of a large structure in keeping with the scale of the district, a mixed-use development including housing, grocery, and retail was proposed on a prominent but underutilized site. The specific site was selected due to its development potential as a single parcel and its centralized location on the edge of the central business district, warehouse district, and an historic African

American neighborhood. The residential tower serves as a way finding element and gateway to downtown. Since the project is civic in nature, its size and program contribute to a series of iconic buildings including the cathedral and the masonic temple. A public plaza with storefronts creates a civic center while a careful composition of windows and inset balconies responds to the scale of the existing buildings. Residential units vary from studios to three-bedroom apartments catering to a diverse range of family types. Each resident is given ownership of a small public space within the corridor to encourage community connection. The project is large in personal enough to create an economically feasible mixed-use landmark but intimate in personal experience in ways that maintain the character of downtown Mobile.

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**Title:** Increasing global vegetation browning hidden in overall vegetation greening: 2 insights from time-varying trends

**Primary Author (and presenter):** Pan, Naiqing

**Additional Authors:** Feng Xiaoming; Fu Bojie; Wang Shuai; & Ji Fei

**Department:** Forestry

**College/School:** School of Forestry & Wildlife Sciences

**Description:**

Global vegetation dynamics are of critical importance for understanding the changes in ecosystem structure and functioning and their responses to different natural and anthropogenic drivers. Despite that regional decreases in vegetation growth (i.e., vegetation browning) have been reported in multiple studies, it is still a matter of debate what are the extent and intensity of vegetation browning globally. Moreover, little is known about the long-term spatiotemporal evolution of global browning trends. As the first trial of using the Ensemble Empirical Mode Decomposition (EEMD) globally, our study revealed the increasing browning trends hidden in overall greening trends over the last three decades. This result is further confirmed by two piecewise linear regression models. In particular, significant browning trends ( $P < 0.05$ ) expanded quickly since the early 1990s and had more than tripled by 2013, resulting in large scale greening-to-browning reversals. The expansion of browning trends was widespread in all land cover types.

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**Title:** Engaging water observations in evaluating climate models

**Primary Author (and presenter):** Pandey, Ashutosh

**Additional Authors:** Kumar, Sanjiv & Akula, Sathish

**Department:** Forestry

**College/School:** School of Forestry and Wildlife Sciences

**Description:**

Plants play a central role in the global water and energy cycles by regulating the partitioning of energy fluxes at the land surface in response to the soil moisture availability in the root zone and atmospheric conditions. Soil water dynamics in the root zone are dominated by rapid infiltration and subsequent vertical redistribution following rainfall, in contrast, to slow dry down due to water uptake by roots for evapotranspiration (ET) during interstorm periods. Parameterization of the latter process is complicated by the adaptive behaviour of plant water uptake. Key parameters and states (i.e., root distribution, soil moisture) are difficult to measure at the appropriate scale, and they can show large spatial and temporal variability. The sensitivity of ET to soil moisture is a central parameter within the coupled land-atmosphere system. Several studies with Global and Regional Climate Models (GCMs, RCMs) suggest for instance that it might influence low-frequency atmospheric variability in precipitation and temperature; moreover, it is also relevant for the timescales of soil moisture autocorrelation. However, little

is known on the magnitude of this parameter, or on its dependence on vegetation, soil, and/or climate characteristics, due to the lack of concomitant observations of ET and soil moisture at similar spatial scales. In this paper, we will compare the Active Soil Moisture Residence Time (AASMRT) from streamflow as well as soil moisture data over North America. AASMRT is used to quantify how fast or slow land responds to the atmospheric water demand during non-rainy days. We calculate AASMRT from the recession limb of soil moisture data by following a similar procedure as employed in calculating the base flow recession constant using streamflow data. We have compared the soil moisture data from The North American Soil Moisture Database (NASMD) and three versions of Community Land Model (CLM): 4, 4.5, and 5.

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**Title:** Diet Diversity in Andasibe, Madagascar

**Primary Author (and presenter):** Parker, Holly Marielle

**Department:** Nutrition, Dietetics, and Hospitality Management

**College/School:** College of Human Sciences

**Description:**

In Madagascar, over 75% of the population is impoverished, contributing to the nation's tremendous prevalence of growth stunting. Half of Malagasy children are chronically malnourished, with lifelong health and developmental implications. Inadequate energy intake is only part of the issue- diet homogeneity with macronutrient (protein) and micronutrient (Fe, Zn, and vitamins A, C, D) deficiencies also contribute to underdeveloped organ and skeletal systems. National and international agencies have declared intent to address malnutrition in Madagascar, but research regarding the human inhabitants of the ecological hotspot is notably sparse. To help address this gap and lay the groundwork for future research and education programs, a pilot diet diversity study was conducted in the rural village of Andasibe, Madagascar. Over a 6-week period, 24-hour dietary recalls were collected of 150 inhabitants, and diet diversity measured quantitatively based on a United Nations-established scoring system. On average, participants received a diet diversity score of 4, or a "medium diet diversity score". Missing from the average recall were items from the "legumes, nuts, and seeds category"; the "vitamin A-rich fruits and vegetables category"; and the "milk and milk products" category. While diet diversity surveys do not measure specific nutrient intake, low consumption of vitamin A and iron-containing items, among others, on a given day may be indicative of dietary inadequacies related to stunting and morbidity. Diet diversity data allows for basic quantification of the extent of dietary homogeneity in Andasibe, which likely mimics that of other Malagasy villages and contributes to the nationwide cycle of poverty. Diet diversity scores may also be used in determining the effectiveness of future interventions. Results reported to the Association Mitsinjo in Andasibe will add to the growing body of research and hopefully highlight the need for tailored nutrition education programs.

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**Title:** Therapeutic perspectives on chia seed and its oil

**Primary author:** Parker, John K.

**Additional authors:** Schellenberger, Amanda; Roe, Amy; Oketch-Rabbah, Hellen; & Calderón, Angela

**Department:** Drug Discovery and Development

**College:** Harrison School of Pharmacy

**Description:**

The attraction of novel foods proceeds alongside epidemic cardiovascular disease, diabetes, obesity, and related risk factors. Dieticians have identified chia (*Salvia hispanica*) as a product with a catalogue of potential benefits related to these health detriments. Chia seeds and chia seed oil are used mainly as a food commodity and the oil is also used popularly as a dietary ingredient used in various dietary supplements available in the USA market. Chia is currently consumed not only as seeds, but also as oil,

which brings about similar effects. Chia seed is rich in  $\alpha$ -linolenic acid, the biological precursor to eicosapentaenoic acid (EPA), a polyunsaturated fatty acid, and docosahexaenoic acid (DHA). Because the body cannot synthesize  $\alpha$ -linolenic acid, chia has a newfound and instrumental role in diet. However, the inconclusive nature of the scientific community's understanding of its safety warrants further research and appropriate testing. The focus of this work is to summarize dietary health benefits of *S. hispanica* seed and oil, to acknowledge concerns of adverse events from its ingestion, to assess current research in the field, and to highlight the importance of quality compendial standards to support safe use. To achieve this end, a large-scale literature search was partaken on the two well-known databases, PubMed and SciFinder. Hundreds of articles detailing such benefits as decreased blood glucose, decreased waist circumference and weight in overweight adults, as well as improvements in pruritic skin in End Stage Renal Disease patients and endurance in distance runners have been recorded. These benefits must be considered within the circumstances in which they were achieved.

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**Title:** Racial disparities in bedtime, dinnertime and television viewing among elementary school children  
**Primary Author (and presenter):** Parra, Peyton, Emily  
**Additional Authors:** Ayine, Priscilla; Carmona, Beatriz; Lopez, Isabella; Jeganathan, Ramesh; Thangiah, Geetha  
**Department:** Nutrition, Dietetics, and Hospitality Management  
**College/School:** College of Human Sciences

**Description:**

Adverse childhood experiences have negative effects on behavior problems, learning disability and obesity in children, which could eventually lead to smoking, alcoholism, depression, autoimmune disease and heart disease in adults. Racial/ethnic minority children have a greater incidence of adverse childhood experiences. Childhood obesity is a public health concern resulting from a variety of reasons. 23.8% of African American children are obese compared with 13.1% of Whites between ages 6 to 11 years. In Alabama, 35.5% children are overweight and obese; it is 6th highest ranked in United States.

In this study we investigated the differences in some of the behavioral factors such as sleeping time, dinner time and television watching time in racial ethnic groups. 28 White/European American (EA) and 30 Black/African American (AA) elementary school children aged between 6 to 10 years participated in this study. Height and weight were measured, without shoes and wearing only light clothing. Body mass index (BMI) percentile was calculated using Centers for Disease Control and Prevention growth reference. Parents reported child's typical weekday bedtime, dinner time and television watching time of their children.

38% of EA children slept later than 8:30 pm during school days compared to 67% of AA children. Only 4% of EA children had late dinner (after 7 pm), whereas 50% of AA children had late dinner during week days. 27% of EA children watched television for more than 1 hour in comparison to 73% of AA children every day. Our findings suggest that insufficient sleep, late dinner schedule, and longer television exposure are some of the behavioral factors that contribute to greater percentage of childhood obesity in AA than EA children.

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**Title:** Thinking fast and slow about food  
**Primary Author (and presenter):** Parrott, Melanie W.  
**Additional Authors:** Franco-Watkins, Ana  
**Department:** Psychology  
**College/School:** College of Liberal Arts

**Description:**

People make food choices every day. It is imperative to investigate the decision processes underlying food choices to provide solutions for the current obesity epidemic. Dual Process Theory proposes there are two systems of thinking: one that is fast and automatic and one that is slow and deliberate. The goal of this study was to investigate how reliance on dual processes impacts food decisions. Additionally, we examined how the framing of nutrition information interacted with dual processes in decision making. Specifically, calorie information was presented either in a unit frame (i.e. one cookie contains 70 calories) or a package frame (i.e. three cookies contain 210 calories total). We present how using the fast and automatic system of thinking can affect choosing foods with higher calorie contents, and make people more susceptible to biases associated with the framing of options. We discuss the implications between food choices and the obesity epidemic, and propose possible interventions.

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**Title:** Determining habitat suitability for the conservation of a native ecosystem engineer

**Primary Author (and presenter):** Parsons, Elizabeth I.

**Additional Authors:** Gitzen, Robert; Pynne, JT; Castleberry, Steven; Conner, L. Mike; Duncan, Sarah; Austin, James; & McCleary, Robert

**Department:** Wildlife Science

**College/School:** School of Forestry and Wildlife Sciences

**Description:**

The southeastern pocket gopher (SEPG, *Geomys pinetis*) is endemic to the Natural Pinelands in the southeastern United States where, as an ecosystem engineer, it provides vital ecosystem services such as nutrient cycling, soil aeration, and creation of habitat for commensals. This ecosystem has been reduced to 3% of its historic range through urbanization and habitat conversion and with it SEPG populations have declined. While the species is important for the functionality of the ecosystem, little is known about the species' ecology, natural history, or current distribution. Therefore, a multi-state collaborative project is being conducted to identify habitat features that are limiting SEPG distribution, develop a decision support tool for enhancing local habitat, while also using satellite imagery to identify areas for possible translocation. Auburn University will take the lead on determining characteristics associated with the most suitable habitat along with determining possible reasons for decline. To assess habitat suitability, vegetation and presence surveys were conducted during the past 2 summers across 186 sites in public and private lands. The preliminary results show the overall percentage of occupied sites was 23.12%. Alabama had the fewest sites occupied (3.57%). Based on visual observations, many sites surveyed had unfavourable structural conditions for the species. Conditions such as flooded hardwoods, dense vine/woody understory, and wetlands were common for unoccupied sites. Occupied sites were characterized by fire maintained pine forests. The project aims to identify management options for the species throughout its range and determine habitat conditions for maintaining and restoring SEPG populations.

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**Title:** Co-pyrolysis of waste plastics with lignin: A sustainable approach to mitigate plastic pollution

**Primary Author (and presenter):** Patil, Vivek

**Additional Authors:** Adhikari, Sushil & Shanmugam, Saravanan R.

**Department:** Biosystems Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

The 8.3 billion tons of plastics created in the world in the last six decades still exist as wastes in various forms. There is an urgent need to manage this volume of plastic waste in an environment-friendly manner. In addition, the United States' goal of replacing 30% of crude oil consumption with biomass-

based sources by 2030 is likely to generate 225 million tons of lignin, a polymer present in the woody biomass. Red mud, with its low cost has the potential to convert the worldwide plastic waste into bio-oil having similar properties as that of petroleum crude oil. The goal of this research is to study the effect of 'red mud' catalyst on co-pyrolysis of various plastics combined with lignin, a by-product of second-generation bioethanol industry. Requirement of expensive metal catalysts and release of toxic emissions from the conversion process are limitations in the widespread adoption of fast pyrolysis for plastic waste mitigation. Waste plastics were combined with lignin and their mass loss was studied in a DTGA instrument. Co-pyrolysis of lignin with various plastics (LDPE, HDPE, PET, PP and PS) was carried out at 500°C for 10 seconds with 'red mud' catalyst in a 'pyro-probe' reactor attached to a 'gas chromatography-mass spectroscopy (GC-MS)' device. The analysis of product bio-oil composition, specifically to quantify the formation of olefins and aromatics was carried out from the resulting GC-MS spectra. In addition, the non-condensable gases produced during the fast pyrolysis were analyzed separately for the presence of toxins such as dioxins and persistent organic pollutants ('PoP's). Making this thermochemical conversion economically feasible will incentivize waste plastic segregation and collection. The impacts of this technology will be amplified when the toxic gases from the pyrolysis process are reduced, making it environmentally clean. Additionally, supplementing plastic pyrolysis with biomass will boost the circular bio-economy for the future.

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**Title:** Study of Mammal Diversity in Auburn, Alabama

**Primary Author (and presenter):** Patterson, Autumn, D

**Additional Authors:** 2nd Author Anderson, Cullen; 3rd Author Lepczyk, Christopher

**Department:** Wildlife Sciences

**College/School:** School of Forestry and Wildlife Sciences

**Description:**

Trail Cameras are increasingly being used to assess biodiversity throughout the world as they are a cost-effective tool that minimizes the impact of human disturbance while collecting large amounts of data. The lack of disturbance increases the possibility of detecting animal species or behavior, otherwise difficult to obtain in the field. Given the lack of knowledge about mammals in urban areas throughout the Southeast, our goal was to inventory mammal diversity in six urban green spaces of Auburn, AL. Locations were chosen based on public accessibility and spaced 4-8 km apart from one another. In autumn of 2017 we placed nine cameras at trail intersections for optimal visibility at Louise Kreher Forest Ecology Preserve; monitoring them every four weeks. To date, three months of data has been collected. We investigated all pictures for mammals, identifying 11 species: *Canis latrans*, *Procyon lotor*, *Odocoileus virginianus*, *Vulpes vulpes*, *Urocyon cinereoargenteus*, *Sylvilagus floridanus*, *Sciurus carolinensis*, *lynx rufus*, *Tamias striatus*, *Didelphis virginiana*, and *Dasyurus novemcinctus*. Additional camera traps are being placed at other green spaces. Upon completion, our data will provide both residents and management organizations a detailed understanding of the mammals present in Auburn and how they vary across the city based on environmental attributes.

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**Title:** A rapid thermal modeling approach for additive manufacturing

**Primary Author (and presenter):** Paudel, Basil J.

**Additional Authors:** Thompson, Scott M. & Shamsaei, Nima

**Department:** Mechanical Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Additive manufacturing (AM) is a layer-by-layer manufacturing method that differs substantially from the more conventional subtractive approaches. Due to its potential benefits and promises to modern industry, AM is evolving quickly, but so are the challenges. High thermal gradients exist in vicinity of the highly-localized laser irradiation and this complicates the quality of material processing. Thermal analysis of the energy deposition process forms the basis for understanding and predicting the microstructure of the final/manufactured part. Numerical codes utilizing Computational Fluid Dynamics (CFD) have been able to model the temperature response of parts during laser-based AM, but the solutions are unrealistic or fall behind significantly from full-scale modeling. In this study, a different analytical approach has been undertaken which utilizes conventional understanding of a thermal resistance network. While some errors are deliberately introduced due to the inherent assumptions, this approach can be used to estimate and assess a part's thermal response in significantly less time and with reduced computational investment. This approach presents the possibility of developing a feed-forward process control mechanism of AM systems, which can be employed to engineer parts with site specific properties.

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**Title:** Patient satisfaction with pharmacist-delivered disease state management in a heart failure clinic

**Primary Author (and presenter):** Peel, Emily, K.

**Additional Authors:** Garza, Kimberly & Mehringer, Sarah

**Department:** Health Outcomes Research and Policy

**College/ School:** Harrison School of Pharmacy

**Description:**

Pharmacists counsel patients on how to properly take their medications to ensure optimal patient outcomes and minimize drug-related problems. Pharmacists within heart failure clinics have greater interaction time with patients compared to those in the community pharmacy setting. Patient satisfaction with pharmacy-delivered care can impact not only the patient's medication adherence but also their likelihood to seek information from their pharmacist. This study evaluates patient satisfaction with pharmacy services in a heart failure clinic located at a large teaching hospital in Nashville, TN. Patients were recruited in person and informed consent was obtained over the course of 3 months during biweekly or monthly visits. Pharmacists met one-on-one with patients to review their medications, assess disease control and adjust dosing as needed. Approximately 2 months after enrolment, patients completed an online satisfaction survey on a tablet, phone, or laptop using Qualtrics. Survey items included three items that assessed level of agreement using a 5-point Likert-type scale (e.g., I would go to my pharmacist first for information...). A total of 12 patients were recruited (9 males; 3 females.) The majority (75%) of patients were white (n=9), 2 were African American, and one was of Hispanic/Latino/Spanish descent. Total annual household income ranged from \$20,000 to \$139,000. All patients reported being satisfied or very satisfied with their pharmacist. Ten patients (83%) reported that they would consult their pharmacist first for medication related questions, and all but one patient (92%) reported that their pharmacist would be one of the healthcare providers they would ask for medication related questions. The results from the patient satisfaction survey indicated that the patients felt the time spent with their pharmacist was beneficial.

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**Title:** Part size effects on the fatigue strength of additively manufactured Ti-Al-4V parts

**Primary Author (and presenter):** Pegues, Jonathan W.

**Additional Authors:** Roach, Michael & Shamsaei, Nima

**Department:** Mechanical Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

As additive manufacturing becomes an increasingly popular method for advanced manufacturing of components, there are many questions that need to be answered before these parts can be implemented for structural purposes. One of the most common concerns with additively manufactured parts is the reliability when subjected to cyclic loadings which has been shown to be highly sensitive to surface roughness in the as-built condition. It stands to reason that larger parts will inherently have larger surface area which could result in a sensitivity to part size as well. In this research, Ti-6Al-4V specimens of various sizes were tested under uniaxial cyclic conditions to investigate the effect of part size on fatigue behavior. Fractography was conducted to determine the failure mechanisms between specimen sets of different sizes. Results show that the fatigue behavior is highly sensitive to surface roughness which is affected by part size. Samples with gage diameters below 6.06 mm showed decreased mean fatigue lives for both low and high cycle fatigue which were related to increased surface roughness. Additionally, an underestimation of the stress amplitude for smaller gage diameter parts, as a result of the high surface roughness, resulted in a large amount of scatter for the high cycle fatigue regime.

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**Title:** Managing renewable energy in data centers using distributed UPS systems

**Primary Author (and presenter):** Peng, Xiaopu

**Additional Authors:** Qin, Xiao

**Department:** Computer Systems and Software Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

The huge and "non-environmental friendly" power consumption of datacenters has driven companies to build individual onsite renewable sources such as solar and wind. However, due to the intermittency feature of renewable energy, a distributed UPS system were implemented by datacenters not only to guarantee the stable operation of daily workload, but also enabling significant increases in datacenter capacity and reductions in cost. We propose Redux, a smart server power management scheme that integrate a distributed UPS system and maintains a desirable balance between renewable energy utilization and data center performance, especially when renewable generation is low or fluctuant. Comparing with other strategy, Redux could obviously mitigate average peak workload and reduce job waiting time, while still maintaining perfect renewable energy utilization.

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**Title:** Effects of varying digestible amino acid density on growth performance and meat yield of MV × Cobb 700 broiler chickens from 1 to 46 days of age

**Primary Author (and presenter):** Philpot, Stephanie C.

**Additional Authors:** Caldas, Justina & Dozier, William

**Department:** Poultry Science

**College/School:** College of Agriculture

**Description:**

A new genetic male line, MV Cobb, is being used to produce chicks for broiler production, but nutritional needs of the progeny originating from the MV male are sparse. Digestible amino acid (dig AA) needs of MV Cobb × Cobb 700 for optimum growth performance and carcass characteristics are not well defined. A study was conducted using a 2 × 4 factorial treatment structure of sex and four dig AA densities to evaluate growth performance and carcass characteristics of broilers. Digestible AA densities of 95, 100, 105, and 110% were used based on the recommended nutritional guidelines from the primary breeder. Day old chicks were randomly distributed by sex into 64 floor pens, with 22 birds per pen (eight replicate pens per treatment). Birds were provided starter, grower, finisher, and withdrawal diets, based on age. Diets were corn and soybean meal based and were formulated to be isocaloric. At days 18, 28,

38, and 45, birds and feed were weighed to determine body weight gain (BWG), feed intake, and feed conversion ratio (FCR). At day 46, twelve birds per pen were selected for processing. Carcass weight, total breast meat weight, and abdominal fat pad weight were measured, and breast fillets were scored for severity of wooden breast and white striping to determine fillet quality. At 18, 28, and 38 days, FCR had a quadratic response to AA density ( $P \leq 0.01$ ). At 45 days, FCR was lower at the 105% AA density than the 100% AA density ( $P = 0.04$ ), but there were no significant differences in BWG ( $P > 0.05$ ). White striping and wooden breast were not affected by AA density ( $P > 0.05$ ). Total breast meat weight displayed a quadratic response with AA density ( $P = 0.001$ ), with the largest increase occurring between the birds fed at 95% and 100% AA density. These results indicate that the MV × Cobb 700 is not as sensitive to changes in dig AA density as other genetic strains of broilers.

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**Title:** Elucidation of mechanism of learning and memory deficits in prenatal cannabinoid exposure

**Primary Author (and presenter):** Pinky, Priyanka D.

**Additional Authors:** Bloemer, Jenna; Heslin, Ryan; Setti, Sharay; Du, Yifeng; Reed, Miranda; & Suppiramaniam, Vishnu

**Department:** Drug Discovery and Development

**College/School:** Harrison School of Pharmacy

**Description:**

Cannabis use during pregnancy has increased by 62% from 2002 through 2014 and is now the most commonly used illicit drug during pregnancy with use ranging from 2-5% in most studies but as high as 15-28% among urban, low-income pregnant women. Several studies have demonstrated that the neural network activity underlies the typical cognitive and behavioral processes reportedly altered by prenatal cannabinoid exposure (PCE). Prenatal Cannabinoid Exposure (PCE) is associated with long lasting effects on adult behavior such as learning ability, stress response, pain sensitivity, social interaction and others. We investigated the impact of PCE in adolescent offspring in hippocampal dependent spatial learning and memory performing a series of behavioral, electrophysiological and immunochemical studies. An osmotic pump filled with either N-Methyl Pyrulol (NMP) or the cannabinoid receptor full agonist WIN55,212-2 (2 mg/kg body weight/day) was implanted subcutaneously in Gestational Day-3 (GD-3) which delivered the drug at a constant rate until the delivery of the pups. Contextual Fear Conditioning (CFL) and Morris Water Maze (MWM) were performed to investigate the behavioral deficits which revealed significant deficits in the PCE animals. Later we performed electrophysiological experiment in Schaffer Collateral Pathway of Hippocampus where we observed the fEPSP slope is reduced by 50% in PCE animals. Immunochemical and Western blot data has shown increased Cannabinoid Receptor Type 1(CB1) expression followed by reduced Neural Cell Adhesion Molecule (NCAM) expression which signifies the observed behavioral deficits might be due to altered glutamatergic neurotransmission in the hippocampus of these animals which leads to impaired synaptic plasticity causing significant learning and memory deficits.

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**Title:** Transcriptomic analysis for differentially expressed genes in response to the phytoalexin gossypol in *Fusarium oxysporum* f. Sp. *vasinfectum*

**Primary Author (and presenter):** Pokhrel, Ambika

**Additional Authors:** Coleman, Jeffrey

**Department:** Entomology and Plant Pathology

**College/School:** College of Agriculture

**Description:**

*Fusarium oxysporium* f.sp *vasinfectum* (FOV) is a soilborne filamentous fungus that causes vascular wilt in cotton. In response to pathogens including FOV, cotton plants produce the phytoalexin

gossypol as a defense mechanism. This research aims to explore the molecular mechanisms utilized by FOV to tolerate the antimicrobial action of gossypol during infection and colonization of cotton. To identify these mechanisms, candidate genes that could be responsible for gossypol tolerance were identified through RNA sequencing. Four RNA samples were extracted from germlings of a virulent race 4 genotype FOV isolate, grown in minimal medium before and after treatment of 80 ug/mL of gossypol at 1, 2 and 4 hours. RNA sequence data showed upregulation of ABC and major facilitator transporters and several classes of dehydrogenases when compared with the non-treated FOV control RNA sample. The last phase of this work involves validation of genes identified through RNA sequencing in gossypol tolerance. This will be done through generation of mutants using CRISPR-Cas9 technology. The research findings will help to understand how a pathogen can develop mechanisms to overcome these plant antimicrobial compounds.

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**Title:** High fat diet with impairing autophagy and induces deposition of oligomeric/fibrillar species of Amyloid- $\beta$  in Mice Brain

**Primary Author (and presenter):** Polinsky, Brooke

**Additional Authors:** Connor Koch<sup>†</sup>, Suhail Rasool<sup>†</sup> and Ramesh Jeganathan<sup>†</sup>

**College/School:** College of Human Sciences

**Department:** Department of Nutrition, Dietetics, and Hospitality Management, Auburn University, Auburn, Alabama 36849 USA.

**Description:**

High fat diet with sugar (HFS) induces obesity, which leads to peripheral and central insulin resistance. Recent studies from our lab showed that mice fed with HFS diet develop Alzheimer's disease (AD) phenotype in the brain compared to mice fed a traditional chow diet. The purpose of this study was to investigate the effect of HFS diet on apoptosis, autophagy and different conformation of amyloid  $\beta$  in brain of mice fed with HFS diet. The brain tissue of HFS diet fed mice displayed a significant increase of apoptotic markers and autophagy markers, decrease in glucose transporters as compared to mice fed with chow diet. Our result showed the HFS diet has a potential of inducing deposition of A $\beta$  oligomers and fibrils. Interestingly, further immunoblot data displays the deposition of toxic oligomeric form of A $\beta$  as well as fibrillary form of A $\beta$  in brain homogenates of mice fed HFS diet as compared to mice fed with chow diet. These findings revealed that HFS diet not only impairs glucose transport and insulin signaling but also leads to deposition of various conformational form of A $\beta$ .

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**Title:** The Public Realm

**Primary Author (and presenter):** Porter, Allison, E.

**Department:** Environmental Design

**College/School:** College of Architecture, Design, and Construction

**Description:**

This research project is about the various aspects of the public realm that especially focuses on Copenhagen Denmark, as well as Europe in general, with some comparisons made to the public realm in Atlanta Georgia, as well as the United States in general. My research questions were as follows: What is the difference between public and private space? What makes a good public space? How does the addition of parks impact the quality of public space? What are steps that Americans can take to imitate the high quality public space demonstrated in Copenhagen? I gathered data from census information published on government websites, as well as experiential data from my study abroad time in Copenhagen. My research applies to major metropolitan areas, especially areas that are experiencing urban growth and development. The quality of the public realm impacts how we interact with people, how society mixes between socio-

economic groups, education levels, and races. It is where the average person can casually learn more about those living around them. I collected both qualitative and quantitative data to discover the different degrees of public space, and the role of the different realms. Through my research, I discovered that the public realm is different in every society, that each level of the public realm appeals to different people in an urban area, and that the public realm carries different importance in different societies.

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**Title:** An overview of Auburn University efforts to combat *Flavobacterium columnare* in aquaculture farms

**Primary Author (and presenter):** Porterfield, Aaron D.

**Additional Authors:** Arias, Covadonga; Mohammed, Haitham; & Lafrentz, Stacey

**Department:** Fisheries

**College/School:** School of Fisheries, Aquaculture and Aquatic Sciences

**Description:**

Infectious diseases are one of the main factors limiting aquaculture productivity. *Flavobacterium columnare*, the causative agent of columnaris disease, is one of the leading causes of fish mortality for US catfish farmers. Mortalities rates varied but can reach up to 90% in fingerlings. *Flavobacterium columnare* is a ubiquitous bacterium in freshwater environments and its eradication from catfish farms is unrealistic. Prevention is the best strategy to control and minimize disease impacts in farms. Among other best management practices, vaccination protocols have proved to be very successful to prevent infectious diseases in aquaculture. Currently, there are no commercial vaccines that are effective in preventing columnaris disease. Our group has developed a modified-live vaccine against the most virulent form of columnaris in catfish. Our vaccine is a safe and permanently stable rifampicin-resistant mutant based on a genomovar II strain (17-23). Genomovar II strains have been proven to be more virulent towards catfish, leading to the hypothesis that genomovar II based vaccines will lead to increasing effectiveness against columnaris disease. Our laboratory studies have confirmed that our modified-live genomovar II vaccine is effective against both genomovar I and genomovar II isolates and significantly increases survival in catfish, tilapia, and zebrafish after controlled exposure to the pathogen. Recently, we have received a USDA-NIFA grant to take our vaccine out of the lab and into experimental field studies. This poster summarizes our findings to date and describes the upcoming experiments in the field.

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**Title:** The effects on broiler chicken feeding behavior and nutrient intake while using different particle sizes and controlling proportions of fines

**Primary Author (and presenter):** Powell, Judson E.

**Additional Authors:** Oscar J. Tejada, Jessica D. Starkey, Charles W. Starkey

**Department:** Poultry Science

**College/School:** College of Agriculture

**Description:**

An experiment was conducted to determine whether different particle size and proportions of fines in the feed affected broiler chicken feeding behavior and total caloric intake. The pelleting process generates fines which are then placed in front of birds during the rearing period. During the first 3 weeks of life, a bird's growth rate is most rapid and caloric intake must be sufficient for it to gain weight. If birds cannot consume enough calories, weight gain will suffer. The feed was manufactured using corn ground to achieve 1,680 microns and 841 microns, and each grind was mixed with whole pellets to achieve treatments with 25%, 50%, and 75% fines. The birds were housed in battery cages with six birds per cage. Feed disappearance was measured daily over a 21-day period. Birds were weighed once a week to calculate body weight gain (BWG). For the entire rearing period, no significant differences in BWG (*P*

= 0.4518), average daily feed intake (ADFI;  $P = 0.4832$ ), or feed conversion ratio (FCR;  $P = 0.6229$ ) were observed when comparing the fine and the course ground treatments. Body weight gains for birds consuming diets including 25% and 75% fines were greater when compared to birds consuming 50% fines ( $P = 0.0012$ ). Average daily feed intake was higher for birds fed 75% fines compared to those fed 25% and 50% fines ( $P = 0.0258$ ). Birds consuming only 25% fines had lower FCR than those consuming diets including 50% or 75% fines ( $P = 0.0019$ ). Feed conversion ratio is utilized by the industry to demonstrate efficiency of rearing. Lower feed intake in relation to weight gained is desired and demonstrates a more economically viable and sustainable option for production. Increasing the percentage of fines decreased overall broiler production efficiency.

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**Title:** Anaerobic digestion of poultry litter for biogas production

**Primary Author (and presenter):** Preisser, Matthew, D.

**Additional Authors:** Higgins, Brendan

**Department:** Biosystems Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Anaerobic digestion has been a suggested method for diverting waste products (wood chips, poultry and cow waste, food waste, etc.) from landfills to create second generation products. This includes the production of biogas with high methane concentrations for energy use and nutrient rich effluent that can be used in future biofuels research or as an organic fertilizer substitute. This benefits local communities by diverting a potential pollutant and waste item and generating carbon neutral energy. Anaerobic digestion occurs when a feedstock and an inoculum full of methanogens (methane producing bacteria) are incubated in an oxygen free environment. The campus dining program, Tiger Dining, at Auburn University has expressed enthusiastic interest in this concept and hopes to utilize biogas for its greenhouses on campus.

This research project looks into the potential for utilizing campus food waste and local poultry litter as a feedstock for anaerobic digestion. The objectives are to see if these two substrates are capable of producing a high quantity and quality biogas. This was accomplished through the use of biogas methane potential testing (BMP) using 150 mL bioreactors to aid campus stakeholders in future decision-making processes. In order to scale up to larger experiments and be able to monitor gas production rates more efficiently, an inexpensive on-line gas monitoring device was designed and built alongside a bench scale semi-continuous fed reactor.

This gas monitoring device and bench scale reactor will be used for future anaerobic digestion research and can serve as a demonstration reactor for education and outreach opportunities at Auburn University. Ongoing lab efforts are examining uses of the digestate in algal research with biofuel applications. Future investigations will continue to look at the cost benefit analysis of scaling up the process to a school wide anaerobic digester and further algal research in conjunction with current campus initiatives.

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**Title:** The influence of maternal nesting behavior and nest microhabitat on embryo development and offspring fitness across early-life stages

**Primary Author (and presenter):** Pruett, Jenna E.

**Additional Author:** Warner, Dan A.

**Department:** Biological Sciences

**College/ School:** College of Sciences and Mathematics

**Description:**

Phenotypic plasticity, or the ability of a single genotype to express multiple phenotypes, is critically important in fluctuating or changing environments. Developmental and embryonic life stages are particularly sensitive to their environment, especially in oviparous taxa that lack of parental care. Thus, the location that mothers choose for nesting has important consequences on fitness. When choosing an oviposition site mothers must assess both (1) the conditions (both biotic and abiotic) that offspring will experience during development, and (2) the location of the nest in relation to resources offspring may need after hatching. To quantify the influences of nest site microhabitat, location, and maternal effects on offspring, we studied the Western Painted Turtle (*Chrysemys picta*), which has a unique life history trait where hatchlings remain in the nest over winter. We observed nesting behavior at Round Lake State Park in Northern Idaho, and used a cross-fostering experiment to quantify the contributions of maternal identity and nest microclimate to variation in offspring survival and phenotype. Specifically, I manipulated two variables that are important to development and post-hatching dispersal (shade cover and distance to water) to determine their effects on development and offspring fitness. Because shade cover has significant effects on summer and winter nest temperatures, we predict that these factors contribute to variation in offspring phenotypes and survival at the embryo, over-winter, and dispersal stages.

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**Title:** Risky decision making in adolescence: Effects of peers

**Primary Author (and presenter):** Punna, Bharat, V

**Additional Authors:** Kaepler, Alexander; McConnell, Leanna; Carothers, Katherine; Hall, Justin; Hinnant, Ben

**Department:** Human Development and Family Studies

**College/School:** Human Sciences

**Description:**

Risk-taking behaviors rise steadily during adolescence and contribute to unintentional injuries. Motor vehicle accidents account for 73% of unintentional injury deaths. A “peer effect” during adolescence has been well-documented indicating adolescents take risks in contexts with peers because peers act as a reward system. However, adolescents vary in the amount of risky decisions they make. It is unclear what individual differences may underlie this relationship. For example, resistance to peer influence may play an important role because adolescents who are able to resist pressure from peers may also be less likely to take risks in the presence of peers.

Participants included 24 adolescents who completed questionnaires assessing self-reported resistance to peer influence as well as a computerized driving game to assess risky decision-making under different conditions. During the driving task, participants were asked to make decisions about whether to “stop” or “go” through a series of intersections. The driving task included two experimental manipulations, one in which participants were told they were being observed by a same-aged, same-sex peer, and another in which a performance-based incentive was provided as a reward for specific trials.

Preliminary analyses revealed that, within individuals, the number of risky-decisions made during the driving task was significantly larger during the combination peer-reward condition than during the reward-only and control conditions. A trend-level main effect was also observed between self-reports of resistance to peer influence (RPI) and number of risky decisions, such that higher levels of RPI predicted fewer risky decisions made during the driving task. Further analyses will examine how condition effects may be moderated by individual differences related to risk-taking behavior.

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**Title:** Glucose responsiveness to epinephrine in diabetic and non-diabetic leptin-treated rats

**Primary Author (and presenter):** Qi, Yijing

**Additional Authors:** White, B. Douglas

**Department:** Nutrition

**College/School:** College of Human Sciences

**Description:**

Evidence has shown that leptin administration into the lateral ventricle of the brain of streptozotocin (STZ)-induced diabetic rats will lead to a normalization of blood glucose concentrations independent of insulin. In previous studies, we observed that leptin-treated diabetic rats could not maintain their blood glucose levels and even led to hypoglycemia during fasting. Epinephrine is known to raise blood glucose levels in response to hypoglycemia. We hypothesize that chronic central leptin administration blocks the cAMP (cyclic adenosine monophosphate)-CREB (cAMP response element binding protein) pathway in the liver, blocking or attenuating the effects of counterregulatory hormones to increase hepatic gluconeogenesis. To test this hypothesis, we determined the glucose responsiveness of leptin-treated nondiabetic and diabetic rats to epinephrine during the fed and fasted states and whether alterations in blood glucose concentrations are associated with biochemical changes in the cAMP-CREB pathway in the liver. Baseline blood glucose concentrations were determined followed by an intraperitoneal injection of epinephrine or saline to each rat both during fasting and fed state. Blood glucose concentrations were monitored for 3 hours post-injection. Leptin normalized the daily blood glucose levels in diabetic rats and attenuated the effect of epinephrine in both diabetic and non-diabetic rats during fasting. Diabetes increased hepatic phosphoenolpyruvate carboxykinase, glucose 6-phosphatase, CREB, and glycogen synthase 2 levels, while hepatic glycogen phosphorylase content was decreased by diabetes. Leptin treatment of diabetic rats negated all these changes, except for glucose 6-phosphatase, which remained elevated even after leptin treatment. These results support the hypothesis that chronic central leptin treatment blocks the cAMP-CREB pathway and attenuates the effects of epinephrine to increase hepatic glucose production via gluconeogenesis.

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**Title:** Reactive transport modeling of CO<sub>2</sub> mineralization and the potential changes of rock properties in the Lower Tuscaloosa formation at the Kemper pilot CO<sub>2</sub> injection site

**Primary Author (and presenter):** Qin, Fanqi<sup>1</sup>

**Additional Authors:** Anjekar, Ishan<sup>1</sup>; Kirkland, Brenda<sup>2</sup>; Beckingham, Laura<sup>1</sup>

**Department:** <sup>1</sup>Civil Engineering; <sup>2</sup>Department of Geosciences, Mississippi State University, MS

**College/ School:** <sup>1</sup>Samuel Ginn College of Engineering

**Description:**

Subsurface CO<sub>2</sub> storage may have an impact on rock properties including porosity, permeability, and pore connectivity through CO<sub>2</sub>-brine-mineral reactions. The rate and extent of mineral alteration largely depends on the nature and evolution of reactive mineral interfaces. The Lower Tuscaloosa formation has been identified as one of the potential CO<sub>2</sub> storage reservoirs at the CO<sub>2</sub> Storage Complex in Kemper County, Mississippi, USA (Project ECO<sub>2</sub>S). In this work, the potential for geochemical reactions and changes in rock properties are evaluated through reactive transport modeling. Formation samples were obtained from the Geological Survey of Alabama and the mineral composition of these samples determined using petrography and powder X-ray Diffraction (XRD). The spatial distribution and accessibility of minerals to reactive fluids is critical to understanding mineral reaction rates and corresponding changes in the pore structure, including pore connectivity, porosity and permeability. Scanning electron microscopy (SEM) backscattered electron (BSE) images and energy dispersive X-ray spectroscopy (EDS) images are used to generate maps of mineral distributions. The nature of the pore-mineral interface, and distribution of reactive minerals as well as their accessibilities is determined through imaging analysis. Continuum-scale reactive transport simulations are then developed based on these analyses to examine potential CO<sub>2</sub>-brine-mineral interactions. Simulations focus on mineral dissolution and precipitation reactions and the potential changes in the system including pH, porosity, permeability, etc. and the timeline of CO<sub>2</sub> mineralization. The “Establishing an Early CO<sub>2</sub> Storage

Complex in Kemper, MS” project is funded by the U.S. Department of Energy’s National Energy Technology Laboratory and cost-sharing partners.

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**Title:** Interparental conflict as a predictor of siblings’ anxiety symptomology: A multi-informant study of military families

**Primary Author (and presenter):** Quichocho, Davina

**Additional Authors:** Lucier-Greer, Mallory

**Department:** Human Development and Family Studies

**College/School:** College of Human Sciences

**Description:**

Based in family systems theory and the spillover hypothesis, this study examined how interparental conflict (e.g., hostility between parents) was related to anxiety among adolescent children in the home. Structural equation models were fit with data from 116 military families, comprised of an active duty military parent, a civilian parent, and two adolescent children (between ages 11-18). Results showed that interparental conflict reported by parents about their own couple relationship was not directly associated with child anxiety. Rather, the perception of interparental conflict from the point of view of the adolescents (e.g., how much conflict the adolescent sees and hears) was essential in predicting child anxiety. Our final model fit the data well (TLI=.953, CFI=.982, RMSEA=.032,  $p=.546$ ) and suggested that when civilian parents reported higher rates of interparental conflict, children perceived that more conflict was happening between the parents, and these higher rates of perceived interparental conflict by children were related to higher reports of child anxiety. This relationship differed for active duty parents; active duty parents’ reports of conflict with his/her spouse had no bearing on perceived interparental conflict by the child or child anxiety. These patterns were consistent for both siblings. Findings suggest that civilian parent perceptions of interparental conflict have a stronger relationship with child mental health outcomes in comparison to active duty parent perceptions. This is consistent with previous research that highlights the well-being of the “at home” caregiver as an important predictor of child outcomes. Findings further suggest that child perceptions of conflict need to be considered in the context of these family dynamics. This study points to the parental subsystem, specifically supporting the needs of the civilian parent, as a potential point of intervention in preventing or treating child anxiety within military families.

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**Title:** Revisiting linear programming to solve Markov decision processes with long-run average reward functions

**Primary Author (and presenter):** Qureshi, Rehman S.

**Additional Authors:** Silva, Daniel

**Department:** Industrial & Systems Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Discrete-time, infinite-horizon Markov decision processes (MDPs) are a type of mathematical model that is commonly used in sequential decision-making. Applications of MDPs include queuing problems, financial services, and autonomous systems. While MDPs are mathematical structures, most do not have closed-form solutions and must be solved numerically. Three common solution methods exist: the value iteration algorithm (VIA), the policy iteration algorithm (PIA), and linear programming (LP). This study compares the computational time required to find an optimal policy by PIA and LP for MDPs with long-run average reward functions. Although the method of solving MDPs using LP has existed for decades, it has often been dismissed as inferior to PIA due to LP’s use of additional computational

resources and historically slower runtime. However, in the past three decades, hardware and software advancements have led to LP packages that are orders of magnitude faster than their predecessors. Past studies have shown that VIA is slower than PIA, so this study only compares PIA to LP. Randomly generated test cases were developed and solved to empirically demonstrate that commercial LP algorithms (particularly barrier methods) are faster at solving long-run average MDPs. The analysis was conducted over test instances with varying sizes of state space and action space, as well as different sparsity levels of the transition probability matrix. This study shows that a commercial LP solver using barrier methods is a viable solution tool for solving MDPs. The results also yield a general conclusion: LP is faster than PIA for MDPs with relatively dense transition probability matrices and small action spaces. As action space size increases or sparsity decreases, PIA outperforms LP. This conclusion scales with state space size. Although PIA was regarded as the fastest method, this study demonstrates that LPs using barrier methods are faster than PIA for certain classes of MDPs.

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**Title:** Disparities in the appropriateness of medication use: analysis of the REGARDS study

**Primary Author (and presenter):** Rahman, Motiur

**Additional Authors:** Howard, George; Qian, Jingjing; Chou, Chiahung; & Hansen, Richard

**Department:** Health Outcomes Research and Policy

**College/School:** Harrison School of Pharmacy

**Description:**

The purpose of this study is to assess the association between socioeconomic disparities (sex, age, race, income, education, and rural or urban areas) and appropriateness of medication use (AMU). Our study included 30,183 black and white US adults with age  $\geq 45$  years from the REasons for Geographic And Racial Differences in Stroke (REGARDS) study, of which 11,912 participants were of age  $\geq 65$  years (recruited 2003-2007). AMU was measured by the presence of drug-drug interactions (DDIs) and potentially inappropriate medications (PIMs) use in older adults. Multivariable logistic regressions assessed the association of disparity parameters with PIM use and DDIs. About 80% of the older adults used at least one drug listed in the Beers criteria, and 3.4% of all participants used two or more drugs with DDIs. For older adults, sex (female vs. male: OR=1.23, 95% CI 1.12-1.34), race (black vs. white: OR= 0.80, 95% CI 0.73-0.88), education (< high school vs. >college: OR= 1.18, 95% CI 1.02-1.36), and rurality (rural vs. urban: OR= 1.17, 95% CI 1.01-1.37) were significantly associated with PIM use. DDIs also were significantly associated with sex (female vs. male: OR= 0.65, 95% CI 0.56-0.74), age (age 60-64 vs. <60: OR= 1.30, 95% CI 1.05-1.60; age 65-75 vs. <60: OR= 1.28, 95% CI 1.06-1.54; age  $\geq 75$  vs. <60: OR= 1.65, 1.34-2.05), race (black vs. white: OR= 0.44, 95% CI 0.38-0.53), and income (<\$20,000 vs.  $\geq$ \$75,000: OR= 1.50, 95% CI 1.15-1.96). Analysis of prescription-only drugs revealed that sex, income, and education were associated with higher odds of PIM use ( $p \leq 0.01$ ). A significant sex-race interaction ( $p < 0.01$ ) in the prescription-only group illustrated that PIM use was higher among black vs. white males (OR=1.24, 95% CI 1.07-1.45); however, this difference was not significant among women. Socioeconomic disparities in PIM use and DDIs exist, and future studies should seek to better understand factors contributing to the disparities to guide development of interventions.

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**Title:** Biglobal instability investigation of cylindrical solid rocket motors

**Primary Author (and presenter):** Ramesh Kumar, Tharikaa

**Additional Authors:** Majdalani, Joseph

**Department:** Aerospace Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Combustion Instability in long and segmented solid rocket motors have been known to be caused by a vortex shedding mechanism leading to undesired pressure oscillations. From motor firings and cold-flow setup experiments, it has been observed that these pressure oscillations occur at frequencies close to the vorticoacoustic modes of the motor and are triggered by the hydrodynamic modes. In this work, we adopt a compressible biglobal stability approach to investigate the hydrodynamic and vorticoacoustic responses of unsteady waves in right-cylindrical porous chambers that are driven by radial wall injection. The retention of compressibility in the governing equations enables us to construct a robust framework that is capable of predicting both hydrodynamic and vorticoacoustic wave motions simultaneously. The flowfield is simulated using this solver to obtain a comprehensive frequency spectrum. This enables us to identify the longitudinal, transverse and mixed modal frequencies and also their frequency shifts, an effect of the mean flow. Pure acoustic tones have been recovered by the solver for zero mean flow and has also been validated with data from ONERA's VALDO cold-flow setup experiment. Parametric studies have been carried to identify the possible damping factors on instability such as injection Mach number, viscosity of the flow and length of the motor. This work will also detail various techniques used in improving the solver capabilities viz., the eigensolver algorithm, the spectrum filter and a  $N \times M$  mesh. Acoustic boundary layer is characterized using the a single similarity parameter, the penetration number  $S_p$  for both transverse and longitudinal waves and its effect on the stability of the motor has been analysed. The approach presented here may be viewed as a milestone in advancing our modeling capabilities to the extent of obviating the need to employ Helmholtz decomposition of the unsteady motion at the forefront of the instability analysis.

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**Title:** Pioglitazone suppresses high glucose-induced A $\beta$  production in a hippocampal cell model

**Primary Author (and presenter):** Ramesh, Sindhu

**Additional Authors:** Govindarajulu, M.; Suppiramaniam, V.; Dhanasekaran, M.; & Moore, T.

**Department:** Drug Discovery & Development

**College/ School:** Harrison School of Pharmacy

**Description:**

Type 2 Diabetes Mellitus (T2DM) predisposes patients for late onset Alzheimer's disease (AD). Hyperglycemia leads to high levels of amyloid beta (A $\beta$ ) accumulation in the brain. Cellular A $\beta$  accumulation may result from decreased peroxisomal proliferator activating receptor gamma (PPAR $\gamma$ ) expression in a Beta Secretase/beta-site amyloid precursor protein cleaving enzyme-1 (BACE1) dependent mechanism. Therefore, stimulation and/or preservation of PPAR $\gamma$  receptor levels may reduce the risk of T2DM-associated AD. Thiazolidinediones, such as pioglitazone (Pio), are insulin-sensitizing PPAR $\gamma$  agonists that have been shown to improve cognitive function in AD animal models. This study tests whether: (i) Pio can attenuate high glucose-induced A $\beta$  production in a hippocampal-derived *in vitro* cell model and (ii) the protective effects of Pio are accomplished through inhibiting BACE1. Four experimental groups were studied: (i) Normal Glucose Control (NG) (ii) High Glucose (HG) (iii) Pio (5 $\mu$ M) treated HG cells & (iv) Pio (10 $\mu$ M) treated HG cells. For all groups, A $\beta$ , BACE1, & PPAR $\gamma$  protein levels were determined (Western analysis) and BACE1 activity was measured using ELISA. Compared to Control, the HG group showed increased A $\beta$  ( $\approx$ 80%), increased BACE1 ( $\approx$ 80%), and decreased PPAR $\gamma$  ( $\approx$ 50%) protein levels. The decreased BACE1 protein levels were coupled to elevated BACE1 activity ( $\approx$ 90%). Pio treatment (10 $\mu$ M) attenuated the HG mediated increases in A $\beta$ , BACE1 protein expression, & BACE1 activity to levels similar to Control. Pio (10 $\mu$ M) also increased PPAR $\gamma$  protein expression by approximately 50%. In summary, Pio attenuates increased A $\beta$  levels in hippocampal neurons exposed to high glucose. This effect is likely mediated through activation of constitutive PPAR $\gamma$  receptors, restoration of PPAR $\gamma$  receptor expression, and inhibition of BACE1. These studies further support the hypothesis that thiazolidinediones may be a useful class of drugs for reducing the risk of developing AD in T2DM.

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**Title:** Longleaf pine water relations under extended drought stress  
**Primary Author (and presenter):** Ramirez, Michael R.  
**Additional Authors:** Stokes, Tom; Blackstock, Jake; & Samuelson, Lisa  
**Department:** Forestry  
**College/School:** School of Forestry and Wildlife Sciences

**Description:**

Once common throughout the southeast United States, Longleaf pine (*Pinus palustris*) ecosystems have been reduced in area drastically in the last century. Today, these ecosystems are valued for their fire tolerance and high biodiversity. Interest has been raised in longleaf pine's traits as a disturbance-resistant species, considering recent climate change projections. Climate change has been projected to increase peak summer temperatures in the southeast United States, as well as altering the precipitation patterns, which may lead to increased occurrence and severity of drought events. Drought-related mortality has caused large die-back events in the western extents of the Southeast. Longleaf pine is thought to be particularly drought tolerant amongst the southern pines, but the limits of that tolerance are not well understood. To explore longleaf pine's ability to resist (and recover from) drought stress, 40% throughfall reduction and ambient precipitation treatments were installed in an 11-year-old longleaf pine plantation in Marion County, Georgia. A severe natural drought occurred June-October 2016, wherein 77 continuous days received no appreciable rainfall. Soil moisture, soil temperature, air temperature, precipitation, solar radiation, and relative humidity were measured continuously on-site to monitor meteorological conditions. Leaf water potential, sap flux density, whole-tree hydraulic conductance, and leaf area index, were measured to examine longleaf pine's hydraulic adjustment under drought stress. Over the course of 18 months of measurement, average midday leaf water potential values were observed as low as -3.25 MPa during the natural drought, and as high as -0.48 following the return of precipitation. Average midday sap flux density was much as 3.48 kg m<sup>-1</sup> s<sup>-1</sup> when water was available, and ceased by the end of the drought. These measurements provide insight into the effects of severe drought stress on longleaf pine water relations.

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**Title:** Addressing the issues of public housing  
**Primary Author (and presenter):** Ramsey, Donqika L.J  
**Department:** Environmental Design  
**College/School:** College of Architecture and Design Construction

**Description:**

In many countries, *public housing* has a negative and connotation. However, the reason this term is negative is because perceptions are hard to change once they are set. These perceptions lead to the way we design and maintain communities. Because of this cycle, the connotation of *public housing* continues to be negative. Public housing in the United States was established when WWII was coming to an end. Developers were expecting people to come back from the war and live in cities so they needed a place to house them. Thirty years later, people became less interested in public housing because the city became over-populated with people, crime, and drugs. This was the start of seeing public housing as something that was undesirable. The problems mentioned above quickly escalated into crises that were disregarded by the government, and that further contributed to the "negative" housing system we have today. The purpose of this research is to show that the way *public housing* is perceived contributes to public education and community planning lack of appropriate design for the people who live here. This research is proposing that there is a change in the way these communities are being plan, and this can lead to better schools and perceptions of these communities.

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**Title:** Electrophoretic co-deposition of graphene/metal oxide platelets for composite electrode fabrication

**Primary Author (and presenter):** Rashti, Ali

**Advisor:** Oh, Tae-sik

**Department:** Chemical Engineering

**School:** Samuel Ginn College of Engineering

**Description:**

Metal oxide composites have been recently introduced as promising materials for energy storage and catalysis. The synergistic effects between graphene and metal oxide play an important role in improving the performance of these materials as in comparison to their individual components.<sup>1</sup> Improved electrochemical properties such as high capacity and cycling stability makes graphene/ NiCo<sub>2</sub>O<sub>4</sub> hybrid materials favorable to use in electrochemical capacitors.<sup>2</sup> In this work, the main approach is to develop graphene/ NiCo<sub>2</sub>O<sub>4</sub> composites supported on graphite electrode. Using electrochemical exfoliation of graphite and sulfur salts as the intercalators, graphene sheets are initially synthesized and collected from the solution.<sup>3</sup> NiCo<sub>2</sub>O<sub>4</sub> plates are synthesized using a thermal method starting from NiCl<sub>2</sub> and CoCl<sub>2</sub> as precursors.<sup>4</sup> Finally for the last step, graphene sheets and NiCo<sub>2</sub>O<sub>4</sub> plates are deposited on a graphite electrode using electrophoretic deposition technique. Electrochemical measurements on the final electrode are carried out using CV, EIS and galvanostatic charge/discharge test.

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**Title:** Automating gobble count surveys for eastern wild turkey

**Primary Author (and presenter):** Ratterman, Cara, M

**Additional Authors:** Grand, James

**Department:** Wildlife Sciences

**College/School:** School of Forestry and Wildlife Sciences

**Description:**

Expense is often a high priority factor in determining methods used for wildlife management. Traditional methods typically require resources to be spent on weekly surveys in the form of equipment, transportation, and labor. I propose an automated method of detection for eastern wild turkey (*Meleagris gallopavo silvestris*) in central Alabama to reduce these costs while maintaining the quality of estimates of abundance acquired from traditional surveys. Automated recording units were used to gather data that was analyzed visually to reduce expenses and increase the rate of analysis. Results suggest that automated surveying methods are viable methods for reducing expenses, but were too variable to suggest that detection rates were as well supported as those produced by traditional survey methods.

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**Title:** Use of *Dirofilaria immitis* infected and uninfected blood to determine mosquito feeding preference

**Primary Author (and presenter):** Rice, Kirsten S.

**Department:** Forestry and Wildlife Sciences

**College/School:** School of Forestry and Wildlife Sciences

**Description:**

*Dirofilaria immitis* is a parasitic round worm that causes Dirofilariasis, also known as heartworm disease—a common and potentially fatal condition that affects dogs and other household pets. When left untreated, the adult worms will migrate to the heart and lungs causing many complications. To continue the life cycle, a mosquito must bite and take blood from an already infected dog containing microfilariae. The parasite then grows into larvae within the mosquito, which infects a new dog when a mosquito bites

and deposits the larvae into the bloodstream. The close evolutionary relationship between mosquito vectors of canine heartworm suggest that there may be cues that attract mosquitoes to infected dogs. Human malaria parasites have coevolved with their hosts for millennia, and recent research on humans infected with malaria suggests that they produce a breath odor that is saturated with chemicals that are a by-product of infection and that are known to be attractive to mosquitoes. For my research, I investigate whether there is a similar mechanism in heartworm-infected dogs that attracts mosquito vectors to continue the life cycle. I hypothesize that more mosquitoes will be attracted to blood and odor from infected dogs than uninfected dogs. When presented with a choice, I found that there was no significant difference between mosquito preferences of infected or uninfected blood. Breath odor analysis and trials are still in progress before a conclusion can be made. Further research can help to better understand the ecological and evolutionary drivers of mosquito-borne diseases in reservoir hosts, as well as be able to use findings to develop non-invasive canine heartworm detection in dogs.

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**Title:** The multi-functional drug granisetron enhances the integrity of the blood brain barrier and normalizes cognition in a murine Alzheimer's model

**Primary Author (and presenter):** Rihani, Sweilem B.

**Additional Authors:** Kaddoumi, Amal K.

**Department:** Drug Discovery and Development

**College/School:** Harrison School of Pharmacy

**Description:**

In the absence of new therapeutics, the number of cases of Alzheimer's disease (AD) – estimated to be more than 5.4 million currently – will rapidly increase in the coming decades. Current treatments provide, at best, only modest and temporary symptomatic relief, without altering the underlying mechanisms that led to the onset. Several studies in aging and Alzheimer's disease showed that the blood brain barrier (BBB) integrity is compromised, which could contribute to the disease pathology. The BBB breakdown could range from mild disruption of tight junctions (TJs) with enhanced BBB permeability to chronic integrity loss with altered transport of molecules across the BBB, brain hypo-perfusion and inflammatory responses. Therefore, enhancing the integrity of the BBB can be the first step in finding new therapeutics for neurodegenerative diseases. In our recent work, granisetron, a serotonin 5-HT<sub>3</sub> receptor antagonist, widely used as an antiemetic drug following chemotherapy was identified in a screen for candidates that enhance the integrity of the BBB, thus reversing this disruption in AD. With its already proven ability to improve learning and memory, granisetron could be a potential candidate drug for the treatment of AD. In this work, we evaluated the mechanism by which granisetron enhances the integrity of the BBB. In addition, we studied the effect of granisetron on amyloid beta production and clearance, and its effect on memory and learning abilities. Our results revealed for the first time that granisetron treatment significantly enhanced the integrity of the BBB in wild type aged mice and AD mice through upregulation of TJs proteins. Granisetron treatment significantly reduced amyloid beta accumulation and its related pathologies which was associated with enhancing the cognitive function in AD mice.

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**Title:** Key personality traits and alcohol use disorder among first and second year college students: Detangling antecedent vs. consequence

**Primary Author (and presenter):** Riley, Lucy K.

**Additional Authors:** Samek, Diana

**Department:** Human Development and Family Studies

**College/School:** College of Human Sciences

**Description:**

According to the National Institute of Alcohol Abuse and Alcoholism (2015), nearly 20% of college students meet criteria for alcohol use disorder (AUD). In fact, alcohol use rates spike in the first year of college and it remains imperative to better understand risk and protective factors associated with problematic alcohol use at this time. This paper investigates whether key personality traits (low Constraint, high Negative Emotionality) are an antecedent vs. consequence in the association between personality traits and AUD symptoms in a population of first and second year college students. The College Experiences Study ( $N = 209$ ; 90% white, 62% female; *Age* at Wave 1 = 19.1 years; *Age* at Wave 2 = 19.8 years; 85% retention) was used to test study research questions via cross-lagged panel models. Further analyses were used to determine the consistency or variation in results upon examining two additional categorical outcomes (AUD diagnosis and frequent binge drinking) and whether results varied by gender. All variables were assessed via an online survey at two time points about 10 months apart. Twenty-four and 25% of first and second year college students met AUD, respectively. Cross-lagged panel results found that AUD symptoms at Wave 1 significantly predicted constraint at Wave 2, for males only. Additionally, negative emotionality at Wave 1 significantly predicted constraint at Wave 2, for females only. Results were largely consistent when considering the categorical outcomes. Results for males are somewhat consistent with a “scar” hypothesis, such that the effect of AUD symptoms in the first year of college appears to decrease overall constraint in the second year. Results for females suggest negative emotionality in the first year of college appears to be an important predisposition/vulnerability factor for AUD in the second year of college.

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**Title:** Predicting cooperative behavior in the workplace: The mediating role of affective commitment

**Primary Author (and presenter):** Ritterbush, Elizabeth A.

**Additional Authors:** Smith, Adam; Whitman, Rachel; & Svyantek, Daniel

**Department:** Psychology

**College/School:** College of Liberal Arts

**Description:**

The current study aims to explain why employees engage in cooperative or competitive behaviours when making decisions in the workplace. Using a person-situation interactionist perspective, we examine how personality, context, and behaviour interact to describe a mechanistic prediction of cooperative decision making. Undergraduate students responded to four decision making scenarios based on classic game theory. Decisions regarding these scenarios were made in both cooperative and competitive organizational contexts. Results from the study showed that affective commitment significantly mediated the relationship between organizational context and decision making behaviour. However, personality variables did not moderate the relationships between context and affective commitment or decision making behaviour, indicating that the interactionist perspective may not be as useful in decisions where cooperation or teamwork would be encouraged. Moreover, after accounting for the mediating effect of affective commitment, personality variables failed to be predictive of decision making. In the final model, only Machiavellianism and altruism were significant predictors of affective commitment. Thus, when attempting to encourage cooperative behaviour within an organization it may be important to focus primarily on the situational aspects such as organizational culture rather than the personality of the individuals involved.

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**Title:** Designing a curriculum for Malagasy school children in Northern and Southern regions of Madagascar that educate them about the health effects from mosquito borne diseases

**Primary Author (and presenter):** Roberts, Janet, Lee

**Additional Authors:** Zohdy, Sarah

**Department:** School of Forestry and Wildlife Sciences  
**College/School:** Auburn University

**Description:**

Health effects from mosquito borne diseases is a key indicator of health inequity. There is ample evidence that poor education leads to poor health. A pilot project has been conducted that was inspired by an activity pamphlet designed by Placer Mosquito & Vector Control District (PMVDC). The pamphlet focuses on educating young individuals about the health effects from mosquito borne diseases, as well as increasing awareness about environmental factors that are linked to mosquitoes. The pamphlet also includes a variety of activities that have readers engaged in practicing sets of skills for mosquito defense. This pilot project started in August 2017 in Auburn, Alabama at Auburn University under a full-scale project called Mosquitoes to Empower and Education Malagasy kids (MEEM). It will be tested on school students located in Northern (n≈400) and Southern (n≈400) regions of Madagascar. A similar approach to PMVDC's pamphlet is used to create a curriculum that aims to educate the students about the health effects from mosquito borne diseases. The curriculum is designed to focus on practices in basic science skills and natural resources. The curriculum contains 1 index, 6 learning modules, 6 experiments, and 8 activities. The index classifies a collection of disease-carrying mosquitoes for identification purposes. The learning modules cover lectures about scientific reasoning, entomology, mosquito prevention, and environmental management. Students will apply the knowledge they receive from their lectures to hands-on experiments inside or outside the classroom. The activities are like the pamphlet described above and focus on key elements of reading success like print awareness, metalinguistic skills, and oral language skills. Results of this curriculum are shown as a published book titled "What's Bugging' Moko The Lemur?" Next steps include evaluating the impacts of this curriculum activity book on mosquito abundance and incidence of mosquito-borne illnesses.

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**Title:** Using software development and instructional design principles to implement interactive online experiences that achieve engaged hybrid learning

**Primary Author (and presenter):** Roberts, Jeremy H.

**Additional Authors:** Ali, S. Asim; Bowers, Shawndra T.

**Department:** Office of the Provost

**College/School:** Auburn Online

**Description:**

Recent trends show massive increases in student preference for blended learning (ECAR Study of Undergraduate Students and Information Technology, 2017). Interactive online learning experiences combine principles of software development and instructional design to enhance student participation, engagement, and performance. The selected contributions to Auburn University through the Auburn Online unit in the Office of the Provost demonstrate the implementation of thoughtfully-designed, interactive learning pertaining to broad skills and diverse academic fields. These online learning experiences allow instructors to analyse student interactions and feedback and enable fine tuning the content to better serve students. To demonstrate a highly interactive hybrid learning experience, the Flight Controls activity guides students to manipulate flight control systems to learn the effect on the aircraft. Quality design principles and the benefit of repetitive practice is exhibited in the Booker T Washington Outline Activity, which helps students practice outlining skills with immediate feedback for both the students and faculty. The Keywording Storylines showcase a combination of elegant design, interactive content, immediate and helpful feedback, and instructor participation. These activities help students improve their keyword brainstorming for research and provide faculty with in-depth records to help them analyse, improve, and iterate these activities to meet the changing needs of students.

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**Title:** A methanotroph-microalgae coculture platform for efficient biological CH<sub>4</sub> and CO<sub>2</sub> co-utilization

**Primary Author (and presenter):** Roberts, Nathan, R. M.

**Additional Authors:** Badr, Kiumars; Hilliard, Matthew; He, Peter Q.; & Wang, Jin

**Department:** Chemical Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Recent findings suggest that the coupling of methane oxidation and oxygenic photosynthesis are prevalent in nature and reduce CH<sub>4</sub> emissions and reuses CO<sub>2</sub>. In addition, a 2015 ISME Journal paper reported that methane removal in anoxic waters is due to true aerobic oxidation of methane, rather than anaerobic oxidation, fueled by in situ O<sub>2</sub> produced from photosynthetic algae. These findings suggest that the coculture of methanotrophs and microalgae represents not only a feasible, but also a highly promising strategy for simultaneous conversion of biogas (both CH<sub>4</sub> and CO<sub>2</sub>) into valuable products such as feed or energy. In this work, we present a flexible and stable methanotrophs-microalgae coculture platform for simultaneous biological CH<sub>4</sub>/CO<sub>2</sub> co-utilization. We hypothesize that cocultures of different methanotroph and microalgae strains can be stabilized if their growth conditions are compatible. To validate our hypothesis, established pairs of methanotroph-microalgae coculture were studied to confirm the stability all under light-dark cycles (12:12 or 16:8) of illumination. Two pairs of the model coculture were used to gain fundamental understandings on the interactions between the methanotroph and microalgae strains. Specifically, inoculation ratio, gas phase composition and illumination regimes will be examined using batch experiments. Also, computational tools were developed to study the coculture that will enable us to estimate individual cell concentrations, gas substrate (CH<sub>4</sub> and CO<sub>2</sub>) consumption rates and O<sub>2</sub> production and consumption rates. Our computational and experimental tools will allow us to evaluate the performance of the coculture under different experimental conditions.

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**Title:** Magnetic Resonance Imaging Analysis of Anterior Cruciate Ligaments with Magnetization Transfer Contrast

**Primary Author (and presenter):** Rodich, Reed, A

**Additional Authors:** Zabala, Michael

**Department:** Mechanical Engineering

**College/School:** College of Engineering

**Description:**

Anterior cruciate ligament (ACL) rupture is a common musculoskeletal injury, occurring almost 100,000 times in the United States alone each year. Individuals with this injury will likely endure with several negative consequences including joint pain and reduced activity level. ACL reconstruction is an invasive procedure that, while restoring kinematic constraint of the knee, oftentimes fails to prevent cartilage degradation and early onset osteoarthritis. The purpose of this study is to explore methods of predicting ACL injury risk via ligament composition and morphology. This would allow “at-risk” patients to undergo preventive treatment to reduce the likelihood of future ACL rupture. This study utilized three magnetic resonance imaging (MRI) scan sequences of healthy subjects’ knees: TRU-FI (3D-SPGR), T2 Map, and Magnetization Transfer (MT). The goal of this project was to create a novel, quantitative method for ACL analysis with MRI. Additionally, as the few existing quantitative analysis methods mainly focus on a single image slice of the ACL, a secondary goal was made to allow for three-dimensional analysis. First, the ACL was segmented on a slice-by-slice basis from the high-resolution topographical TRU-FI sequence to create an accurate 3D volume of the ACL. Image subtraction was performed on the MT scan to display signal intensity differences with and without MT contrast. The segmented ACL volume was then aligned anatomically with the MT scan, and a heatmap was created to display the signal intensity values in the ACL region. The developed method has the potential to meaningfully quantify MRI scans of the ACL, especially since MT signal intensity can be used to

describe ACL composition. Future development includes creating 3D matrices of the MT signal intensity values for subjects' ACLs. An "average" matrix can be calculated and used for comparison with new subject scans to find abnormalities that might indicate ACL injury risk potential.

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**Title:** Understanding and Controlling the Growth of Algae Species on Nanocomposites.

**Primary Author (and presenter):** Rodriguez, Marisa, G

**Additional Authors:** Karimi, Zahra; Herring, Derryn; Blersch, D. M. ; Davis, Virginia A.

**Department:** Chemical Engineering

**College/School:** Samuel Ginn College of Engineering; Auburn University

**Description:**

Due to the increased media attention on climate change and the negative impacts of fossil fuels on the environment, many petrochemical companies are turning to alternatives to fossil fuels. Biofuels greatly reduce the overall carbon dioxide emissions resulting from the use of fuels and are also a cheaper alternative. They are therefore ideal candidates to replace fossil fuels in industry.

Among the different candidates for biofuels, algae stand out as one of the most versatile sources of biofuel. In nature, multiple species of algae grow together in groups on rocks and other surfaces. In industry, there arise situations in which it is necessary to produce only one species of alga, but this of course does not happen naturally. This project focuses on two species of filamentous algae: *Microspora* and *Oedogonium*. *Microspora* is an alga which can be used in contaminated waterways for heavy metal clean up, and *Oedogonium* is potentially useful as a biofuel. By understanding the growth and attachment of algae, specific substrata could be made that would only grow one alga species each. The goal of this research is to understand the attachment and growth of algae on nanocomposites that are made from polylactic acid and cellulosic materials. Through experimentation it has been determined that between 10-200 cells adhere to our selected surfaces. This experiment requires an algae culture that must be grown and maintained. In order to determine the algae concentration of the experimental population, UV vis spectrometry was used to determine that the molar extinction coefficient is  $3E-08 \text{ L mol}^{-1} \text{ mm}^{-1}$ . We use this value to estimate the algal population at random.

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**Title:** Perceived self-congruence in influencer marketing: Attitudinal perceptions and moderating influences of value propositioning and product use context in Instagram influencer posts

**Primary Author (and presenter):** Ross, Cassandra

**Additional Authors:** Kwon, Wi-Suk

**Department:** Consumer and Design Sciences

**College/School:** College of Human Sciences

**Description:**

Recently, influencer marketing has gained traction in the realm of social media. Brands are looking to reach consumers in a less conspicuous manner through utilizing influencer marketing. Social media were not originally intended for branding and marketing, but for self-publishing social activities among consumers. This makes it particularly important for marketers to understand the social congruity occurring between brands and consumers when brands interact with consumers via social media, especially if brands are employing influencers as brand extensions. This study used an online survey of a convenience sample of 147 college students to canvas consumers' perceptions of *actual* and *ideal* self-congruity with Instagram influencers and their attitudes towards influencers, brands, and products endorsed. Further, this study examined moderating roles of consumers' perception of symbolic/functional product value propositioning and public/private product use context in the relationships between consumers' self-congruity with the influencer and their influencer, brand, and product attitudes. This

study revealed the significant relationships between perceptions of self-congruence with influencers and consumers' attitudes, as well as significant moderating effects of product value propositioning and product use context for these relationships.

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**Title:** Mindfulness and decision making: A meta-analysis

**Primary Author (and presenter):** Rotch, Michael, A.

**Additional Authors:** Willis, Julia, K.

**Department:** Psychology

**College/School:** College of Liberal Arts

**Description:**

Decision making is an integral part of most of our lives, as thinking and deciding allows us to select our homes, our jobs, partners, and countless other things. Mindfulness interventions have demonstrated immense value for stress reduction, worker well-being, and numerous other outcomes. Mindfulness impacts decision making through a variety of means, but most positive results are due to increased attentional stability, control, and efficiency. Literature examining the effects of mindfulness on decision making has supported positive outcomes, but no prior meta-analysis on the relationship has been conducted. The literature search was conducted with computer-based searches, including seven databases covering psychology, business, and economics literature. The initial search yielded 2,800 results which was reduced to 26 studies with 39 independent samples through the use of inclusion and exclusion criteria. We performed a meta-analysis of mindfulness and decision making constructs with the 39 unique samples. Results indicate that mindfulness is positively related to decision making effectiveness ( $\rho=0.24$ ), decision making style ( $\rho=0.50$ ), bias reduction ( $\rho=0.27$ ), and ethical decision making ( $\rho=0.42$ ). We performed moderator analyses on 13 variables related to demographics, publication, and study design. Results show that mindfulness is positively related to decision making effectiveness, decision making style, bias reduction, and ethical decision making. Moderation analyses of 13 variables revealed that demographic characteristics, aspects of publication, and study design may impact the strength of the relationship between mindfulness and decision making. Findings indicate that there may be publication bias in studies that examine mindfulness in relation to effective and ethical decision making. This meta-analysis lends support to mindfulness being used as an effective intervention for improving decision making in the workplace.

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**Title:** The effects of work and nonwork boundary fit on role satisfaction and subjective well-being

**Primary Author (and presenter):** Rotch, Michael A.

**Department:** Psychology

**College/School:** College of Liberal Arts

**Description:**

Employees manage work and nonwork boundaries, or socially constructed lines of demarcation, in different ways due to their preferences and ability to do so. When an individual's integration-segmentation boundary enactment matches their boundary preference, they possess greater boundary fit. The purpose of this study was to the impact of work and nonwork boundary fit on subjective well-being, mediated by work and nonwork satisfaction. This is the first empirical study to examine the effects of boundary fit operationalized by preference and enactment alignment. Participants were recruited through Amazon's Mechanical Turk and 681 participants were retained for analysis. Participants completed measures of integration/segmentation preference and enactment, role satisfaction, and subjective well-being across three waves of data collection. Results confirmed positive direct effects for work/nonwork boundary fit on role satisfaction and role satisfaction on subjective well-being. We also found significant

mediation effects for role satisfaction between work/nonwork boundary fit and subjective well-being. Fit between an employees' boundary management preferences and their boundary enactment is associated with greater subjective well-being through increased role satisfaction. Work boundary fit has larger direct effects on role satisfaction and larger indirect effects on subjective well-being than nonwork boundary fit; thus, interventions to increase work boundary fit should be a focus for organizations seeking to improve worker well-being.

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**Title:** Impact of nature-based stimuli on directed attention performance

**Primary Author (and presenter):** Rowe, Christina, C.,

**Additional Authors:** Hall, Tristan, T., O'Neil, Jennifer, P., Rhoads, Jence, A., Miller, Matthew, W., and Dyke, Ford, B.

**Department:** School of Kinesiology

**College/School:** Auburn University

**Description:**

Attention refers to the allocation of limited neural resources to stimuli. Attention is separated into two characteristically different constructs: involuntary attention and voluntary (directed) attention. Involuntary attention involves the automatic allocation of neural resources to stimuli (in a stimulus-driven manner). Conversely, directed attention involves the deliberate allocation of neural resources to stimuli (in a goal-driven manner). Directed attention is a limited cognitive resource, susceptible to fatigue. Thus, it is important to explore means by which to facilitate recovery from directed attention fatigue (DAF). Attention Restoration Theory (ART) has been proposed as a potential approach. The theory postulates directed attention is likely to replenish if permitted to rest. One way to allow directed attention to rest is to promote the use of involuntary attention. Previous research suggests viewing nature-based stimuli captures involuntary attention while simultaneously limiting the need for directed attention. However, directed attention restoration has only been measured at the behavioral level (e.g., improvements on cognitive task performance). Therefore, the purpose of this study was to quantify directed attention restoration at the neuronal level, as indexed by electroencephalography (EEG). EEG was recorded while 80 participants completed a cognitive task [i.e., the Sustained Attention to Response Task (SART)]. Subsequently, participants assigned to either 'GREEN' or 'URBAN' treatment groups viewed images of greenspace or urbanspace, respectively. Post-treatment procedures were identical to pre-treatment procedures. Importantly, behavioral (SART) and psychophysiological (EEG) data is currently being processed; results pending completion.

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**Title:** Feeding whole corn as an alternative to reduce electrical costs and improve growth rate and meat accretion of broilers

**Primary Author (and presenter):** Rubio, Andrea A.

**Additional Authors:** Aranibar, Juan; Fuentes, Henry; & Pacheco, Wilmer

**Department:** Poultry Science

**College/School:** College of Agriculture

**Description:**

Previous research has shown that inclusion of whole cereal grains could be an alternative to improve growth and stimulate gastrointestinal tract development of broilers. In addition, economical revenues could be generated from reducing the costs of grinding whole grains. The objective of this study was to evaluate the effect of different inclusion levels of whole corn before pelleting on live performance and processing yields of broilers from 1 to 42 d of age. A total of 1,000 male Ross x Ross 708 broiler chicks were randomly distributed among 4 treatments with 10 replicate pens per treatment and 25

birds/pen. The treatments consisted of different inclusion levels of whole corn (0%, 2.5%, 5% and 7.5%) that replaced ground corn. The starter diets were fed in crumbled form while the grower and finisher diets were fed in pelleted form. Feed consumption and BW were determined at 14, 28, and 42 d of age and feed conversion ratio (FCR) calculated by using the weights of the mortality. At 43 d, 10 birds/pen were processed for yield determination. After processing, carcasses were chilled in slush ice for 4 hours before chilled carcass weights were determined. At 44 d carcasses were deboned to determine breast meat weight and breast meat yield. Data were statistically evaluated using ANOVA procedure and means were separated by Tukey honestly significant different procedure. The inclusion of whole corn did not influence BW and feed consumption ( $P>0.05$ ) at 42 d of age. However, birds that received diets with whole corn had better FCR from 28 to 42 d of age (1.94 vs. 2.00,  $P<0.05$ ). Birds fed diets with 5% of whole corn had higher breast meat weight (292 vs. 284 g,  $P<0.05$ ) than birds fed 7.5%, but similar to birds fed diets without whole corn. The results of this experiment indicated that up to 5% of whole corn could be used to replace ground corn during the starter, grower and finisher periods without a negative effect on broiler performance and carcass characteristics.

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**Title:** Tidal-flow wetlands with feedback control for management of nitrogen in aquaculture wastewater

**Primary Author (and Presenter):** Rubisch, Mary C.

**Additional Authors:** Blersch, David

**Department:** Biosystems Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

The potential exists for the United States to increase seafood production through aquaculture (AQ), particularly in the southeastern United States where the climate and environment is favorable. However, with an increase in production comes the need for management of nutrients in AQ waste effluent. Left untreated, this waste contaminates water supplies and encourages eutrophication from elevated nutrient loading. As additional treatment and transportation of water can be costly, the need arises for onsite waste treatment that is not taxing for farmers. An effective way to satisfy this need is through constructed wetlands, which have proven suitable for treating a variety of waste streams. However, the ability of these systems to remove nitrogen (N) can vary due to misaligned reduction-oxidation (redox) potential related to oxygen supply. Tidal flow wetlands, in which water supply is pulsed, overcome these flaws by alternating cycles of nitrification and denitrification to optimize the redox potential regime for N removal. As this requires higher energy inputs and costs, the best system will optimize the timing of these cycles. The objective of this study is to assess the performance of tidal flow wetlands for N removal from AQ wastewater employing active feedback control. By monitoring the pH and redox potential, a feedback-control driven flooding and draining schedule will be implemented on tidal flow wetlands. A second objective will be to evaluate the role of plants in the N dynamics within these tidal wetlands. Results are anticipated to reflect increased removal rates for the feedback driven system. Plants are not expected to contribute significantly to N removal due to their overall lower rates of N uptake compared to the tidal system itself. Overall, results will lead to a better understanding of tidal-flow wetlands in N management from waste streams, and the role of feedback control in self-optimization of constructed wetland performance.

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**Title:** Taxonomic confirmation of infections of *Myxobolus cerebralis* (etiological agent of “whirling disease”) in North Carolina trouts (Salmonidae)

**Primary Author (and presenter):** Ruiz, Carlos

**Additional Authors:** Bullard, Stephen; Arias, Covadonga; Rash, Jacob; & Besler, Doug

**Department:** Fisheries

**College/School:** College of Agriculture

**Description:**

The myxozoan parasite *Myxobolus cerebralis* was introduced into North America in the mid-twentieth century with infected trout imported from Europe and is now recorded in 24 states and 26 countries. This parasite is the causative agent of whirling disease, an economically and ecologically devastating disease of salmonids. Heavily-infected (diseased) fishes exhibit “whirling” behaviour (tail chasing, erratic swimming) plus skeletal and pigment abnormalities that are obvious and alarming anglers. Herein, we used microscopy and molecular biology to provide the first documentation of infections of *M. cerebralis* in trouts from North Carolina (NC) river basins. A total of 1,085 rainbow trout (*Oncorhynchus mykiss*), 696 brown trout (*Salmo trutta*), and 319 brook trout (*Salvelinus fontinalis*) from 43 localities across 9 river basins were screened. Myxospores were observed microscopically in pepsin-trypsin digested heads of rainbow trout and brown trout from the Watauga River Basin. Those infections were confirmed using the prescribed nested polymerase chain reaction (PCR, 18S rDNA, ITS-1), which detected infections also in rainbow trout, brown trout, and brook trout from the French Broad River Basin and the Yadkin Pee-Dee River Basin. Myxospores were 9.0–10.0  $\mu\text{m}$  (mean=9.6  $\pm$  SD=0.4; N=119) long, 8.0–10.0 (8.8  $\pm$  0.6; 104) wide, and 6.0–7.5 (6.9  $\pm$  0.5; 15) thick and had polar capsules 4.0–6.0 (5.0  $\pm$  0.5; 104) long, 2.5–3.5 (3.1  $\pm$  0.3; 104) wide, and with 5 or 6 polar filament coils. Myxospores from these hosts and rivers were morphologically indistinguishable, indicating conspecificity, and the resulting 18S rDNA and ITS-1 sequences derived from these myxospores were 99.5–100% and 99.3–99.8% similar, respectively to published GenBank sequences ascribed to *M. cerebralis*. This is the first taxonomic circumscription and molecular confirmation of *M. cerebralis* in the southeastern United States south of Virginia. Surveillance for infections by *M. cerebralis* in NC trouts is ongoing.

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**Title:** How different materials affect the frequency of a musical string due to temperature change

**Primary Author (and presenter):** Russell, Ian D.

**Additional Authors:** Jackson, Kyle; Rist, Nicholas; & Sewell, Ryllie

**Department:** Music

**College/School:** College of Liberal Arts

**Description:**

The effect of temperature on pitch is extremely important to musicians, particularly those who do concerts outdoors with varying temperatures and most adjust their play style accordingly. This research seeks to discover if the material that a string is made of meaningfully affects the frequency of the sound produced in various temperatures. This will give musicians a good idea of which string materials are more or less suited to concerts in unusual temperatures. The experiment was performed by recording the pitch produced by four guitar strings made from different materials, nylon, nickel, steel, and cobalt. Each string was tested at five different temperatures, 60 to 80 degrees Fahrenheit at five-degree intervals, and the overall variance in pitch was used to draw conclusions. The results showed that strings made from nickel or nylon are barely affected by temperature, while strings made from steel or cobalt are affected significantly more, although the change is still very small. Therefore, while most concerts would not be affected by this pitch variance, concerts in more extreme temperatures, such as around 40 degrees, should be performed with nylon or nickel strings if possible.

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**Title:** Hyperspectral imaging with plenoptic cameras

**Primary Author (and presenter):** Saab, Catherine, B

**Additional Authors:**

**Department:** Aerospace Engineering

**College/School:** College of Engineering

**Description:**

The objective of this research is to create and analyze a compact hyperspectral imaging technique for measuring temperature. The lab utilizes a plenoptic camera coupled with a linear variable rainbow bandpass filter. The plenoptic camera is a unique method for imaging because it collects data on the entire 4-dimensional light field within a single exposure. The optical arrangement of the plenoptic camera involves thousands of microlenses that shift perspective and refocus throughout the light field. Since the color of light is dependent on temperature, the bandpass filter detects temperature through emitted light.

This project was funded by a research laboratory in the Advanced Sensing and Optical Measurements branch of NASA Langley. The primary application of the research techniques is to observe the behaviour of a spacecraft's thermal barrier coating as it burns upon re-entry.

Experimental and calibration data was taken at NASA Langley and sent to our lab to be analyzed. My role in the project is to create image processing algorithms for the data provided. A calibration is necessary in order to identify how the linear varying bandpass filter affected the microlenses individually. Before analysis, theoretical results found from Planck's Black Body radiation and the quantum efficiency of the image sensor related the wavelength of light and imaging equipment limitations in order to predict the temperature of a light source. Currently I have completed the calibration and am working on numerical techniques in order to experimentally predict the temperature of a light source from empirical data.

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**Title:** Surface tailored cellulose nanocrystal films for cancer detection

**Primary Author (and presenter):** Saha, Partha

**Additional Authors:** Ashurst, William R. & Davis, Virginia A.

**Department:** Chemical Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Cantilever-based diagnostic arrays are of growing interest for rapid multiplexed detection of cancer biomarkers. To date, most of the research studies have been focused on silicon-based cantilever biosensors, but the silicon fabrication process is slow, energy intensive, expensive, and not biocompatible. The objective of this research is to understand the potential for cellulose nanocrystals (CNC) to be used for cantilever biosensors. CNC enable faster, less energy intensive, less expensive, and more biocompatible fabrication methods. They also hold easily tunable mechanical and surface properties compatible for biosensing platform. Therefore, alpha fetoprotein (AFP), prostate specific antigen (PSA), and carcinoembryonic antigen (CEA) specific antibodies were immobilized on the CNC *via* (3-Aminopropyl) triethoxysilane (APTES) chemistry, using glutaric anhydride (GA) as the organosilicon linker. Fluorescence microscopy, Fourier-transform infrared spectroscopy (FTIR), and atomic force microscopy (AFM) were used to confirm the antibody immobilization and antigen detection. These results provide the foundation for further understanding the resonance frequency based quantitative detection of cancer biomarkers by cellulose cantilevers.

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**Title:** Electron-hole hopping as catalytic self-preservation: How catalase-peroxidase from *M. tuberculosis* avoids the perils of peroxide decomposition.

**Primary Author (and presenter):** Sahrman, Patrick, G.

**Additional Authors:** McWhorter, Kirklin; Krewall, Jessica; Goodwin, Douglas

**Department:** Department of Chemistry and Biochemistry

**College/School:** College of Sciences and Mathematics

**Description:**

Catalase-peroxidase (KatG), an enzyme produced by bacteria and fungi, is especially prominent among some of the world's most prolific pathogens (e.g., *Mycobacterium tuberculosis*). These organisms use KatG to defend against H<sub>2</sub>O<sub>2</sub> produced by host immune responses. Contrary to all other members of its superfamily, KatG is bifunctional (catalase and peroxidase). Further, against long-standing predictions that its two activities would be mutually antagonistic, we have shown that peroxidatic electron donors (PxEDs) *stimulate* KatG's catalase activity. A narrow active site access channel prevents PxEDs from directly reducing KatG's heme cofactor, suggesting that the protein itself must facilitate electron-hole hopping via oxidizable amino acids, linking the active site to the solvent-accessible surface of KatG. We have shown that one prominent electron hole-hopping pathway begins with oxidation of an active site tryptophan (W321). A methionine (M377) 3.9 Å away from W321 is a prime candidate for the next step in this mechanism. To investigate this possibility, we used site-directed mutagenesis to generate M377I KatG, replacing methionine with non-oxidizable isoleucine. Kinetic analyses reveal that the catalase activity of M377I is similar to wild type KatG. The M377I variant becomes catalytically inactive after fewer substrate turnovers than wild type, but appears able to sustain activity to a greater extent than W321F KatG. As with both wild-type and W321F KatG, inclusion of a PxED sustains the catalase activity of the M377I variant to the complete consumption of H<sub>2</sub>O<sub>2</sub>. These data suggest that M377 has a role in preserving KatG catalase activity, but its contribution appears to be less than W321. We propose that possible pathways for through-protein radical transfer expand as the distance from active site heme cofactor increases, thereby producing a corresponding decrease in contribution from any particular oxidizable amino acid in catalase activity preservation.

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**Title:** Neighborhood safety and sleep: Longitudinal influences on adolescent physical health and adjustment

**Primary Author (and presenter):** Saini, Ekjyot K.

**Additional Authors:** El-Sheikh, Mona

**Department:** Human Development and Family Studies

**College/School:** College of Human Sciences

**Description:**

Emerging evidence indicates that disadvantaged neighborhoods are associated with sleep problems (short, poor-quality) and adjustment problems (e.g., internalizing and externalizing problems) in adolescents, but few studies have examined the conjoint influences on adolescent well-being. The present study examines how neighborhood perceptions interact with sleep to predict physical health and adjustment problems in adolescence over time. A community sample of 235 adolescents (M age = 15.75 years, 54.3% female) participated in sleep and laboratory assessments twice across adolescence. Youth came from diverse racial/ethnic and socioeconomic backgrounds (32.5% African-American, 43.8% at or below the federal poverty line). Adolescents reported on perceptions of neighborhood safety and community violence. Adolescents wore actigraphs to objectively measure sleep minutes (# of minutes from sleep onset to wake time) and sleep efficiency (% of minutes asleep). Two years later, youth completed well-established measures of physical health, internalizing (e.g., depression), and externalizing problems (e.g., rule-breaking). Consistent with hypotheses, preliminary analyses reveal a pattern of effects where perceived neighborhood safety interacted with several sleep parameters to predict adolescent well-being over time. Youths living in unsafe neighborhoods and had poor sleep (e.g., short) were at greatest risk for poor health and greater internalizing problems. Additional analyses will examine associations among community violence and sleep parameters for physical health and adjustment problems. Findings are supportive of a dual-risk perspective demonstrating that neighborhood context and poor sleep interact to influence youth well-being over time. Identification of such risk factors may help to

create targeted intervention to bolster health trajectories of adolescents and the need to examine neighborhood context as a social determinant of health.

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**Title:** Tumor activity of candidate promoters in canine tumors

**Primary Author (and presenter):** Sajib, Abdul Mohin

**Additional Authors:** Sandey, Maninder; Morici, Samantha; Schuler, Bradley; Agarwal, Payal; & Smith, Bruce, F.

**Department:** Pathobiology

**College/School:** Veterinary Medicine

**Description:**

Expression targeting in cancer gene therapy uses tumor upregulated expression of promoters to govern therapeutic genes, or genes controlling replication. This results in tumor specific expression with reduced toxicity in normal cells. Several promoters have been tested for specificity in a variety of human cancers; few have been evaluated for canine tumors. Our goal was to investigate the tumor activity of canine survivin (cSurvivin), canine chemokine receptor 4 (cCXCR4) and canine telomerase reverse transcriptase (cTERT) as they showed high levels of expression in human cancers and murine models. In addition, we investigated expression of an exogenous E2F modified E1a promoter (E2F-E1a) of canine adenovirus type 2. We evaluated the activity of the endogenous promoters in canine tumor cells and tissues by employing Q-RT-PCR and by measuring GFP reporter gene expression level to evaluate exogenous promoter activity. Results showed negligible endogenous expression differences between canine normal and both hematopoietic and non-hematopoietic tumor cells for cTERT promoter. cSurvivin showed markedly higher endogenous activity in both hematopoietic and non-hematopoietic tumor cells/tissues with reduced expression in most normal cells and tissues. cCXCR4 showed reduced endogenous activity for most of the canine tumors/ tissues while it showed high levels of activity for canine T-lymphoma cells and tissues. To validate these findings, we constructed GFP reporter plasmids to measure exogenous promoter activity using cellular transfections followed by measuring reporter gene expression by flow cytometry. Although results were congruent with RT-qPCR data for cTERT, cSurvivin, cCXCR4 and E2F-E1a showed higher levels of canine tumor-specific expression than that of normal cells. Our findings imply that identification of a pan-cancer promoter is difficult and that expression targeting must rely on selecting patient-specific promoters to drive the activity of therapeutic genes.

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**Title:** Strength and cognition correlates to locomotor adaptation in old adults on a split-belt treadmill

**Primary Author (and presenter):** Salguero, Pablo A.

**Additional Authors:** Roper, Jaimie; Raffegeau, Tiphanie; Terza, Matthew; Stone, Amanda; Altmann, Lori; & Hass, Chris

**Department:** Kinesiology

**College/School:** College of Education

**Description:**

The split-belt treadmill (SBT) walking paradigm is used to study locomotor adaptation. This paradigm allows researchers to understand how an individual adapts to a novel walking pattern by measuring parameters such as step length asymmetry (SLA). While we understand that healthy adults are capable of adapting to a new walking pattern, not enough is known about how cognition and strength relate to locomotor adaptation. This study focused on understanding the relationships between cognitive and strength measures and locomotor adaptation parameters. Twenty older adults were recruited for the study. For the experiment, they performed a series of cognitive tests, and 16 of them performed maximum

joint voluntary contractions (MVC) on a strength dynamometer. All participants walked on a SBT. The SBT conditions were: belts tied (baseline), the dominant leg on a slower belt while the nondominant leg walked on a belt moving twice the speed of the dominant leg (split), and belts tied right after the split condition (washout). We observed that the cognitive test representing visual attention and task switching (trails B) demonstrated a relationship of  $r = -.447$  ( $p = .048$ ) to SLA in washout. Relative effort (RE), defined as the ratio between peak sagittal joint moments and MVC, showed significant correlations as well. RE in baseline of the dominant knee was related to SLA in late split ( $r = .709$ ,  $p = .003$ ) as well as to spatial SLA contributions in late split ( $r = .581$ ,  $p = .023$ ) and washout ( $r = .715$ ,  $p = .003$ ). Better performance on the Trails B set switching cognitive test relates to a higher asymmetry during washout which implies better learning of new walking patterns. Also, higher effort exerted in the dominant knee during normal walking shows a better ability to return to symmetry in late split. Taken together, these results suggest that both cognitive and strength measures play a role in reinforcement of learning a new walking pattern.

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**Title:** Analysis of the D'Olive Creek Watershed: Identifying the local drivers that have led to stream degradation

**Primary Author (and presenter):** Salisbury, Michael E.

**Additional Authors:** Shepherd, Stephanie L.

**Department:** Geosciences

**College/School:** College of Sciences and Mathematics

**Description:**

Over the past few decades, anthropogenic activities have had detrimental effects on both the D'Olive Creek and Fly Creek Watersheds (DCW and FCW, respectively), located in Southern Alabama. In an effort to aid local stream restoration activities, this study identified the drivers of stream degradation in both watersheds. Methods included: (1) meta-analysis of relevant literature and datasets, (2) spatial investigation via the utilization of geographic information systems (GIS), and (3) field verification and analysis at three designated stream sites, which included vegetation assessment and stream surveying. The critical drivers of stream degradation in the DCW are (1) urban sprawl, (2) pre-existing impervious surfaces in the watershed, and (3) steepness of average watershed slope. Critical drivers of stream degradation in the FCW include (1) urban sprawl and (2) pre-existing impervious surfaces in the watershed. The FCW is not as environmentally stressed as the DCW, but rising issues related to stream degradation will parallel an increase in watershed urbanization if proper mitigation efforts are not implemented. This study has implications for both current watershed restoration efforts and future restoration design, ultimately providing stakeholders with valuable information about the primary drivers of local stream degradation.

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**Title:** Development of silk fibroin-cellulose nanocrystal composite for enzyme immobilization: An innovative approach for malaria virus detection

**Primary Author (and presenter):** Sanchez Diaz, Simon

**Additional Authors:** Peresin, Maria Soledad; Elder, Thomas; Gomez, Diego; Zhody, Sarah; & Filpponen, Ilari

**Department:** Forestry

**College/School:** School of Forestry & Wildlife Science

**Description:**

The fight against Malaria virus looks like an endless campaign, due to the increasing number of cases in spite of initiatives to restrain its outbreak. In 2016, more than 219 million cases of malaria were reported and 445,000 deaths were associated with this virus. Usually, in the early stage, malaria is linked

with mild-impact illness such as headache, fever and chills, however, if the infection is not treated at time, it may lead to severe diseases like anaemia, respiratory distresses, among other. It has become a major worldwide concern on public health, especially in low-income countries where the lack of infrastructure as well as rapid and accurate diagnosis tests limit the detection and treatment at time. Currently, the most used methods to detect malaria are the rapid diagnostic test of blood samples and microscopy examination. Notwithstanding, their inaccuracy and short reliability diagnosis enforce the use of specialized assessment methods such as parasitology tests. Nonetheless, in regions with limited access to specialized detection centres, their application is nonviable. With the aim to detect malaria virus in a faster, easier and accurate way, the concept of a biosensor was proposed. The biosensor will be assembled via enzyme-conjugated anti-viral antibodies encapsulated on a nonwoven support made on renewable resources. In this order, silk fibroin (SF), cellulose nanocrystals (CNC) and SF/CNC supports were fabricated, and their affinity to specific antibodies for malaria detection was investigated via Quartz Crystal Microbalance with dissipation. Furthermore, the matrixes were chemically and morphologically characterized using Fourier transform infra-red spectroscopy and atomic force microscopy. The development of this project has led to a better understanding of the interaction between CNC and SF, as well as the supports with antibodies for malaria detection. This first approach set the basis to for the development a biosensor whose detection capacity will be proofed in a following step.

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**Title:** The effect of high heat stress on the rate of wound healing

**Primary Author (and presenter):** Sardinha, Rhea C.

**Additional Authors:** Hoffman, Alexander & Wada, Haruka

**Department:** Biological Sciences

**College/School:** College of Science and Mathematics

**Description:**

A stressor is traditionally considered to negatively impact physiological functions. For instance, stress has been shown to suppress the immune system. However, the effect of a stressor depends on duration and magnitude of the stressor. In addition, when an animal experiences a stressor during development, it can prepare animals to thrive in a stressful environment. Using heat as a stressor, we tested a potential beneficial effect of developmental and adult stress using zebra finches (*Taeniopygia guttata*) as a model species.. Our hypothesis is the rate of wound healing is a measure of immune function as it is ecologically relevant, and has been demonstrated to be affected by thermal stresses. We predicted the zebra finches would acquire thermotolerance when subjected to the heat conditioning as juveniles, allowing them to better cope with the heat stress as adults and maintain immune function. To test this hypothesis, juvenile zebra finches were separated into a control (23°C) or a high heat stressor (40°C) treatment for a period of 28 days, every other day. Once the zebra finches reached adulthood they were separated into a control (23°C) or high heat stressor (42°C) treatment for a period of three consecutive days. A skin excision was created on both the left and right legs prior to adult treatment (Day 0). Pictures of wounds were taken daily to quantify rate of healing in male and female zebra finches. Zebra finches that were exposed to high heat stress conditioning as juveniles and then exposed to high heat stress conditioning as adults would have a rate of wound healing analogous to birds that were in the control-control group, and the juvenile birds that were not subjected to high heat stress conditioning but subjected to it during adulthood would have a slower rate of wound healing. Although our hypothesis was not supported, we did see potential beneficial effects of early life stress that persists into adulthood.

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**Title:** Microwave initiated nanomanufacturing towards energy applications

**Primary Author (and presenter):** Sarwar, Shatila

**Additional Authors:** Cook, Jonathan; Nautiyal, Amit; & Zhang, Xinyu

**Department:** Chemical Engineering  
**College/School:** Samuel Ginn College of Engineering

**Description:**

To meet the increasing demand on world energy, new types of renewable energy resources along with advanced energy storage systems are being developed. Nanomaterials, such as carbon nanotubes (CNT), metal oxides, metal carbides, chalcogenides and polymers with superior mechanical, thermal and electrical properties, lead to broad applications in composite materials, smart structures, chemical sensors, energy storages and nano-electronic devices. However, the high cost and difficulty in large scale production of high quality nanomaterials remain as challenges. We have demonstrated a facile and scalable microwave approach for the direct growth of molybdenum sulfide ( $\text{MoS}_2$ ) on a wide range of substrates, including polypyrrole nanofibers (PPy-NF), graphenes and so on. The growth of nanomaterials initiated within 20-30 seconds under the microwave irradiation at room temperature in air, no need of any inert gas protection, and additional feed stock gases. The scanning electron microscope (SEM), transmission electron microscope (TEM) and energy dispersive spectroscopy (EDS) analysis confirm the formation of fullerene-like  $\text{MoS}_2$  nanoparticles. Preliminary results from electrochemical analysis i.e. cyclic voltammogram (CV), linear sweep voltammogram (LSV), charge-discharge curves demonstrated the as-produced nanocomposites can be used for hydrogen evolution reaction (HER) to generate useful hydrogen fuel and for electrochemical energy storage such as supercapacitor applications. This single-step microwave approach can be universally employed to produce other useful transition metal dichalcogenide (TMD) materials (e.g.,  $\text{MoSe}_2$ ,  $\text{WS}_2$ ,  $\text{WSe}_2$  etc.), that will catalyze substantial development in more widespread uses of TMD-based nanocomposites for successful energy applications.

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**Title:** Avoiding Phase Separation of Asphaltenes in Crude Oil Operations Using Alternating Current (AC) Electric Fields

**Primary Author (and presenter):** Schartung, David F

**Additional Authors:** Moncada, Jorge; Carrero, Carlos A

**Department:** Chemical Engineering

**College/School:** Samuel Ginn College of Engineering; Auburn University

**Description:**

Due to the increasing demand for oil-based products by consumers over the last century, conventional crude oil levels have peaked and are now on a terminal global decline. However, oil is not running out. Instead, the form we use is changing – chemically, geographically, and geologically. As conventional oil dwindles, scientists and engineers have begun to study new means of producing and upgrading unconventional crude oil sources. Presently, delayed coking is the most commonly utilized process for refining the asphaltene-rich fraction of crude oil into more valuable liquid and gas products. However, this method invariably produces a large amount of the carbon-rich by-product known as petcoke (petroleum coke). Minimization of its formation in any stage of the refinery process is universally desired.

Unconventional crude oil is comprised of a variety of complex hydrocarbons, the largest and most polar of which are known as asphaltenes—the main precursors of petcoke. Based on the high polarity of these asphaltenes, we propose to investigate the aggregation process of these molecules using electrochemical impedance spectroscopy (EIS). This will allow us to gain insights into how asphaltene aggregates respond to an alternating current (AC) electric field. We will determine the relaxation time of these materials to find the characteristic AC frequency in which the asphaltenes align with the electric field. This frequency could also be used to promote changes in the aggregation state of asphaltenes in crude oil.

An *ex situ* optical methodology is currently used to measure asphaltene stability and determine the flocculation point, and though it works optimally for light and medium crude oil, highly viscous and totally black heavy crude oils require sample dilution. Our primary aim is to impact the processes in the oil industry involving asphaltenes by developing *in situ* EIS as a new approach to replace this *ex situ* optical

methodology. The results to be shown in this poster have recently been compiled in a publication (Moncada, Schartung, Stephens, Carrero, FUEL (2018) “submitted”) which opens a new research area to explore other feedstocks like biomass, bio-oils, polymers, and others.

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**Title:** Linking large-scale climate variability with anomalies of summer and winter crop yields in the rainfed United States

**Primary Author (and presenter):** Schillerberg, Tayler A.

**Additional Authors:** Tian, Di

**Department:** Crop, Soil, and Environmental Sciences

**College/School:** College of Agriculture

**Description:**

Large-scale atmosphere-ocean circulations as characterized by modes of climate variability influence local weather conditions through teleconnections. This impact may modulate crop growth during a growing season and affect crop yields at the end of the season. The objective of this study is to evaluate the influence of climate modes on crop yields in the rainfed United States. County level yield and production data from 1960 through 2016 has been collected for corn (summer crops) and winter wheat (winter crop). Several important indices for climate modes (including Atlantic Multidecadal Oscillation (AMO), North Atlantic Oscillation (NAO), El Niño – Southern Oscillation (ENSO), Pacific Decadal Oscillation (PDO), and Pacific-North American (PNA)), as well as surface climate variables (including precipitation, temperature, and Palmer Drought Severity Index (PDSI)) have been obtained for each climate division. Weighted yield averages have been calculated for each climate division, the linear yield trend has been removed. Statistical analysis was then performed to identify the primary modes of variability in the yields in space and time using rotated principle component analysis (RPCA), explaining 79% of the variability. Correlations between the principal components of crop yields, climate modes, and surface variables were analyzed. Statistical regression models were developed to predict crop yields using climate modes and surface variables. The results will illustrate the modes of temporal variability of crop yields and surface climates, the correlations between climate indices and surface climate crop and crop yields, and the sources of predictability of crop yields originated from climate variability. The knowledge gained from this study will contribute to understanding the risks of large-scale climate variability to local-scale crop production and making better seasonal predictions of crop yield variations induced by climate.

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**Title:** Tracking *Staphylococcus aureus* infections *in vivo*

**Primary Author (and presenter):** Schoeberl, Madison K.

**Additional Authors:** Panizzi, Peter

**Department:** Drug Discovery and Development

**College/School:** Harrison School of Pharmacy

**Description:**

The purpose of this project is to track *Staphylococcus aureus* (*S. aureus*) infections in a living organism over time. We choose a bioluminescent strain of *S. aureus* called Xen-36 that constitutively expresses light and studies that in a murine sepsis model. As there was little previously done in the way of characterization of the strain, we confirmed that the Xen36 expressed a high level of the virulence factor staphylocoagulase by use of a chromogenic substrate hydrolysis assay. It is inferred that the high level of staphylocoagulase should translate in to a high level of infectivity and virulence potential of the strain. To determine whether the bioluminescence can be tracked in a murine model after injection, we injected the pathogen retro-orbitally at a sublethal dose. The distribution and kinetics of the infection was analysed using the In Vivo Imaging System (IVIS) Lumina XRMS maintained in the Auburn Laboratory for Imaging

Animal Systems. Results thus far include the successful inoculation of the mice and tracking of the injection to the kidneys. We plan to continue this work by imaging using the photo-acoustics to determine if the infection is also obvious with and within the use of contrast agents targeted to the bacteria cell wall. Collectively, the study closes the current gaps that exist in the understanding of the best ways to track *S. aureus* in a host.

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**Title:** Soma: Personal Fogponic Mushroom Grow Unit

**Primary Author (and presenter):** Seaman, Rex, R

**Additional Authors:**

**Department:** Industrial Design

**College/School:** Auburn University

**Description:**

At the beginning of the fall 2017 semester, I was given an assignment to design a consumer product of my choosing that could be mass-produced. Our focus was on sustainability, so I concentrated on growing food in your own home. While developing ideas, I contacted some friends who are starting their own edible gourmet mushroom farm nearby, and we discussed the possibility of developing a mushroom grower for personal use, and how it could exist on the consumer market. They explained to me how something like this had never really been done before, and all the possibilities that it could entail. After I had learned all I could from them, I went out to do some research of my own. My goals included developing a unique system that could provide the mushrooms with the perfect environment to grow, which would in turn speed up the growth process. Similar processes are currently used by serious mushroom growers, but on a much larger scale, too big for the average consumer. I spent all semester trying different methods and techniques of growing gourmet Oyster mushrooms using an ultrasonic humidifier to create fog, substrate bags that contain mycelium, different types of led lights, and creating different environments for them. The substrate bags that I was using usually take 15 to 20 days to produce a flush of mushrooms. After 15 different experimental grows, I found a way to grow them in 6 days, while doubling the amount of mushrooms that you would usually get. I then created this product that could do it all in your kitchen, while adding some modern ambiance to your everyday life. Soma has 2 settings that include an auto-grow setting that employs my unique growth method, and a fog setting that simply produces fog. With Soma, growing mushrooms in your own home is now as easy as turning a dial. And if you don't like mushrooms, Soma doubles as an essential oil diffuser. Just add a few drops of essential oils in the water tank and turn it to the fog setting.

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**Title:** Predicting concussion using data analytic approaches

**Primary Author (and presenter):** Sedighi Maman, Zahra

**Additional Authors:** Gupta, Ashish & Wilkerson, Gary

**Department:** Industrial and Systems Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Sports related concussion forms a major component of all brain injuries occurring in the United States and has a huge detrimental impact on the quality of life and various health outcomes. Predicting concussion is an important way to achieve prevention. Understanding concussion likelihood in the context of different data such as demographic, life style and mental health information related injury will support the development of better diagnostics and preventative techniques. In this study, we develop novel data analytic models that are built using disparate data about lifestyle, demographics and medical history. The objective of this study is to predict the concussion occurrence using the analytical models

that are based on various machine learning algorithms such as K Nearest Neighbor, Support Vector Machines, Ensemble models, Artificial Neural Networks, Decision Tree and General Linear Model. In this paper the synthetic minority over-sampling (SMOTE) is employed to overcome the data-imbalance problems. The results show that the predictors associated with the cognitive-mental health plays an important role as a predictor of concussions. Findings suggest that Random Forest, Artificial Neural Networks and Decision Tree demonstrate superior performance over the other analytics approaches.

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**Title:** Preaching Culture: How Methodist Missions Changed Slave Culture in Antigua

**Primary Author (and presenter):** Segrest III, Douglass Broward

**Department:** History

**College/School:** Liberal Arts

**Description:**

The island of Antigua, located in the Caribbean, was an essential resource to the British Empire in the Eighteenth Century. The island produced large amounts of sugar due to its large slave population. A change occurred in the daily lives of the slaves and in the overall political climate on the island beginning in 1758, when Methodist missions began in Antigua. Out of all the Methodists missions in the British West Indies, the ones that took place in Antigua stand out noticeably in documents on the topic of Methodism of the time. The Methodists, through their disciplined way of practicing Christianity, created a change in culture in the slaves in Antigua through these missions. The Methodists may have had an ulterior motive to introducing a “European” way of practicing faith. The island would become a key player in the later abolition of the slave trade because of the Methodist missions.

This paper looks at the state of the island and the slaves within before and after the arrival of the Methodists. The concrete direct results of the missions are examined, as well as the indirect results. The blatant opposition to slavery shown by the Methodists is examined, as well as Parliamentary debates on the Slave Trade. These debates mention the change in culture of the Antiguan slaves as a result of the Methodist missions. The paper includes many accounts from the Methodists who led missions on the island. The paper concludes that the Methodists promoted the “Europeanization of the African slaves in Antigua in order to change opinions on the slave trade within the British Empire.

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**Title:** Life’s a witch: the Catholic influence of visual representations of witchcraft in the late middle ages

**Primary Author (and Presenter):** Seidel, Madeleine, A.

**Department:** Art and Art History

**College/School:** College of Liberal Arts

**Description:**

In the Middle Ages, mania over witches hit a fever-pitch, propelled by the consolidation of power and struggles faced by the Catholic Church, the production of manuscripts like *Formicarius*, and early methods of printing. Johannes Nider, Heinrich Krämer, and other revered medieval theologians wrote incendiary documents, including the infamous *Malleus maleficarum* (the “hammer of witches”), on the proposed tenets of medieval witchcraft and ways to extinguish it. Their texts portrayed witchcraft as heretical, and as a threat on the level with the rise of early defectors of the Catholic Church. Jews, women, and protestant sects were most commonly implicated in witchcraft trials and were accused of crimes like infanticide and control of the weather. Theological texts that espoused the persecution of so-called witches, such as those produced by Nider and Krämer, were also ultimately used as source material for the portrayal of witches in medieval art.

This paper identifies and examines instances of overlapping imagery in texts like *Malleus maleficarum* and images created by artists such as Albrecht Dürer and Hans Baldung Grien. The lasting

power of Dürer and Grien's gruesome and hyper-sexualized witches further implicated witches as a real and corrosive threat to the European and Catholic social order, even prior to the Protestant Reformation that loomed only a few decades in the future. The study of anti-witchcraft imagery in the arts is one way to explore how Christianity was — and in many ways, still is — such an omnipresent force within medieval culture, politics, and society, sometimes to discriminatory and deadly extremes.

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**Title:** Comparative genomic analysis of *Fusarium oxysporum* f. sp. *vasinfectum* isolates and their small secreted proteins

**Primary Author (and presenter):** Seo, Seungyeon

**Additional Authors:** Coleman, Jeffrey

**Department:** Entomology and Plant Pathology

**College/School:** College of Agriculture

**Description:**

*Fusarium oxysporum* f. sp. *vasinfectum* (Fov) causing vascular wilt disease is one of the most devastating pathogens of cotton (*Gossypium* spp). To elucidate the molecular mechanisms responsible for host-specificity for pathogenicity on cotton, five Fov isolates were sequenced using PacBio SMRT sequencing and the genomes compared with 10 *F. oxysporum* genomes that are non-virulent on cotton. Genome analysis revealed that the highly virulent genotype race 4 had the largest genome size and coding genes and repetitive elements, compared to the other four Fov isolates. The genome of *F. oxysporum* comprises both core and accessory regions, and all the genomes of the Fov isolates were able to be divided into these two main architectures based on the genome of *F. oxysporum* f. sp. *lycopersici* (Fol) as a reference. Comparative analysis among both cotton and non-cotton isolates of *F. oxysporum* focused on small secreted proteins (SSPs), which may function as virulence factors termed fungal effectors. The results showed that all isolates had similar proportions of SSPs based on the whole genome following a universal effector prediction pipeline. A total of 165 proteins were common to all the different formae speciales of *F. oxysporum*. Importantly, fifty-six SSPs are unique to the most virulent genotype and 17 SSPs existed only in the cotton Fov isolates. In summary, each Fov isolate genome reflects the diversity of pathogenesis-related genomic features, sharing or differing from each other, and may yield insights into the development of disease management strategies for cotton wilt.

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**Title:** Investigating the role of the lateral entorhinal cortex in Alzheimer's disease

**Primary Author (and presenter):** Setti, Sharay E.

**Additional Authors:** Reed, Miranda, N.

**Department:** Drug Discovery and Development

**College/School:** Harrison School of Pharmacy

**Description:**

Alzheimer's disease (AD) is biologically characterized by accumulation of beta-amyloid plaques, neurofibrillary tangles containing hyperphosphorylated tau protein, and pervasive neuronal damage ultimately leading to neuronal death. Because of the irreversible nature of the neuronal death, early detection of AD is important for any treatment aiming to halt or prevent neuronal damage. Currently, existing cognitive screening tasks for AD are optimized for learning and memory associated with brain regions affected later in the disease state, such as the hippocampus and prefrontal cortex, but do not selectively assess function of one of the first brain regions affected in AD, the lateral entorhinal cortex (LEC). Tasks aimed to assess LEC function, as it is the first area to exhibit tau pathology, would aid in early detection of AD, thereby offering a better prognosis for affected individuals. The goal of this project was to identify a cognitive task sensitive to alterations in LEC functioning within the context of tau

pathology. We have identified two potential tasks that may be sensitive to tau pathology-induced deficits within the LEC, object recognition and trace fear conditioning. We have assessed animals exposed to tau pathology and age-matched controls on performance of these tasks. Preliminary data suggests that introduction of tau pathology into the LEC using viral vector delivery is sufficient to produce subtle cognitive deficits in both of the aforementioned tasks. In future work, we intend to validate the sensitivity of these tasks to alterations in LEC activity using the optogenetic technique, and determine whether manipulating neuronal activity in the presence of tau pathology is sufficient to rescue AD-induced cognitive deficits.

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**Title:** Neuro-urban design: an analysis the negative effects on mental health that cities have and people-centered urban design strategies that combat these

**Primary Author (and presenter):** Shannon, Ian, D

**Additional Authors:**

**Department:** Environmental Design

**College/School:** College of Architecture, Design, and Construction

**Description:**

The main focus of this project was to identify some of the harm cities have on the mental health of those who live in them and provide a few possible solutions to help combat that harm. It's well known that people living in larger cities are more prone to depression and other harms to mental health (40% more prone to mood disorders, 20% more prone to anxiety disorders according to a Dutch meta-analysis), but the reason why is still speculative with little conclusive research. This is becoming incredibly more important as more and more populations are moving into the urban environment, with projections that close to 70% of the world's population will be living in cities by the year 2050. Some current thinking on this issue believes that the harm to city dwellers' mental health comes from the combined stresses of social isolation and social density that cities can create. The question then becomes: how do we design cities to mitigate these spaces, or at the very least, how do we design spaces in cities where these stresses can't impact people in the way they normally do? My initial ideas for these spaces were nature parks, as activity in nature or around nature has been proven to positively affect mental health, and some of my research backed up this idea. Proximity to larger parks did indeed have a positive effect on the mental health of city dwellers (an L.A. study found that those living within 1/4 mile of a park showed a boost to mental health equivalent to lowering the local unemployment rate by 2 percentage points), but since building new large parks is not particularly easy for a city that's already built, I expanded my proposed best practices for cities to include things like small city square and parklets, more easily designed and built spaces that could offer the same kind (albeit lessened) mitigation to city stresses. These best practices revolve around an idea of people-centered urban design to help those living in cities, not hurt them.

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**Title:** Ingénue: Melding traditional and revamped techniques

**Primary Author (and presenter):** Shealey, Alaundra

**Department:** Consumer and Design Sciences

**College/School:** College of Human Sciences

**Description:**

In a world where there exist seemingly infinite methods by which to create a garment, and quickly, and cheaply, the challenge of today's apparel designer is not so much what *can* be made but what *should* be made and *how*. Ingénue is an experiment in tacit knowledge acquisition and contemporary garment construction that elicits grotesque-to-beauty juxtaposition and challenges existing definitions of

counterculture aesthetics. Inspired by *Heart*, a woodcut created by Burton (1994), the work is constructed through iterative overlay of contemporary technical methods from both traditional handicraft and computerized machinery. The basic technique was refined through several experimental iterations that incorporated the testing of different threads and other support materials within the context of the desired design features. The matrix of the gown was constructed by traditional means (e.g., fabric draping, patternmaking) and the neckline and front yoke of the gown are products of contemporary advances in computer-aided design (CAD) for the embroidery realm. Each piece of machine made lace was subjected to traditional hand draping and dressmaking methods; each was wet-draped, hand-tacked, and molded to the proper shape to get the desired neckline. In a world where *why* and *how* suggest limitless possibilities, the process becomes equally as important as the product. The execution of this experimental work enabled for the artist the acquisition of tacit knowledge for emulating highly-commercialized Schiffli lace embroidery (or chemical lace) through home methods, by incorporating a non-commercial embroidery machine, embroidery thread, and digital designs. The resulting creative work, a chaotic interplay of color and pattern as expressed in fabric and lace, contributes to a broader conversation about counterculture aesthetics in the contemporary marketplace.

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**Title:** Delivery to the posterior segment of the eye by biodegradable microneedles

**Primary Author (and presenter):** Shelley, Haley R.

**Additional Authors:** Grant, Makenzie & Ramapuram, J.

**Department:** Drug Discovery and Development

**College/School:** Harrison School of Pharmacy

**Description:**

Difluprednate is a corticosteroid approved for treatment of anterior uveitis; however, recent studies have shown that difluprednate can treat posterior segment conditions. Difluprednate is currently only available as a topical emulsion. Topical formulations limit the amount of drug capable of permeating to the posterior segment due to permeation barriers. Biodegradable microneedles patches can be used to bypass the tear film and sclera, improving the amount of drug delivered to the posterior segment. A dissolvable backing will be implemented for rapid dissolution upon administration; leaving the microneedles imbedded in the sclera for slow degradation and subsequent drug release over a period of days. Microneedle patches were fabricated PLGA for the microneedle tips, PAA for the dissolvable backing, and difluprednate as the active pharmaceutical ingredient. The patches were analysed for uniformity and sharpness using scanning electron microscopy (SEM). Failure force analysis was performed on a Texture Analyzer to determine the amount of force and distance necessary to break the microneedles. PAA backing dissolution was performed in phosphate buffered saline (PBS). Difluprednate release studies were performed over 5 days with the patches submerged in PBS. Permeation studies using porcine scleral tissue were performed on a Franz diffusion apparatus over a 24-hour period. SEM analysis proved that the microneedles were uniform and sharp. Failure force analysis revealed that the microneedles failure force of 14.715N. The PAA backing dissolved within 30-40 minutes after being submerged in the PBS. Release studies showed a slow steady release over the 5-day period and the microneedles were still intact following the study. Scleral permeation studies revealed an increase in the cumulative amount of drug over the 24-hour period. Additionally, SEM images taken of the microneedles after 24-hour scleral permeation had more deterioration compared to the 12-hour microneedles.

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**Title:** Education and employment of female graduate student in U.S.: A historical data perspective

**Primary Author (and presenter):** Shi, Yuewei

**Additional Authors:** Lin, Xi

**Department:** Education Foundations, Leadership and Technology

**College/School:** College of Education

**Description:**

With the development and expansion of U.S higher education, the number of graduate students is continually growing. The number of female graduate students is increasing and even outnumbering the male graduate students. From the human resources perspective, the improvement in women's employment is associated with the development of economic prosperity and social justice. It promotes the advancement of the social status of women and allows the labor market to absorb and utilize enough high intelligence labor resources. This research will use the original data related to employment statistics of female graduates from 1966 to 2010, which come from the U.S National Science Foundation (NSF), the U.S. Bureau of Labor Statistic (BLS) and other agencies, and organize the data on the U.S. women's graduate training, employment rates, employment distribution and salary level. The purpose of this research is to explore the effects of cultural background and government policies on women's equal access to education, employment and fair pay through the data analysis.

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**Title:** MTurk as a viable source for organizational and occupational health research

**Primary Author (and presenter):** Shifrin, Nicole V.

**Additional Authors:** Michel, Jesse; O'Neill, Sadie; Hartman, Paige; & Lorys, Anna

**Department:** Psychology

**College/School:** College of Liberal Arts

**Description:**

Amazon's Mechanical Turk (MTurk), a crowdsourcing online platform enabling individuals to be compensated for completing human intelligence tasks, is an increasingly popular method of conducting research. However, few studies have examined the labor market characteristics of MTurk workers (Turkers) or the results of organizational and occupational health data as compared to published benchmarks. The present study reviews current MTurk literature and presents a multi-wave study of labor characteristics and organizational and occupational health variable relationships. Turkers were distributed across the labor market, providing for generalizable, understudied, and targeted occupation samples. Effect size magnitudes were comparable to or stronger than published benchmarks, and data displayed high test-retest reliability and stability of relationships. Results support using MTurk for organizational and occupational health research.

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**Title:** Self-healing polymer filaments for additive manufacturing

**Primary Author (and presenter):** Shinde, Vinita

**Additional Authors:** Beckingham, Bryan

**Department:** Chemical Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Additive manufacturing technology (e.g. 3D printing) has seen a dramatic increase in both attention and industrial application. Revolution of the technology is caused due to decreasing costs of 3D printing equipment, low waste generation and improvements in print quality and overall progress in ease-of-use through software improvements. There are currently limited range of polymer materials for 3D printing providing opportunities in developing new materials and material platforms for 3D printing. Here we aim to improve the lifetime of 3D printed polymeric objects through the incorporation of self-healing properties. Inspired by biological self-healing in which a damage event triggers an automatic healing response, microcapsules containing healing agents can be embedded into a host material that upon rupture

during a damage event heal the surrounding material. During the damage event, microcrack expansion initiates rupturing of embedded microcapsules releasing the healing agent that then interacts with the host material to repair the crack either by polymerization, entanglement or cross-linking. We aim to study the mechanical properties of microcapsules and leverage microcapsule shell wall chemistry to tune their properties to both withstand high shear stresses during additive manufacturing and also promoting the automatic release of healing fluid to the crack site. 3D printable self-healing polymers will increase product shelf life and thereby improve material sustainability and long-term cost. We aim to synthesize double shell wall polyurethane/poly (urea-formaldehyde) microcapsules by in-situ polymerization using established methods. Microcapsules containing healing fluid will be incorporated into the host polymer matrix to produce 3D printed polymer filaments capable of self-healing. Microcapsule-loaded polymer specimens will be produced via 3D printing and healing efficiency will be evaluated with varied microcapsule size concentration and shell wall thickness.

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**Title:** Implementation of nutritional screening tools in the care of geriatric patients admitted to the Acute Care Unit

**Primary Author (and presenter):** Short, Pamela R.

**Additional Author:** Watts, Sarah

**Department:** Nursing

**College/ School:** School of Nursing

**Description:**

There is strong evidence that malnutrition contributes to poor outcomes among geriatric patients in acute care settings. Evidence-based guidelines recommend screening for malnutrition upon admission in hospitalized geriatric patients using a standardized assessment tool. The purpose of this project was to evaluate the impact of using a standardized assessment tool to screen for malnutrition compared to current practice for early diagnosis and prompt treatment. A longitudinal study was conducted in an acute care facility. Target population included adults (65 years or older) with no cognitive deficits admitted to the medical/surgical unit. Following informed consent, a registered nurse administered a validated nutrition screening tool (MNA-SF) in conjunction with the current practice of using routine parameter methods and a short questionnaire. Descriptive statistics were used to describe the patient population and identify the number of participants who are malnourished or at risk for malnutrition. Outcomes were increased diagnosis of nutritional risk in patients screened using the MNA-SF. Inferential statistical analysis was conducted. Following descriptive analysis by group, each group's data was analyzed for improvement in outcomes using paired t-Tests for the interval/ratio variables and Wilcoxon Matched for ordinal variables. MNA-SF was compared to current practice using independent t-tests and Mann-Whitney U tests. Statistically significant ( $p \leq 0.05$ ) differences were observed between the MNA-SF and the current practice tool. Screening for malnutrition among geriatric patients using a standardized tool increased identification of malnutrition or risk of malnutrition. Early identification and treatment of malnutrition among geriatric patients are achievable in the acute care setting. Further implementation of the project is warranted because it can have a positive impact on patients maintaining their functional status while hospitalized in the acute care setting.

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**Title:** Effects of build orientation and surface roughness on the fatigue behavior of additive manufactured stainless steel 316L

**Primary Author (and presenter):** Shrestha, Rakish

**Additional Authors:** Simsiriwong, Jutima & Shamsaei, Nima

**Department:** Mechanical Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

The effects of build orientation and surface roughness on the mechanical properties and fatigue life of stainless steel (SS) 316L fabricated via a laser-based powder bed fusion (L-PBF) additive manufacturing process are investigated. Quasi-static tensile and uniaxial fatigue tests were conducted on L-PBF SS 316L specimens fabricated in various directions, including horizontal (H), vertical (V), and diagonal (D), in their as-built and machined conditions. Experimental results revealed that anisotropy exists in both tensile properties and fatigue resistant of L-PBF SS 316L. In general, the L-PBF specimens, both in their as-built and machined conditions, exhibited higher yield and ultimate tensile strengths when compared to their wrought counterpart. Higher elongation to failure was also observed for L-PBF SS 316L specimens fabricated in vertical and diagonal directions relative to the wrought SS 316. Moreover, the horizontally built specimens possessed higher fatigue resistant as compared to the L-PBF specimens built in other directions, while due to the presence of larger sub-surface defects in as-built specimens, minimum effect of surface roughness on fatigue life of L-PBF SS 316L specimens was reported. Better tensile properties for additively manufactured specimens were attributed to the higher cooling rate experienced by the specimens during fabrication, leading to finer microstructures. Whereas, anisotropy in the fatigue life was due to the variation in build orientation resulting to defect directionality, which can significantly affect the fatigue behavior of additively-manufactured parts and components.

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**Title:** A Numerical Analysis of Heterogeneous 4 Truck Platoon Aerodynamic Drag Reduction

**Primary Author (and presenter):** Siemon, Michael L.

**Additional Authors:** Nichols, Stephen

**Department:** Aerospace Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

The purpose of this study was to provide an analysis of the aerodynamic phenomena involved with the platooning of multiple truck-trailer configurations. With fuel usage being a large factor in high operational costs of truck fleets, increases in fuel economy may drastically reduce these costs for large fleets. Furthermore, there are clear link-ages between aerodynamic drag on a particular vehicle and that vehicle's fuel economy, providing incentive to decrease drag and thus decrease fuel usage. This is increasingly achieved by the platooning of multiple vehicles coupled with a controller to govern engine usage and preserve proper spacing between vehicles. Computational Fluid Dynamics (CFD) provides a relatively inexpensive and robust avenue to experiment with solutions to reduce drag. Previous studies of these heavy vehicles have generally focused either on single vehicle drag reduction or platoons involving two identical truck-trailer configurations. This study aims to investigate more complex truck-trailer configurations, using the Peterbilt 579 truck, where trailer loads are non-homogeneous and therefore the wake structure behind each vehicle is unique. Modifications to truck-to-truck spacings, platoon order, and investigation of lateral offset are all to be studied for their effect on platoon drag reduction. Additionally, this study aims to investigate the results presented by various turbulence models to identify any possible discrepancies and determine what is necessary to provide proper solution fidelity.

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**Title:** Preclinical strategies to evaluate treatment strategies in triple negative breast cancer

**Primary Author (and presenter):** <sup>1,2</sup>Skarupa, Elena, B

**Additional Authors:** <sup>2</sup>Jasper, Shanese, L; <sup>2</sup>Arnold, Robert, D

**Department:** Drug Discovery and Development

**College/School:** <sup>1</sup>College of Sciences and Mathematics, <sup>2</sup>Harrison School of Pharmacy

**Description:**

Breast cancer is the second leading cause of cancer death among women. Early detection and diagnosis in addition to targeted therapies, have improved survival rates. This improvement does not extend to patients with metastatic, triple-negative breast cancer (TNBC). TNBC is estrogen receptor, progesterone receptor, and HER2 negative. TNBC cannot be targeted via hormone or anti-HER2 therapies. Chemotherapeutics like Doxorubicin are a primary treatment option, but it exhibits cumulative dose-limiting cardio toxicity that limits its clinical utility. In order to create and optimize TNBC treatment options, a better understanding of these tumors and their drug interaction is necessary. 2-dimensional in vitro models assess these interactions but do not recapitulate the complexity and multicellular nature of in vivo tumors. 3-dimensional in vitro models are a more physiologically relevant model mimicking the tumor microenvironment and for assessing the interplay between drug and tumor. The potency of doxorubicin was determined using classic 2D cell toxicity assays (total protein: SRB and mitochondrial enzymatic activity: MTT), with drug exposures ranging from 10 to 0.0001uM doxorubicin in the human TNBC cell-line, MDA-MB-231, and evaluated at 24, 48, and 72 hours exposure. The potency (IC50 value) was calculated after the 72 hour time point. The 2D experiment will be a reference platform for evaluating a 3D model using tumor spheroids. The development and evaluation of the 3D model were conducted in parallel. Future studies will determine potency of doxorubicin using a single cell (tumor only) and multicellular (tumor and cells associated with tumor stroma) 3D models. Future studies will evaluate differences in gene and protein expression between the 2D and 3D cell models with interest in HIF and B21 genes. The goal is to determine if 3D models can be used as a more accurate depiction of the in vivo tumor response in an effort to develop better treatment options for TNBC.

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**Title:** Predicting subordinate decisions using an integrative model of personality, leader behavior, and leader-member exchange

**Primary Author (and presenter):** Smith, Adam M.

**Additional Authors:** Ritterbush, Elizabeth A.; Whitman, Rachel L.; & Svyantek Daniel, J.

**Department:** Psychology

**College/School:** College of Liberal Arts

**Description:**

This project investigated how leader behaviors interact with subordinate perceptions and personality to influence decision making outcomes in the workplace. Specifically, we tested a hypothesized integrative model that provides evidence for (a) the distinction between the measurement of gratitude and leader-member exchange (LMX), and (b) the mediating effect of LMX between leader behavior and congruence of leader-subordinate decision making. Data were gathered from 54 undergraduate students in a large Midwestern university. An experimental design was used to manipulate leadership behaviors as well as control the interaction between leader and subordinates. During each trial, participants filled out several questionnaires and then completed a problem-solving activity under the leadership of a trained confederate. Half of the trials experienced democratic leadership, while the other half experienced autocratic leadership. After the end of each trial, participants were given the opportunity to agree with or reject leader decisions, resulting in a measurement of decision making congruence. Results showed that high subordinate gratitude was significantly correlated with high LMX quality. Factor analysis also confirmed the distinction between the measurement of LMX and gratitude. Additionally, democratic leadership resulted in significantly higher LMX ratings than autocratic leadership. Utilizing structural equation modelling techniques, the integrative model fit the data well in support of LMX fully mediating the relationship between leadership style and congruence of decision making. These results provide strong evidence for the combined importance of examining personality, behavior, and relationship dynamics in order to explain workers' decisions. Findings also suggest that regardless of the situation, leader behavior can have a significant impact on subordinate perceptions and resulting decisions.

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**Title:** Discrete cosine transform spectral pooling layers for convolutional neural networks

**Primary Author (and presenter):** Smith, James S.

**Additional Authors:** Wilamowski, Bogdan

**Department:** Electrical and Computer Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Pooling operations for convolutional neural networks provide the opportunity to greatly reduce network parameters, leading to faster training time and less data overfitting. Unfortunately, many of the common pooling methods such as max pooling and mean pooling lose information about the data (i.e., they are lossy methods). Recently, a new pooling method called spectral pooling has been utilized to pool data in the spectral domain. By doing so, greater information can be retained with the same network parameter reduction as spatial pooling. Additionally, the convolution step can be combined with spectral pooling to further reduce computational load compared to spatial pooling methods. Spectral pooling is currently implemented in the discrete Fourier domain, but it is found that implementing spectral pooling in the discrete cosine domain concentrates energy in even fewer spectra. An algorithm is presented that implements spectral pooling in the discrete cosine domain and compares results with other pooling methods on a large benchmark dataset. Although Discrete Cosine Transforms Spectral Pooling Layers (DCTSPL) require extra computation compared to normal spectral pooling, the overall time complexity does not change and, furthermore, greater information preservation is obtained, producing networks which converge faster and achieve a lower misclassification error.

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**Title:** Creation of smoke hood donning standard: A pilot study

**Primary Author (and presenter):** Smith, Tenchi

**Additional Authors:** Haynes, Kristen; Huang, Zhengyin; Parsek, Anthony; Tella, Meghana; Zhang, Xuanxuan

**Department:** Industrial and Systems Engineering

**College/ School:** Samuel Ginn College of Engineering

**Description:**

The goal of this pilot study was to create a standard for donning a smoke hood and to examine if the users could don with this standard correctly within the required evacuation time from an aircraft during emergency. A total of 13 subjects participated and completed 102 trials. Subjects were seated six at a time, 3 in the front row and 3 in the back row. The seating had with same dimensions of Boeing 737 aircraft. Upon watching an instructional video on correct donning and indicated that they fully understood the procedure, subjects in the back row were video-recorded while donning the hood. The video instruction was scripted based on the most common manufacturers' smoke hood donning instructions and organized in a way that facilitate the most reasonable procedure flow around the design of the hood. The data collected in the experiment, including donning times for each and every subject and trial, position of the subject, successful or failed dons, successful or failed post-don sealing, and potential reasons for failure, were annotated and analyzed. The data were analyzed for five different groups: male with glasses, male without glasses, female with glasses, female without glasses and overall. A study have shown that as soon as 10 seconds from the start of a fire, smoke in the cabin of an aircraft can start to impede escape attempts. The findings from this study compared the impact of the above factors in determining mean donning time, and determines whether the current common smoke hood design is or is not feasible to be donned and donned correctly at a speed which a person in emergency can be protected from lethal smoke.

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**Title:** Effects of powder degradation on additively manufactured Ti-6Al-4V parts

**Primary Author (and presenter):** Soltani Tehrani, Arash

**Additional Authors:** Thompson, Scott & Shamsaei, Nima

**Department:** Mechanical Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Additive manufacturing (AM) provides a newfound ability to fabricate parts once conceived as infeasible or difficult fabricate. The most common metals AM process is Laser-Powder Bed Fusion (L-PBF) which consists of a powder feedstock being selectively melted. In order to keep L-PBF relevant to industry, it is important to quantify the reuse/recycling of previously invested, unmelted powder and this can save substantial resources and money. Using unique powder/part characterization methods, this study aims to quantify the effects of powder recycling on powder rheological properties and final AM part mechanical behaviour. Measurements associated with Ti-6Al-4V (titanium alloy) powder properties, e.g. flowability, bulk and tapped density, shield stress, permeability, morphology, size distribution and chemistry, will be provided to elucidate the effects of powder recycling on the AM process and final part mechanical behaviour, e.g. tensile strength, fatigue cycles, porosity, and surface roughness. This study aims to discover guidelines that define how to find/use a specific ratio of virgin (unused) powder to the recycled powder for ensuring more consistency in AM part quality.

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**Title:** Evaluating contemporary conservation biology texts for bias in biodiversity representation

**Primary Author (and presenter):** Stahl, Katherine E.

**Additional Authors:** Lepczyk, Christopher & Christoffel, Rebecca

**Department:** Wildlife Sciences

**College/School:** School of Forestry and Wildlife Sciences

**Description:**

A critical component of textbooks is fair representation of the material they cover. Within conservation biology, fair coverage is particularly important given Earth's breadth of species and diversity of ecosystems. However, research on species tends to be biased towards certain taxonomic groups, so it is possible that textbooks may have a similar bias. Our goal was to evaluate contemporary books in the field of conservation biology to determine if they are representative of Earth's biodiversity. To address our goal, we categorized all figures, tables, and boxes in current conservation biology textbooks. Information was sorted by taxonomic group (if described); whether human influence, positive or negative, was noted in the example; if the species or group was a marine or terrestrial organism; and by the continent in which data was gathered. Based on our initial sampling, we found that when a specific taxon was described, 28% were birds, 25% were mammals, 11% were plants, 10.5% were amphibians, 9% were reptiles, 9% were invertebrates, and 7% were fish. Of the boxes, figures, and tables that noted human influence, 72% were examples of negative human influence, while only 28% depicted positive human influence on the environment. Roughly 71% of examples mentioning a specific taxon used data from terrestrial organisms. There were also disparities in which continents were used in examples, with Asia accounting for 27%, North and South America 19% each, Australia 18%, Africa 15%, and Europe only 2%. Antarctica was not mentioned. Our initial findings suggest that modern conservation biology textbooks are biased in terms of coverage of taxonomic groups, human influence on the environment, and equal representation of ecosystems across the planet. Skewed representation of biodiversity in textbooks could favor an inaccurate view of the world due to insufficient knowledge of its multitudinous ecosystems and biota.

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**Title:** Screening for canine cancers through the identification of upregulation and downregulation of micro-RNAs

**Primary Author (and presenter):** Stahr, Natalie, Middle A

**Additional Authors:** Agarwal, Payal; Crepps, Melissa; Smith, Bruce, F.

**Department:** Pathobiology

**College/School:** College of Veterinary Medicine

**Description:**

The goal of this research is to identify specific Micro-RNAs (miRNAs) that are consistently upregulated or downregulated in a wide spectrum of cancers in dogs, and use this to create a routine screening test for cancer. If a certain miRNA is consistently upregulated or downregulated across canine cancers, then this difference in concentration should also be present and measurable in RNA extracted from plasma exosomes. Other studies have identified miRNAs that are upregulated or downregulated in specific types of cancer and could be used in diagnosing the respective cancer. In contrast, this study aims to find a miRNA that is consistently affected in all cancers. We have identified a set of miRNAs whose expression is altered in the supernatants of a panel of cultured canine cancer cells. These miRNAs are being validated in the circulation of canine cancer patients. To accomplish this, exosomes are first isolated from canine plasma, then total RNA is isolated from these exosomes. The RNA is reverse transcribed into cDNA, which is amplified by Polymerase Chain Reactions (rtPCR) which include Taqman probes. These assays identify and amplify specific miRNA sequences. Amplification is measured by fluorescence intensity emitted by the Taqman probe. The experimental miRNAs are compared with the levels of a housekeeping miRNA that is unchanged by disease to demonstrate the relative concentrations of these miRNAs. Using a variety of samples that reflect various types of cancer, this research could find a miRNA that is consistently affected in all cancers; creating a test that could then prompt follow-up action towards identifying the specific type of cancer in at-risk individuals. Currently, this ongoing project has processed samples from various canine patients and is currently optimizing the PCR and experimental design.

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**Title:** Evaluation of role of pore and pore-throat distributions in controlling permeability in heterogeneous mineral dissolution and precipitation scenarios

**Primary Author (and presenter):** Steinwinder, Jeffrey H.

**Additional Authors:** Bensinger, Jacob & Beckingham, Lauren

**Department:** Civil Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Mineral precipitation and dissolution reactions, such as those during CO<sub>2</sub> sequestration, can significantly alter the porosity and permeability of porous media. In general, the change in porosity is directly proportional to the reaction extent and easily predicted, while the evolution of permeability is controlled by reaction location in discrete pores and pore-throats and in the greater pore network. Geochemical reactions have been observed to occur uniformly and non-uniformly in porous media, driven by mineral distribution, Péclet and Damköhler ratios, and grain size, for example. Pore network modeling can be used to simulate the impact of pore scale alterations on permeability where previous simulations observed variations in porosity-permeability evolution for different reaction distribution scenarios (uniform, random, channelized, size-dependent). Comparison of simulation with results with macroscopic porosity-permeability relationships, such as the well-known Kozeny-Carman equation, revealed these relationships are unable to reflect permeability evolution given non-uniform alterations to the pore structure. This work uses pore network modeling simulations to investigate the impact of variations in pore and pore-throat size distribution on porosity-permeability evolution. Pore and pore-throat size

distributions of varying types (skewed, normal, uniform) are used to populate a pore network model and simulate permeability evolution under various network topology, reaction conditions and extents. For all distributions, the size-dependent scenarios exhibit discontinuous behavior, demonstrating fundamental discrepancies with common porosity-permeability relationships. Simulation observations will be used to develop improved porosity-permeability relationships to accurately simulate these size-dependent scenarios.

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**Title:** Synthesis and characterization of Mo/HZSM-5 Catalysts for Natural Gas Upgrading

**Primary Author (and presenter):** Stephens, Natalie, W

**Additional Authors:** Raj Thakur, Reid Adams, Carlos A. Carrero

**Department:** Department of Chemical Engineering

**College/School:** Auburn University Samuel Ginn College of Engineering

**Description:**

The use of natural gas in our society is on the rise and the chemical industry needs new catalysts to assist in its upgrading. Our research focuses on the synthesis methods of HZSM-5 catalysts with varying concentrations of alkali and alkaline earth metals along with molybdenum. The process involves use of incipient wetness impregnation. The addition of the metals inside the internal framework involves pyrolysis and calcination procedures. The effect of the novel methods in the synthesis process with the additional inclusion of the alkali and alkaline earth metals lends itself to affect the structural and catalytic properties. *Operando* Raman- MS (Mass Spectrometry) was utilized to further understand the structure-activity relationship. The activity/ selectivity- stability of the catalysts were also analysed using GC (Gas Chromatography). Our preliminary results show a correlation between the activity/selectivity-stability with the addition of alkali and alkaline metals..

In summary, this presentation will describe a new approach in the preparation of zeolite catalytic material for the upgrading of natural gas. Both bulk and surface characterization will be obtained via *in situ* X-ray diffraction and Raman spectroscopy, respectively.

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**Title:** Repairing valuable parts using additive manufacturing

**Primary Author (and presenter):** Sterling, Amanda, J.

**Additional Authors:** Shamsaei, Nima & Thompson, Scott, M.

**Department:** Mechanical Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

To salvage precious components using a cladding-type repair method via additive manufacturing (AM), and for such parts to be utilized and trusted in various applications, their mechanical properties must be well-characterized and documented. In this study, the fatigue behavior and failure mechanisms of titanium alloy specimens repaired using Laser Engineered Net Shaping (LENS), a blown-powder Direct Laser Deposition (DLD) AM process, was investigated. A series of fully-reversed load-controlled fatigue tests were conducted on the 'LENS-cladded' specimens and Scanning Electron Microscopy (SEM) was used to examine the fracture surfaces. Failure mechanisms, crack initiation sites, and fabrication defects were identified and qualified. Results indicate that the cladded microstructure of the investigated titanium alloy is anisotropic, due to the relatively high localized heating and cooling rates experienced during DLD. Thus, the clad possesses different mechanical properties than that of the traditionally wrought material.

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**Title:** Python-based Implementation of Deep Convolutional Neural Field

**Primary Author (and presenter):** Stowe, Carmen, D

**Additional Authors:** Bhattacharya, Debswapna

**Department:** CSSE

**College/School:** College of Engineering

**Description:**

This experiment was performed in order to create a Python implementation of the Deep Convolutional Neural Field (DeepCNF), which is a Deep Learning framework with many applications in machine learning, especially bioinformatics. The main program of DeepCNF is DeepCNF\_Pred which is a C++ file. The file does much of the predicting for the module. The goal of this project was to create a Python implementation of this file using SWIG which is an interface compiler. SWIG takes a C or C++ file and creates a wrapper of that file. It then imbeds the wrapper as part of the API of the converted Python file. In other words, SWIG allows for C or C++ files to be used as a Python file via the command line. When DeepCNF\_Pred.cpp is compiled, a DeepCNF\_Pred module is created. We were then able to import the DeepCNF\_Pred module along with the other modules we used SWIG to interface with Python (DeepCNF and DeepCNF\_Misc). The compilation also generates a DeepCNF\_Pred.py file which is for all intents and purposes a Python implementation of the DeepCNF\_Pred.cpp program. However, the DeepCNF\_Pred.py file is actually a shadow class. This means that it contains both SWIG and Python API, but it still has the same functionality of the original C++ file.

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**Title:** An experimental and numerical study of the environmental and combustion characteristics of wildland fuels

**Primary Author (and presenter):** Stubbs, Daniel C.

**Additional Authors:** Nichols, Stephen & Scarborough, David

**Department:** Aerospace Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

This project seeks to develop a three-dimensional, physics based, time-accurate model for simulating the spread of forest fires in the Southeast United States. The accurate prediction of wildland fire propagation is a challenging area of research combining the fields of fluid dynamics, combustion, and chemistry. Most current models employ lower order empirical methods relying on experimental and historical data rather than accurate combustion physics to generate their results. These models have primarily been focused on the western United States with little focus on the Southeast. Low order models are convenient for their ability to give relatively good predictions with low computational cost, but they lack the accuracy that can be obtained from a true physics-based simulation. The current research will develop a model that takes inputs regarding fuel type and environmental conditions to simulate how a forest fire would propagate under the given conditions. The developed model will be validated through experimental analysis. Such a tool will give a better understanding of how to safely conduct controlled burns and assist in predicting the impact of a wildland urban interface situation in the Southeast United States.

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**Title:** Utilitarian and hedonic values of virtual fitting rooms and consumers' motivations, attitudes, and intentions

**Primary Author (and presenter):** Sultana, Nigar

**Department:** Consumer and Design Science Department

**College/School:** College of Human Sciences

**Description:**

Fitting rooms are one of the most important necessary components of apparel retail stores that enable consumers to experience the products and make purchase decisions. Solving inherent limitations and enhancing consumer experiences, virtual fitting room technology has emerged and is increasingly adopted by innovative retailers. Despite this trend, research on consumers' perceptions toward virtual fitting rooms is very limited. Based on the value-motivation-attitude-intention model, the purpose of this study is to examine the perceived utilitarian and hedonic values of virtual fitting rooms among consumers, and the influence of such values on consumers' motivations, attitudes, and intentions toward using virtual fitting rooms. The research will employ online survey method to achieve consumers' perceptual responses about virtual fitting rooms. The findings will contribute to the existing literature by highlighting the key merits of this new technology perceived by consumers, and provide managerial insights of potential use of virtual fitting rooms maximizing consumer benefits.

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**Title:** Facile fabrication of polydopamine nanotube for chemo-photothermal therapy

**Primary Author (and presenter):** Sun, Yuzhe

**Additional Authors:** Davis, Edward

**Department:** Mechanical Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Chemotherapy and photothermal therapy via nanomaterials are two promising approaches for cancer treatment. There has been an increasing interest in the combination of these two approaches to achieve a synergetic therapeutic effect. One candidate material for this strategy is polydopamine (PDA), which has excellent biocompatibility and biodegradability, abundant functional groups, and a high photothermal conversion efficiency. In view of these properties, comprehensive studies have been conducted to develop drug delivery nanoparticles via PDA. Recently, it has been reported that rod-like, high aspect ratio nanoparticles have superior biodistribution than spherical nanoparticles, including longer circulatory lives and easier cellular internalization. In this study, drug delivery nanotubes were synthesized via PDA self-polymerization in Tris-HCl buffer. And halloysite, a natural, inexpensive nanotube, was used as sacrificial template material. The morphology, composition and structure of synthesized nanotubes were determined via transmission electron microscope (TEM), thermogravimetric analysis (TGA), Fourier Transform Infrared Spectroscopy (FTIR) and X-ray diffraction (XRD). Through these studies, the removal of template and fabrication of PDA nanotubes were demonstrated. Then drug loading and release experiments were performed using doxorubicin hydrochloride (DOX) as a model molecule. Photothermal conversion efficiency was evaluated by irradiation at 808 nm, obvious temperature elevation could be observed. Photo-stimulated release was also investigated in different pH conditions at this wavelength. With the irradiation of near-infrared laser, the release of absorbed DOX was effectively accelerated.

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**Title:** Assessing socio-environmental factors for childhood Leukemia Cluster in Cleburne County, Alabama

**Primary Author (and presenter):** Sutton, Collin R.

**Additional Authors:** Ashwood, Loka; Hiatt, Christy; Lee, Ming-Kuo; Billor, Zeki; Domova, Natasha; Defler, Kenzley

**Department:** Geosciences

**College/School:** College of Science and Mathematics

**Description:**

This research investigated the socio-environmental factors connecting to recent alarming spike of children leukemia in the rural Fruithurst-Muscadine community in Cleburne County, Alabama. This leukemia cluster rests upon Heflin Phyllite, a Piedmont metamorphic rock that can potentially produce high levels of radon ( $^{222}\text{Rn}$ ). Our research suggests that the patients may have been exposed to radon, heavy metals, and semi-volatile organic compounds in groundwater and sediments. Radon concentrations range from tens to thousands of pCi/L, warranting a long-term radiation test. The current source of Fruithurst drinking water comes from a cold spring connected to the Knox carbonate aquifer in Calhoun County near two superfund sites. The ICP-MS results show that the level of trace metals in current municipal water are below EPA's MCLs, ruling out the potential connection of leukemia to trace metal contamination from current drinking water. However, some rural families still use well water as their main water supply. Our research found heavy metals (arsenic, zinc, barium, chromium, lead, nickel) and semi-volatile organic compounds (Bis(2-ethylhexyl) phthalate, or DEHP) in a soil sample near the Problend Rubber Plant. Zinc content in the soil sample analyzed (3,000 mg/kg) is higher than the level recommended by U.S. EPA Clean Water act (2,800 mg/kg). Historical records from the Alabama Department of Environmental Management show heavy metals in discharge runoff from Problend substantially above the EPA recommended levels: up to 42,222 times higher for zinc, 183 times higher for lead, and 940 times higher for chromium. Seven wells have been tested from patients' houses. Some well water contains low level of DEHP; the source and level of DEHP in the study area require further investigation. The presence of barium in most well water used by leukemia patients suggests common source(s) either from bedrocks or contaminants.

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**Title:** Modern oboe techniques and their musical intent in selections from Kathryn Potter's "In Adoration of the Earth"

**Primary Author (and presenter):** Tanner, Sarah, O.

**Additional Authors:** N/A

**Department:** Department of Music

**College/School:** Auburn University

**Description:**

Kathryn Potter is a modern-day oboist, teacher, performer, and composer. She has composed and published several *étude* books as well as solo and chamber works for oboe. She is passionate and inspired by the natural beauty of the earth, which is clearly reflected in her compositions. While her pieces center on expressing the natural beauty of the earth's wildlife, they also feature many new and advanced modern-day oboe techniques. These techniques include the use of quarter tones, pitch bending, multiphonics, and exploring the extreme high register of the oboe. These progressive and advanced techniques became increasingly popular in the later twentieth century and early twenty-first century. However, as impressive as it is to utilize and perform these techniques, they can be perceived as rather harsh to the ear and must be used tastefully and musically. Potter's collection of progressive *études* titled *In Adoration of the Earth* exemplifies these techniques, using them in an expressive and musical manner.

Potter's status as a living and active composer and musician provides a unique opportunity to engage in discussion with her directly about her compositions, musical intentions, and inspirations as well as her career as a female oboist and composer. I had the privilege of interviewing her and asked her questions about her compositions, specifically selections from *In Adoration of the Earth*. Additionally, I took a couple lessons from her, which afforded direct instruction on how she intended her pieces to be expressed and performed.

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**Title:** Extension empowers Alabama youth and parents to eat better and move more

**Primary Author (and presenter):** Terry, Kara M.  
**Additional Authors:** Parmer, Sondra M. & Struempfer, Barb  
**Department:** Nutrition, Dietetics and Hospitality Management  
**College/School:** College of Human Sciences

**Description:**

Alabama's adult obesity rate is 36%, and the adolescent obesity rate is 19%. National and state data indicate limited fruit and vegetable consumption, excessive sugar-sweetened beverage (SSB) intake and inadequate physical activity participation in both adults and youth; these behaviors have been associated with obesity. *Eat Better, Move More* (EBMM) is a 6-week intervention designed to stimulate healthy eating and physical activity of youth and their caregivers. The purpose of this quasi-experimental study was to determine the efficacy of EBMM. A convenience sample of 600 fourth grade Jefferson County students attending schools where 50% or more of students receive free or reduced price meals were recruited. Parent/guardians of participating fourth graders also were invited to participate. Youth completed an 11-question survey during the first weekly lesson to measure daily fruit, vegetable and beverage intake and daily physical activity participation. In coordination with the first weekly lesson, adults received, completed in the home and returned a 32-question survey measuring daily fruit, vegetable and beverage intake; physical activity participation; and beverage choices. Researchers developed surveys from previously validated instruments. EBMM included a 6-lesson, weekly curriculum adapted from CATCH Kids Club. Topics emphasized vegetables, fruits, dairy products, SSBs, physical activity and energy balance. Parents received educational handouts, child-friendly healthy recipes and text messages with healthy eating and physical activity tips. An Alabama SNAP-Ed at Auburn University educator and Alabama Extension 4-H agent conducted weekly lessons and assessments. Descriptive statistics on pre-assessment findings will be reported. Following pilot completion, EBMM will be adapted and expanded throughout Alabama to empower youth and their parents to increase fruit and vegetable consumption, limit SSB intake and participate in daily physical activity.

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**Title:** Alcohol assisted methane dehydroaromatization over different Mo<sub>2</sub>C- containing zeolite catalysts

**Primary Author (and presenter):** Thakur, Raj  
**Additional Authors:** Adam, Reid; Stephens Natalie; & Carrero, Carlos A.  
**Department:** Chemical Engineering  
**College/School:** Samuel Ginn College of Engineering

**Description:**

The upgrading of natural gas is a ubiquitous goal of industrial chemical processes, and can be achieved through catalysis. The ability to upgrade the most abundant natural gas component, methane, to valuable chemicals is highly desirable. Our research focusses on the direct conversion of methane towards liquid chemicals instead of the indirect path via syngas. A series of catalysts comprised of molybdenum oxide incorporated in the internal framework of a zeolite were synthesized via incipient wetness impregnation and further carburized to molybdenum carbide. Novel parameters for the preparation of the catalyst were introduced, and their effect on the structural and catalytic properties was analyzed through Operando Raman-MS spectroscopy. Kinetic studies in the aromatization of methane, assisted by co-feeding alcohols were performed on various samples to determine the optimal conditions for maximizing activity, selectivity and stability towards alkyl aromatic products. Our preliminary results show a correlation between the activity/selectivity-stability with the condition for the carburization process. In summary, we will be presenting our latest results in the conversion of methane towards alkyl aromatics using Mo<sub>2</sub>C-containing zeolite catalysts. In addition, we will be presenting a new approach in the preparation of the catalytic materials as well as proper (transient and steady-state) kinetic studies to convert methane and improve productivity towards alkyl aromatics.

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**Title:** Health monitoring of damage on automotive underhood electronics subjected to temperature and vibration

**Primary Author (and presenter):** Thomas, Tony

**Additional Authors:** Lall, Pradeep

**Department:** Mechanical Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

This paper focusses on health monitoring of electronic assemblies under vibration load of 5 G until failure at an ambient temperature of 150 degree Celsius. Strain measurements of the electronic assemblies were measured using the voltage outputs from the strain gauges, which are fixed, at different locations on the Printed Circuit Board (PCB). Various analysis was conducted on the strain signals include Time-frequency analysis (TFA), Joint Time-Frequency analysis (JTFA), Empirical Mode Decomposition (EMD) and Statistical techniques like Principal component analysis (PCA) to monitor the health of the packages during the experiment. Frequency analysis techniques were used to get a detailed understanding of the different frequency components before and after the failure of the electronic assemblies. The energy content of the strain signals was also studied using the joint time-frequency analysis. Different filtering algorithms based on Empirical mode Decomposition (EMD) and frequency quantization techniques gave insight about the change in the frequency components with the time of vibration. It is seen that as the vibration time increases and the electronic packages lead to failure, the occurrence of new high-frequency components and the amplitude of the high-frequency components also increases compared to the before failure condition. The health monitoring of electronic assemblies was determined by identifying different feature vectors that can distinguish the before and after failure strain signal and also give you a progression of failure which helps to predict the life of the electronics during vibration. The principal components of the frequency and instantaneous frequency matrix was identified as two major feature vectors that can predict the life of the electronic components. These principal components discretely separated the before and after failure strain components and also showed the progression of failure with vibration time.

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**Title:** Novel microfluidic system for encapsulation of equine endothelial colony forming cells for local cell delivery

**Primary Author (and presenter):** Tian, Yuan

**Additional Authors:** Seeto, Wen; Winter, Randolph L.; Caldwell, Fred J.; Wooldridge, Anne A.; & Lipke, Elizabeth A.

**Department:** Chemical Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Neovascularization is critical in restoring blood flow to ischemic tissue in numerous disease states across species. Endothelial colony forming cells (ECFCs) are highly proliferative and can participate in new blood vessel formation, making them a good source for cell-based therapy. However, cells that are injected directly may have low viability and poor retention at the targeted injection site due to the high shear forces and mechanical wash out. In this study, a custom-built microfluidic encapsulation system was developed for rapid production of ECFC-laden poly(ethylene glycol)-fibrinogen (PF) hydrogel microspheres. This system successfully encapsulated ECFCs at a cell density (10 million cells/mL) that was clinically relevant for cell delivery through injection without sacrificing uniformity and reproducibility. Encapsulated ECFCs maintained high cell viability (>95%), robust proliferative capability, and cellular phenotype. *Ex vivo* and *in vivo* cell delivery studies were performed by injecting

microspheres containing autologous equine ECFCs subcutaneously into distal limb full thickness wounds of adult horses. The cells were labeled with fluorescent nanodots prior to encapsulation for long-term tracking. One week after injection, biopsies of the wounds were analyzed using confocal microscopy. Migration of encapsulated ECFCs into the surrounding host tissue was observed, indicating successful retention and survival of the injected ECFCs and demonstrating feasibility for injectable cell delivery.

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**Title:** Where urban dwelling lizards choose to nest may help their babies beat the city heat.

**Primary Author (and presenter):** Tiatragul, Sarin

**Additional Authors:** Hall, Joshua M. & Warner, Daniel A.

**Department:** Biological Sciences

**College/School:** College of Sciences and Mathematics

**Description:**

Urbanization dramatically alters the environment in which plants and animals rely on. Due to the introduction of heat-retaining concrete and sprinkler, urban areas are usually hotter and moister than nearby natural areas. Developing reptile eggs are directly affected by these environmental changes. However, where the mother chooses to lay her eggs may be critical in buffering the embryos from non-ideal conditions. In this study, we characterized and compared nest sites of an invasive lizard in an urban site and a nearby forest of Miami, Florida. We first randomly searched 1m<sup>2</sup> plots in the study sites and found plots with nests and plots without nest. Then, we characterized each plot by recording the temperature and soil moisture throughout the breeding season when females are most likely to lay eggs. Additionally, we collected data on other relevant environmental features (e.g., shade cover, distance from egg to trees, distance to roads, etc.). We then compared the conditions of plots with nests to those without nests. Our results suggest that females choose nest sites that are more shaded and cooler on average in the urban site but shows no specific preference in the forest. Our study provides a rare evaluation of anole nest sites and is the first to measure environmental characteristics of nests in urban areas. Future studies of how well offspring survive under these selected nest conditions will provide evidence for how mothers may indeed aid in adaptation and acclimation of invasive species to novel urban habitats. Understanding how invasive species adapt to our ever-expanding urban landscape will help shape management strategies to control their spread.

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**Title:** Decriminalizing addiction

**Primary Author (and presenter):** Tindal, Matthew L.

**Department:** Environmental Design

**College/School:** College of Architecture, Design, and Construction

**Description:**

Since its outset in 1971, the federal war on drugs in the United States has sought to curb problematic drug use by its citizens through supply side reduction and incarceration of non-violent personal users. These failed policies have resulted in a burgeoning prison population, contributed massively to the national debt and rate of overdose deaths, as well as spread inequality through over-policing of minority communities in a targeted campaign by increasingly militarized law enforcement officials. Problematic drug use is nevertheless still a prevalent issue in contemporary society, however it is time to adopt a comprehensive treatment centered approach to addressing this issue in a humane and effective manner. Research objectives focused on assessing the degree of social damage incurred as a result of prohibition policies, identifying current international trends of legalization and decriminalization, and demonstrating the extensive potential benefits of legalization and regulation of all drugs. Methods included archival research of documents from the Library of Congress, anecdotal analysis, and appraisal

of harm reduction as a viable alternative to current policy. The combination of failed domestic drug policy with the proven benefits of international decriminalization and legalization lead to the conclusion that a policy of total legalization would best address the issues of health and criminality associated with personal drug use. We are a nation and a world in crisis. Drug war policies have ultimately failed to assuage the rates of incarceration, addiction, and use related deaths, all of which are at historic highs. Legalization and federal regulation would transform our society into a more inclusive and humane collection of free and valued individuals.

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**Title:** Case study: Access to Global Online Research in Agriculture (AGORA)

**Primary Author (and presenter):** Todd, Haley, E

**Department:** English

**College/School:** College of Liberal Arts

**Description:**

This research is an in-depth examination of Access to Global Online Research in Agriculture, or AGORA, a program of the Food and Agriculture Organization of the United Nations. AGORA provides online agricultural research access to developing countries. This case study draws on AGORA's self-description as well as literature from academic journals to compare AGORA to open access. The case study argues that AGORA is superior to open access for developing countries, mostly due to its institution-based access, and presents some potential improvements for AGORA. Those improvements would lead AGORA to facilitate significant advancements for agricultural research in the developing world, which would contribute to systems of empowerment and exchange, greater food security, poverty alleviation, and overall international development.

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**Title:** Stability of Rebaudioside A in Citrate Buffer as Affected by Iron and UV Light Exposure

**Primary Author (and presenter):** Toohey, Mary, J

**Additional Authors:** Bell, Leonard

**Department:** Poultry Science Department, Food Science Program

**College/School:** College of Agriculture

**Description:**

Rebaudioside A (Reb A) is a natural, high intensity sweetener extracted from the leaves of *Stevia rebaudiana*. It is susceptible to degradation dependent upon solution composition and light exposure. The scientific literature contains no data on the combined effects of iron, citrate and light exposure on the stability of Reb A. The objective of this project was to determine the degradation rates of Reb A in various citrate buffers as affected by the presence and absence of iron and ultraviolet (UV) light.

Citrate buffer solutions (0.02 and 0.1 M) were prepared to pH 3. Each solution was made without added iron, 2 ppm iron, and 8 ppm iron. The six solutions were placed into twenty-four 2-mL glass vials; half of each set were stored in darkness and under UV radiation (48  $\mu\text{W}/\text{cm}^2$ ) at 30°C. Samples were removed regularly for up to 2 months. Reb A concentrations were analyzed using HPLC. Data analysis involved determining pseudo-first-order rate constants with 95% confidence intervals.

Reb A stability was negatively affected by iron, citrate, and UV light. Storage of solutions in darkness for 2 months caused no observable loss of Reb A. However, when the solutions were exposed to UV light, degradation rate constants increased dramatically. For example, Reb A in 0.1 M citrate containing 0, 2, and 8 ppm iron had rate constants ( $\pm 95\%$  confidence intervals) of  $0.152 \pm 0.038 \text{ d}^{-1}$ ,  $0.202 \pm 0.070 \text{ d}^{-1}$ ,  $0.318 \pm 0.149 \text{ d}^{-1}$ , respectively, when exposed to UV light. Iron-citrate complexes have been shown to form hydroxyl radicals upon UV exposure, which may be enhancing Reb A loss.

The beverage industry needs to recognize that the presence of iron and citrate buffer increases the photodegradation of Reb A under UV light. Water sources, trace ingredient impurities, and intentional food product fortification are all sources of iron. When developing products with Reb A, the formulation and packaging need to be considered for optimum Reb A stability.

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**Title:** Near-optimal control of complex authentication systems

**Primary Author (and presenter):** Toragay, Oguz

**Additional Authors:** Silva, Daniel F.

**Department:** Industrial and Systems Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

We consider an authentication system, with several methods available, where requests arrive from users of several classes. Users, such as customers of a secure website, are classified considering their characteristics, such as background, type of request and the priority for the system. Authentication methods can have different capacity and cost. Methods can include checking password, security questions, fingerprint or even a direct phone call from customer service. The decision maker must dynamically assign each incoming request to a method, with the objective of maximizing security and minimizing latency and cost. We model the problem as a multi-class, parallel queueing system and solve it using MDP (Markov Decision Processes). The structure of optimal policies in systems with only one finite-capacity method, is known. We use this structure to propose a new heuristic approach to construct near-optimal policies. To do so, we investigate the behavior of optimal policy for different users and find upper and lower bounds for the regions in which we know the general form of optimal policy for each user. Using these bounds, we propose a closed-form formula for a heuristic policy. To evaluate the performance of the proposed heuristic method, we generated the necessary random data and solved the model using parallel computing in MATLAB programming environment. Numerical experimentation shows that our approach offers near-optimal performance for a wide range of parameters. Moreover, our heuristic method decreases the necessary computational effort and solving time dramatically. We believe that, using the proposed heuristic can be considered as a practical alternative for solving those systems in which the “curse of dimensionality” plays a major role.

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**Title:** Three-dimensional (3D) printing of  $Ti_3C_2T_x$  MXene for use in energy storage devices.

**Primary Author (and presenter):** Tormanen, Andrew, H.

**Additional Authors:** Orangi, Jafar; Beidaghi, Majid

**Department:** Materials Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Three-dimensional (3D) printing, an additive manufacturing technique, has grown in popularity in both academia and industry due to the low cost and speed of the process. Also, the 3D printing process is easy to master and offers flexible design options. The many advantages of 3D printing have encouraged the study of 3D printing with two-dimensional (2D) materials. Graphene and graphene oxide (GO) are highly studied 2D materials that exhibit fantastic electrical properties due to their 2D structure. Studies with energy storage devices containing 3D printed graphene and GO have displayed similar or better results than those produced by other methods. MXenes are another family of 2D materials, and they have properties similar to graphene and GO.  $Ti_3C_2T_x$ , the most studied of the MXenes, has a high capacitance and is in high demand. The high capacitance of  $Ti_3C_2T_x$  MXene led to its use in supercapacitors. This study looked to replicate the  $Ti_3C_2T_x$  MXene supercapacitor results using 3D printed  $Ti_3C_2T_x$  MXene components. Inks for

3D printing must have a high viscosity and exhibit shear thinning behavior. Highly concentrated MXene solutions have those properties, so they were synthesized using super-absorbing polymer (SAP) balls. The highly concentrated  $Ti_3C_2T_x$  MXene solutions were 3D printed as the electrodes for a supercapacitor. Tests were run for capacitors with both liquid and solid electrolytes. The results of this study show the great potential of 3D printing as the manufacturing method of high performance energy storage devices based on MXenes.

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**Title:** Fatigue behavior of Ti-6Al-4V fabricated via laser-based powder bed fusion: The effects of build orientation, surface roughness, and hot isostatic pressing

**Primary Author (and presenter):** Torries, Brian A.

**Additional Authors:** Shamsaei, Nima

**Department:** Mechanical Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Additive manufacturing is a novel manufacturing approach that allows for the fabrication of geometries impossible to attain by standard manufacturing methods. However, while this process opens many new design spaces, there are drawbacks; process defects such as porosity, rough as-built surfaces, and inclusions negatively impact the fatigue behavior of additive metals, and research has shown that even the orientation that components are fabricated can effect fatigue and mechanical properties. Therefore, this study investigates the effects of build orientation, surface roughness, and heat treatment on the fatigue life of additively manufactured Ti-6Al-4V specimens fabricated via laser-based powder bed fusion. As-built specimens and rod stock to be machined into specimens were fabricated in vertical, diagonal ( $45^\circ$ ), and horizontal orientations, heat treated, and subjected to fatigue testing. After failure, a microstructural investigation was performed, and fractography was conducted to determine crack initiation sites. Results showed that that build orientation had little to no fatigue life effects for all conditions, while the rough as-built surface led to a large reduction in fatigue life for all conditions. This shows that build orientation is not a factor for Ti-6Al-4V additively manufactured material, and that surface roughness has a much larger impact on fatigue life than porosity.

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**Title:** Evaluating the effectiveness of community gardening in reducing food insecurity and improving health in Chacraseca, Nicaragua

**Primary Author (and presenter):** Tumwebaze, Joel

**Additional Authors:** Onikia, Brown; Thornton, Kate; Jeganathan, Ramesh; & Molnar, Joseph

**Department:** Nutrition, Dietetics and Hospitality Management

**College/School:** College of Human Sciences

**Description:**

Food insecurity and hunger are widely recognized as global issues that require immediate attention using multifaceted approaches. The Food and Agricultural Organization reports that undernourishment in the developing world has reduced by more than half in the last quarter of the century to an average low of 12%. Despite several interventions, UNICEF reports that some countries like Nicaragua have high rates of chronic malnutrition and food insecurity at levels of more than 20%. This longitudinal study was done from 2015 to 2017 and was aimed at evaluating the effectiveness of community gardening in improving health and food security in Chacraseca. A random sample of fifty participants involved in community gardening and fifty participants who are not involved were selected from a population of 10,000 households in Chacraseca. At baseline and at project end quantitative measures of food security, anthropometry and blood pressure were determined for both the control and

intervention groups. Nutrition education and focus group discussions were done for the participatory group whereas only the latter was done for the control group. Results showed that there was no significant difference in food insecurity with a p-value of 0.33 for the study group and 0.51 for the control group. At significant level of 0.05, there was no significant difference in height, weight and BMI for the study group (0.99, 1.00, 0.99 respectively) and in height, weight and BMI for the control group (p 0.99, 0.94, 0.67 respectively). There was no observed significant difference in systolic and diastolic blood pressure for the study group (p 0.65, 0.63 respectively) and for the control group (p 0.32 and 0.14 respectively). Nutrition education and focus group discussions showed that most residents preferred to purchase their food from markets than to engage in gardening. This study will drive improved community gardening programs in Nicaragua and in other food insecure areas.

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**Title:** Explorations in mass timber through the development of interlocking cross laminated timber (iCLT)

**Primary Author (and presenter):** Turkington, William, I.

**Additional Authors:** Adams, Josh; Herron, Charlie; Bragan, Gabriela

**Department:** School of Architecture, Planning, and Landscape Architecture

**College:** College of Architecture, Design and Construction

**Description:**

Mass timber is an emerging building technology which has the potential to reduce the carbon footprint of the building industry while addressing the exponential growth of the world population. Utilizing sustainable forestry techniques, products such as cross laminated timber (CLT) can act as carbon sinks, in contrast to alternative materials like concrete which release massive amounts of carbon into the air by its manufacturing methods and prevalent, wide-spread use across the construction industry. While a standard CLT product exists in which adhesive or metal fasteners are used between each alternating layer, this research explores an alternative method that instead uses wood joinery to attach each layer. Thus, secondary materials which emit carbon in their production, present health hazards to manufactures, and obstruct the ability to recycle the wood panel at the time of building demolition are eliminated. This lack of secondary materials also permits a level of cost effectiveness that other building materials cannot offer. Interlocking cross laminated timber (ICLT) relies solely on friction. Its tongue-and-groove construction between each timber layer develops a frictional force whose strength is comparable to standard CLT panels and concrete construction. This cross lamination provides strength in two directions which prevents the structural members from racking. The prototype constructed for this research involved routing dovetail joints in the four-inch-wide face of five-foot length two by fours to create the first layer. After this layer was fully assembled, a jig was created to carve dovetail joints into the side of the assembled layer, perpendicular to this first layer. All joints are dry fit with a mallet creating a completely homogeneous panel devoid of foreign material. This adaptation of the engineered wood product, CLT, is an emerging alternative to the carbon intensive conventional building materials used today.

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**Title:** Affordability of medications prescribed at a free primary care clinic

**Primary Author (and presenter):** Upton, Addison, J.

**Additional Authors:** Lisenby, Katelin

**Department:** Pharmacy Practice

**College/School:** Harrison School of Pharmacy

**Description:**

To determine the affordability of medications prescribed at a free primary care clinic after a pharmacist implemented a medication formulary. In this chart review study, subjects included men and

non-pregnant women 19 years of age or older whom were seen by a physician and pharmacy team. There were no exclusion criteria. Data was obtained included the patient's status at the encounter (existing or new), medications currently prescribed prior to the visit, medication changes during the visit, financial assistance provided, and documented issues obtaining medications at follow-up. The primary objective was affordability of current and new prescriptions, which was defined as medications on the clinic's formulary, available through patient assistance, or with a cash price of 10 dollars or less. Data was analyzed using descriptive statistics. A total of 50 patient encounters were included in the study. Prior to the identified encounters, 208 medications were prescribed with 15% (32/208) classified as over-the-counter (OTC) medications. Of prescription only medications, 76% (133/176) were affordable with 24% classified as not affordable. During the encounters, 21 medications were discontinued, with 29% (6/21) discontinued due to cost. Of all new prescriptions, 9% (7/76) were classified as OTC. Eighty-seven percent (60/69) of prescription only medications were affordable with 13% (9/69) classified as not affordable. After the encounters, 79% (177/224) of all prescriptions were affordable with 21% (47/224) classified as not affordable. A majority of existing and new medications prescribed using an interdisciplinary approach at a free primary care clinic were affordable. A medication formulary may be helpful to ensure current and new prescriptions are affordable. Given the higher percentage of new prescriptions deemed affordable, a more consistent evaluation of affordability of existing medications is warranted.

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**Title:** Development of next-generation rechargeable aluminium batteries based on a new family of two-dimensional materials

**Primary Author (and presenter):** Vahid Mohammadi, Armin

**Additional Authors:** Beidaghi, Majid

**Department:** Materials Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Batteries based on multivalent ions ( $Mg^{2+}$ ,  $Al^{3+}$ , etc.), are among the potential candidates for future cost-effective energy storage devices. However, development of these batteries is hindered by the lack of efficient electrolytes and cathode materials. Among various multivalent-ion batteries, rechargeable aluminium batteries are promising alternative energy storage devices due to the low-cost and abundance of aluminium. In addition, aluminium, can be handled in open air, providing easier cell fabrication processes and elimination of some of the safety issues associated with lithium and sodium ion batteries. A very few cathode materials such as Vanadium Oxide, Chevrel phase ( $Mo_6S_8$ ), and Titanium disulfide ( $TiS_2$ ) are known that can host the high charge density  $Al^{3+}$  ions and operate as the positive electrode in these battery systems. In addition, these materials usually suffer from low capacity, low voltage, and low cycle life with significant capacity decay over 100 cycles. Here we present a new family of two-dimensional (2D) transition metal carbides (called MXenes) as potential cathode materials for rechargeable aluminium batteries. Aluminium batteries fabricated with 2D MXene cathodes can deliver capacities exceeding  $300 \text{ mAh g}^{-1}$  at a relatively high charging and discharging rates of  $100 \text{ mA g}^{-1}$ , comparable to those of current state-of-the-art lithium ion batteries. Our results show the feasibility of development of next-generation aluminium batteries based on these new family of 2D materials for safer and cheaper energy storage purposes in future.

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**Title:** Going green: the use of ligand-infused cellulose for metal extractions in aqueous media.

**Primary Author (and presenter):** Valentine, Katherine, A

**Additional Authors:** West, Maya; Yates, William; Gorden, Anne E. V.

**Department:** Chemistry and Biochemistry

**College/School:** College of Science and Mathematics

**Description:**

Trace amounts of uranium are present in the water-soluble form of uranyl,  $\text{UO}_2^{2+}$ , in the waste of nuclear power plants. The spent fuel that contains uranium is stored on site, yielding a large potential for contamination. The purpose of this project is to use a 2-quinoxalinol salen based ligand coated onto a cellulose film with capabilities of sensing the presence of  $\text{UO}_2^{2+}$ . Cellulose is a very widely available natural polymer found in wood and wood pulp. This broad availability makes it a unique solid-support system for pairing with Schiff base salen ligands to develop a chemosensor for uranium. By infusing cellulose film with our 2-quinoxalinol salen ligands, uranyl sensing can be performed in aqueous media. This solid-supported ligand will act as a uranyl chemosensor by inducing a change either spectroscopically or visibly when in contact with the uranyl. Sensing using a 2-quinoxalinol salen based ligand paired with cellulose allows an eco-friendly option for the sensing of  $\text{UO}_2^{2+}$  in aqueous media. The ligand-coated film was able to successfully remove 36% of the uranyl ions in just 5 minutes.

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**Title:** The Pedagogical Applications of Absolute Spectral Tone Color: An Analysis of Current Research and Avenues for Future Study

**Primary Author (and presenter):** Verhine, Jacob L

**Additional Authors:** Hoch, Matthew R

**Department:** Department of Music

**College/School:** College of Liberal Arts

**Description:**

In his 2016 publication “Parsing the Spectral Envelope: Toward a General Theory of Vocal Tone Color,” Ian Howell proposed new theories regarding how we perceive vowels in the psychoacoustic sense. In particular, his theory of absolute spectral tone color (ASTC) challenged the long-held view that vowels are determined entirely by the first two formants. Howell’s theory has been somewhat controversial, and further studies will need to take place in order to determine the validity of absolutely spectral tone color. This study focuses in particular on specific pedagogical applications of this theory to singing and voice pedagogy, which remains a missing link due to the recentness of Howell’s research. Special attention is given to the use of ASTC theory as a descriptive tool used to identify elements of timbre as they relate to vowel production. In his book *Kinesthetic Voice Pedagogy* (2017) Kenneth Bozeman terms these elements “over-vowel and under-vowel components” based on the sensations associated with voice production. However, no research has been done to objectively identify the existence of these distinct components or their means of production. During the fellowship year, the researcher pursued an extensive literature review with particular emphasis on vocal acoustics and acoustic pedagogy. Interviews with Ian Howell and Ken Bozeman—two of the field’s most prominent researchers—served as preparatory work for an on-site visit to the National Center for Voice and Speech, where Dr. Ingo Titze was engaged for his thoughts on how ASTC can be measured and dovetailed with voice pedagogy. The data will ultimately be synthesized with specific recommendations for an outcome-based study that measures (a) the validity of the ASTC theory and (b) pedagogical applications.

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**Title:** Determining an individual’s comprehensive antibody-bound epitope repertoire

**Primary Author:** Vroom, Alexis, M.

**Additional Authors:** Pantazes, Robert J.

**Department:** Chemical Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Antibodies are a type of immune protein that bind foreign molecules (antigens). Currently, the total number of antibodies present in blood circulation is known (~1.1 g / dL) but how many different specificities a person has in circulation is unknown. The goal of this work is to be able to characterize everything that a healthy adult's antibody repertoire can bind to. A preliminary computational study identified that 7 amino acids are sufficient to ensure binding in at least 70-80% of antigens. Subsequently, I worked on creating a M13 phage (a virus of *E. coli* bacteria) display system using a patterned DNA library that will then be converted into coat proteins displayed on its surface of the phage. The library is designed to have patterns of 7 amino acids in windows of 13 total residues. Once the peptide display system has been proven to produce all of the patterns originally present in the DNA library, we will introduce blood serum containing antibodies and allow binding to occur. The bound phages will then be separated using magnetic beads bound to the antibodies, the DNA extracted from the phage, and then sequenced. Graduate students will then use computational analysis techniques to examine the patterns bound, determine binding motifs, and quantify how many unique species are present in a sample. This type of immune research is crucial for better understanding our immune system. This display method could be applied to help understand the development of immunity, find rare antibodies such as those associated with autoimmune diseases, and differentiate between healthy and at-risk persons based on their immune function.

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**Title:** Evidence of female spirituality in Marguerite's Hours

**Primary Author (and presenter):** Wade, Jordan, H

**Additional Authors:** none

**Department:** Art History

**College/School:** College of Liberal Arts

**Description:**

Marguerite's Hours, a Book of Hours originating in France c. 1318-1325, was produced by the Church of St. Omer. Measuring 155 x 105 mm, it consists of 236 pages and contains texts and prayers in Latin and French as well as illuminations by artists of the Franco-Flemish school. It also contains a large amount of marginalia, which are remarkable for their depiction of an unusual number of human women, particularly pregnant women. My research examines the depictions of women in the margins of Marguerite's Hours and asks the question: was the frequent portrayal of pregnant women in the margins created with female spirituality in mind? And if so, how would this be identified by the book's medieval female owner? These questions are significant for two reasons. First, because the purpose of marginalia generally is still unclear, and identifying the function of the marginalia in this book could lead to a greater understanding of marginalia as a whole. Second, this research provides a deeper understanding of gender roles within medieval Christianity, specifically as pertains to the perception of women. Drawing on the research of medievalists Caroline Walker Bynum and Michael Camille, as well as my own analyses of Marguerite's Hours, I argue that, in order to relate to its female patron, the marginal depictions of women in Marguerite's Hours deliberately present woman as (potential or actual) sources of literal food; display the female body in a state of physical change; and downplay the notion of women as opprobrious figures.

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**Title:** Stream restoration impact on stream stability and water quality at Moores Creek in Lanett, Alabama

**Primary Author (and presenter):** Waid, Charles, P

**Additional Authors:** Calhoun, Jessica; Prior, Beth; O'Donnell, Frances; Brantley, Eve; James, Alex

**Department:** Department of Biosystems Engineering; Department of Civil Engineering; Department of Crop, Soil, and Environmental Sciences

**College/School:** Samuel Ginn College of Engineering; College of Agriculture

**Description:**

Sediment-related reductions in water quality impact human, environmental, and socio-economic health. Stream restoration may improve water quality by increasing streambank stability, reducing erosion, and increasing sediment deposition. This study investigates the effects of in-stream restoration structures, such as cross-vanes and J-hooks, on water quality. Field data including rainfall, stage, flowrate, turbidity, total suspended solids, dissolved oxygen, pH, and temperature were collected at multiple locations along a 240 m length of Moores Creek in Lanett, Alabama. Samples were collected over a period of 9 months from June to February beginning 7 weeks after restoration of the section. Additionally, a watershed model of Moores Creek was designed to predict flowrate and sediment loads using the TR-55 method and HEC-HMS. Results will indicate effectiveness of the in-stream restoration structures to improve water quality under various flow conditions. These results may aid in the design and implementation of in-stream structures in future projects in order to refine water quality control practices.

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**Title:** Measuring equivalence ratio oscillations in a lean-premixed swirl combustor

**Primary Author (and presenter):** Walker, Josh G.

**Additional Authors:** Humphries, Luke & Scarborough, David

**Department:** Aerospace Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Manufacturers of power generating gas turbines are continuously pushing towards high-efficiencies and low-emissions. Lean premixed combustion is a promising control method of emissions. However, a frequent problem with these combustors is the onset of combustion instabilities which are a coupling between the dynamic heat release and the engines natural acoustic response. As manufacturers continue to push towards higher efficiencies, combustion instabilities become more rampant causing deterioration of critical engine components leading to costly maintenance and down time. Oscillations in the equivalence ratio have proven to be a large factor in the development of instabilities. Since there is currently very little information available for predicting instabilities, expensive trial and error procedures are a common suppression method. The purpose of this study is to develop the currently unavailable information on the prediction of instabilities by observing the swirl-plane of a lean premixed swirl ported injector, using  $CH_4$  as fuel, and its impact on equivalence ratio. The equivalence ratio will be measured with a Helium-Neon laser probe obtaining the absorption spectra of hydrocarbons at  $3.39 \mu m$ . Dynamic pressure transducers and a photo-multiplier tube will also be used to obtain the pressure coupled response function and the dynamic heat release of the flame allowing for a more complete picture of the coupling mechanism involved in combustion instabilities. Results are expected to show a strong correlation between equivalence ratio oscillations and thermo-acoustic oscillations.

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**Title:** Adoption and diffusion of solar dryers for post-harvest management in Panamanian rural farming villages

**Primary Author (and presenter):** Walker, Tegan, J.

**Department:** Curriculum and Teaching

**College/School:** College of Education

**Description:**

Both the willingness to change and the ability to change can limit the adoption and diffusion of new technologies by low-income farmers in Panama. Lower income farmers often lack the resources needed to adopt new technologies. Promoting technologies that increase profits and quality of life is only a

part of what farmers need when they lack means to adopt innovative technologies. Small farming villages in Panama were the location of this project promoting the adoption of solar dryers. The use of post-harvest technologies and methods is key to reducing crop losses, preserving crop economic viability, and increasing food security. Reducing crop losses contributes to poverty reduction in less developed countries. Drying processes that eliminate excess moisture and decrease drying times are essential for rural farmers living in wet and humid climates. A small-scale solar dryer model was designed to increase functionality, reduce construction costs, and increase the lifespan of the dryer. A demonstration solar dryer was built as the first phase of the project. Potential adopters can more readily evaluate an innovation if they can observe it in use. Community meetings were held to assess the willingness of farmers to adopt solar dryers. Twenty-six families expressed enthusiasm in adopting this new post-harvest technology. Adoption was made more feasible by securing funding for 39% of total costs while farmers contributed the remaining amount. A barrier to the adoption of this technology was the one-time expensive cost of start-up materials. All 26 solar dryers were constructed over an eight-month period. Farmers were trained on post-harvest management techniques and how to implement the use of the dryer into their farming system. Each dryer was implemented within one month after completion. The dryers are used to preserve seeds, dry crops such as coffee, corn, and rice, and create value-added products.

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**Title:** Role of CXCR7 in control of myeloid cell proliferation in vitro and in vivo

**Primary Author (and presenter):** Wang, Chuan

**Additional Authors:** Alqurashi, Thamer & Shen, Jianzhong

**Department:** Drug Discovery and Development

**College/ School:** Harrison School of Pharmacy

**Description:**

We previously reported that CXCR7 is induced during monocyte-to-macrophage differentiation in vitro. However, the role of monocyte/macrophage CXCR7 in vivo remains unknown. The CXCR7-floxed mice (CXCR7-floxed<sup>+/+</sup>) were crossed with the LyzM-Cre mice (LyzM-Cre<sup>+/+</sup>) to obtain myeloid-specific deletion of CXCR7 in vivo. Surprisingly, CXCR7 mRNA and protein expression were dramatically upregulated in CXCR7-floxed<sup>+/+</sup>/LyzM-Cre<sup>+/+</sup> mice as compared with the littermate CXCR7-floxed<sup>+/+</sup>/LyzM-Cre<sup>-/-</sup> mice, both in bone marrow-derived macrophages and in peritoneal macrophages, suggesting a potential compensatory mechanism. This is supported by our PCR mapping study which indicated a partial deletion of myeloid CXCR7 gene via the Cre-LoxP approach. In addition, adenovirus delivery of the Cre gene into CXCR7-floxed macrophages in vitro mimicked CXCR7 induction in vivo. Thus, myeloid-specific manipulation of CXCR7 gene using Cre-LoxP method leads to a compensatory upregulation of CXCR7 in monocytes/macrophages. To further explore the role of CXCR7 in cell proliferation and differentiation, we screened a set of cell lines and found that the Raw264.7 cells, a mouse monocyte/macrophage cell line, had no detectable level of mRNAs for both CXCR4 and CXCR7, two known receptors for SDF-1 (CXCL12). Therefore, we stably transduced the CXCR7 gene into the RAW264.7 cells through lentivirus infection, leading to a high level of CXCR7 mRNA and protein expression. To our surprise, those CXCR7-positive RAW264.7 cells had a much slower proliferation capacity as compared with the wild-type control cells, suggesting that CXCR7 may play an important role in control of monocytic cell proliferation. Our further mechanistic study found that CXCR7 expression significantly suppressed cellular basal phosphorylation of both AKT and ERK1/2, with no impact on JNK and p38. Given the vital importance of the AKT and ERK1/2 pathways in cellular proliferation, our findings reveal a previously unknown function of CXCR7 in control of myeloid cell proliferation in vitro and in vivo.

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**Title:** Carotenoids protect against oxidative damage in the marine copepod Tigriopus californicus

**Primary Author (and presenter):** Wang, Philip, R  
**Additional Authors:** Weaver, Ryan; Hill, Geoffrey  
**Department:** Department of Biological Sciences  
**College/School:** College of Sciences and Mathematics

**Description:**

Carotenoids are organic pigments synthesized by plants that are the source of red, orange, and yellow colors in many animals. Carotenoids have antioxidant properties and can quench reactive oxygen species (ROS) as shown in many *in vitro* studies. However, little is known about the antioxidant properties of carotenoids *in vivo*. We used the marine copepod *Tigriopus californicus* to test the antioxidant properties of carotenoids in animal systems. In the wild, *T. californicus* consume a carotenoid-rich microalgae diet, but in the lab, they can be raised on a yeast diet to completely remove carotenoids from its system. Carotenoids can be reintroduced to the copepods by supplementing their yeast diet with powdered carotenoid. To test the antioxidant role of carotenoids in animals we exposed yeast-fed and carotenoid supplemented copepods to a pro-oxidant (tert-butyl hydroperoxide; tBHP) and measured aconitase activity as a marker for oxidative damage.

We found that copepods exposed to tBHP had decreased aconitase activity compared to unexposed copepods. However, tBHP exposed copepods that were fed a carotenoid supplemented diet showed significantly less oxidative damage when compared to copepods raised on just yeast. These results suggest that carotenoids offer some protection against oxidative stress from tBHP and perhaps more broadly as an antioxidant *in vivo*. Past studies have typically compared the effects of a high intake of carotenoids versus a low intake of carotenoids. In contrast, we can compare the effects of carotenoid presence versus carotenoid absence—allowing for more conclusive data about the role of carotenoids in living systems.

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**Title:** Acetone-butanol-ethanol (ABE) production from lignocellulosic biomass through acetic acid pretreatment

**Primary Author (and presenter):** Wang, Pixiang  
**Additional Authors:** Wang, Yi  
**Department:** Biosystems Engineering  
**College/School:** Samuel Ginn College of Engineering

**Description:**

Butanol can be used not only as a valuable fuel source (with various advantages than ethanol) but also as an important chemical feedstock. While the traditional production through petrochemical approach is highly energy-demanding and generates various environmental pollutants, the production from renewable lignocellulosic biomass through clostridial acetone-butanol-ethanol (ABE) fermentation has attracted lots of attention. Prior to fermentation, pretreatment is required to overcome the biomass recalcitrance barrier and liberate the sugars from cellulose and hemicellulose. In this study, we evaluated acetic acid as a catalyst reagent for the biomass pretreatment using switchgrass as the feedstock. Comparing to other catalyst reagents (such as the commonly used sulfuric acid), acetic acid provides a mild pretreatment condition and thus is expected to generate lower amount of fermentation inhibitors from biomass degradation; meanwhile, acetic acid can be used as a carbon source for the following ABE production and thus is expected to generate a higher ABE yield. After pretreatment, the biomass was fractionated into solid cellulosic fraction (SCF) and liquid prehydrolysates fraction (LPF). The cellulosic hydrolysates (obtained through enzymatic hydrolysis of SCF) and the LPF were then evaluated for ABE fermentation. With the enzymatic hydrolysates generated from SCF through the pretreatment with 3 g/L acetic acid at 170 °C for 1 h, 15% higher butanol were obtained in the fermentation compared to the control (with hydrolysates generated through pretreatment with sulfuric acid under the same conditions). On the other hand, LPF also contained decent amount of carbohydrates mostly as oligosaccharides and small amount of phenolic inhibitors. Upon

detoxification through adsorption with activated carbon, simultaneous saccharification and fermentation (SSF) was carried out. A total of 6.1 g/L ABE was obtained from a total of 19.1 g/L sugars. These results indicate that acetic acid pretreatment is an innovative approach for lignocellulosic biomass pretreatment for ABE production.

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**Title:** The study of algae growth inhibitors in Anaerobic Digestate effluent

**Primary author (and presenter):** Wang, Qichen

**Department:** Biosystems Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

The environmental benefits of Anaerobic Digestion (AD) have been widely recognized globally, but its nutrient-rich effluent is still causing environmental concerns. Therefore, algae are selected to utilize these excess nutrients in the anaerobic digestate effluent and to turn these “waste” into bioenergy and bioproducts. However, algae are greatly inhibited when they are directly cultured in AD effluent. The most common solution is using large amounts of freshwater to dilute AD effluent for algae cultivation, but freshwater is precious. If the inhibitory compounds can be targeted, we can reduce the need for freshwater utilization and get all the benefits from anaerobic digestate algae cultivation. These benefits include cleaner water and production of algal biomass which can be used for fuel and feed production. In our previous experiments, we have tested the dose response of two volatile fatty acids (VFAs), which frequently exist in anaerobic digestate, on two strains of algae (*A. protothecoids*, and *C. sorokiniana*), and we found both algae were inhibited at concentrations as low as 400 mg/L. Such concentrations can be found in many digestates. However, there are likely many other chemicals in anaerobic digestate that can lead to algal inhibition such as phenolics, metals, and ammonium. In the future, we will test the dose response with real digestate effluents (municipal digestate and food waste digestate). We are using liquid chromatography and mass spectrometry to track the actual concentration of potentially inhibitory compounds in the digestate before and during algae cultivation. Meanwhile, we are also cooperating with material engineers to develop nanomaterials which are designed to break down inhibitory compounds.

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**Title:** Exploiting power supply ramp rate for calibrating cell strength in SRAM PUFs

**Primary Author (and presenter):** Wang, Wendong<sup>1</sup>

**Additional Authors:** Singh, Adit<sup>1</sup>; Guin, Ujjwal<sup>1</sup>; & Chatterjee, Abhijit <sup>2</sup>

**Department:** Electrical and Computer Engineering

**College/ School:** <sup>1</sup>College of Engineering

**Institution:** <sup>1</sup>Auburn University; <sup>2</sup>Georgia Institute of Technology

**Description:**

SRAM arrays are particularly attractive for use as physically unclonable functions (PUFs) because each manufactured copy of an SRAM array displays a different memory pattern when initially powered-on. This is due to random differences in device parameters in individual memory cells from manufacturing process variations. However, instability in the SRAM PUF response over the expected range of operating voltages and temperature, as well as environmental noise and aging degradation over time, is a challenge. Recent proposals aim at identifying a subset of all the cells in an SRAM, the most robust or “strong” cells, and using only these to construct a PUF. However, the manner in which the SRAM is powered up has been largely ignored in earlier work. We show that the SRAM power-up state is strongly dependent on the power supply ramp rate and direction; very different power-up states are obtained under different power-on scenarios. Furthermore, analyzing the power-up states under different ramp rates and directions can provide considerable insight into which transistor pairs in each individual

cell are mismatched, and even the extent of the mismatch. Since such threshold voltage mismatch is key to cell power-on bias, we finally show how such experiments can be exploited to reliably identify the most robust strong cells in SRAMs for use in PUFs. These cells can be expected to generate reliable keys for cryptographic operations across a wide range of operating conditions, noise and device degradation.

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**Title:** Phosphorus limitation on CO<sub>2</sub> fertilization effect in the terrestrial ecosystems

**Primary Author (and presenter):** Wang, Zhuonan

**Additional Authors:** Jia Yang; Shufen Pan; & Hanqin Tian

**Department:** International Center for Climate and Global Change Research

**College/School:** School of Forestry and Wildlife Sciences

**Description:**

Phosphorus (P) limitation has major impacts on the terrestrial ecosystem carbon fluxes and storage. Many ecosystem models projected a large increase in land ecosystem productivity due to CO<sub>2</sub> fertilization effect in the 21<sup>st</sup> century. However, most earth system models neglect the P dynamics and P limitation on ecosystem productivity, which may result in an overestimation of Carbon (C) uptake by the terrestrial biosphere. In this study, we developed a P module to simulate various P-related processes in the soil and vegetation, including weathering, mineralization, adsorption/desorption, leaching, vegetation P uptake and allocation, and limitation on carbon sequestration. This module was further incorporated into the process-based Dynamic Land Ecosystem Model (DLEM 2.0). By using this model, we assessed the P limitation on CO<sub>2</sub> fertilization effect between 2006 and 2100 under two representative concentration pathways (RCP26 and RCP85) We designed two sets of model experiments (i.e., with P limitation and without P limitation) and compared the simulated carbon fluxes and stocks between them. The results show that future P limitation would lead to lower land carbon uptake under both RCPs scenarios and reduce CO<sub>2</sub> fertilization effect in the 21<sup>st</sup> century. Land ecosystem carbon sequestration with consideration of P limitation could be much lower than most earth system models projected previously.

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**Title:** Village wild and hangar pods

**Primary Author (and presenter):** Warr, Brent W.

**Department:** Environmental Design

**College/School:** College of Architecture, Design and Construction

**Description:**

The need for productive landscapes and common social spaces is ever increasing on college campuses world-wide. We therefore need to establish this type of area on Auburn University's campus thus attracting Auburn students and faculty as well as the Auburn community. This project focused on the area known as the Village, and more specifically the common area in between Aubie Hall and the Auburn Arena. By studying historical photographs and many maps of the area, I discovered that there used to be an old aircraft hangar in the area presently occupied by the Village. This proposal is my representation of how the Village could become a productive landscape, and how it could attract students to the area by creating study pods that mimic the old hangar once located in the Village. These study pods would be made up of individual study cubicles, as well as a few larger group spaces. These would be rented for free to students and faculty similarly to how Ralph Brown Draughton library rents their rooms. Historic pictures and documents hung on the walls of the pods would allow visitors to understand how the space has changed since Auburn University was founded in 1856. Finally, this area would be surrounded by the "Village Wild" – a productive landscape made up of plant and tree species native to Alabama.

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**Title:** Host-switching and copyly among blood parasites of early branching gnathostomes

**Primary Author (and presenter):** Warren, Micah B.

**Additional Authors:** Bullard, Stephen, A.

**Department:** Fisheries

**College/School:** College of Agriculture

**Description:**

Fish blood flukes (FBFs) kill fishes in aquaculture, are ancestral to schistosomes, and infect gnathostomes from chondrichthyans to actinopterygians. Few fishes have been examined for infections. Only 7 FBFs have been reported from cartilaginous fishes: 4 from sharks, 2 from rays, and 1 from a holocephalan. Our goal herein was to explore FBF diversity in sharks and rays. The heart and gill of 10 of 74 (14%; mean intensity = 1.5) smooth butterfly rays, *Gymnura micrura*, from Mobile Bay were infected with adults and eggs of a new FBF species representing a new genus. Based on the presence of a single ventrolateral row of large C-shaped tegumental spines, a post-cecal ovary, and an ascending and descending uterus, the new species resembled *Selachohemecus* spp., which infect sharks (Carcharhinidae). The new species had a medial esophageal swelling, an inverse U-shaped intestine, an elongate oviduct, an oviducal seminal receptacle posterior to the common genital pore, a Laurer's canal, and a coiled portion of the uterus directly anterior to the ootype. The heart of a smalltooth sawfish, *Pristis pectinata*, from the eastern Gulf of Mexico, was infected by a new species of *Myliobaticola*, a genus comprising species that infect stingrays (Dasyatidae). The new species is distinctive by being extremely elongate, having a sinuous testis, and straight ascending and descending portions of the uterus. These FBFs allowed us to test a hypothesis concerning copyly (phylogenetically related parasites infect phylogenetically related hosts) and host switching (a parasite lineage comes to infect a host lineage that is distantly-related to that of its ancestor) of parasites among their vertebrate hosts. The morphological similarity among the FBFs from the butterfly ray and sharks suggest a recent common ancestor (host switching). Forthcoming sequence data from the 28S and 18S will complement these comparisons and help test the host switching hypothesis.

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**Title:** Coherent adaptive housing: Mobile, AL

**Primary Author (and presenter):** Washington, Jania, D.

**Department:** Architecture, Planning, and Landscape Architecture

**College/School:** College of Architecture, Design, and Construction

**Description:**

The historic downtown of Mobile, AL can be strengthened by an increase in density and diversity by managing localized flooding while reclaiming underutilized surface parking for adaptive mixed-use development. Mobile's need for upgraded water retention infrastructure gives the opportunity to define a coherent public realm by linking heavy rains to the urban character of Mobile. In this project, a street network of trees and bioswales is proposed in the district north of historic Dauphin Street. While a continuous wall of buildings has traditionally been understood to define the public space of a street, this project redefines the street as a cohesive public network of water retention that is supported by new buildings as they are built. For this proposed housing project, for example, visible water retention gardens such as the street courts, roof gardens, and retention balconies are combined with a small city-owned parking lot that is reclaimed as a public rain garden. These combined features capture 25% of the total annual rainfall on the site and are the connective tissue that tie the different components of the building together. The building is also conceived to tie diverse populations together to reclaim the social character of downtown. Even as the image of Mobile is portrayed as highly traditional, many young families, students, professionals, and retirees are moving away from purchasing detached single-family homes to join a more urban lifestyle. As society shifts towards increasingly diverse family mixes, new definitions of affordable housing units need to be considered. By providing units that can be adapted into a

combination of studio, 1 bed, 2 bed, and 4 bed units, this project speaks to Mobile's changing social character. Providing these adaptive units allows for a greater range of rental rates and family mixes to claim the site as a diverse yet cohesive micro-community in the center of Mobile.

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**Title:** A novel gust generator design to study the aerodynamic response of birds to turbulent conditions

**Primary Author (and presenter):** Wietstruk, Mike

**Additional Authors:** Raghav, Vrishank

**Department:** Aerospace Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Recently there has been significant interest in the development of uninhabited aerial vehicles (UAVs) for applications in civilian and military settings such as crop monitoring, surveillance and reconnaissance, and even search and rescue during emergencies. However, a primary limitation to the widespread adoption of UAVs is their inability to perform in "real world" conditions such as turbulent/gusty weather. Developing effective countermeasures requires a comprehensive knowledge of potential evasive techniques to fly in turbulent weather. To this end, this project adopts a bio-inspired approach to develop techniques to improve the performance of UAVs in harsh weather conditions. This will be achieved by studying the aerodynamic response of birds to turbulent/gusty conditions in collaboration with the Southeastern Raptor Center (SRC) at Auburn University. To study the aerodynamic response of birds to gusty weather conditions in a controlled environment, a novel gust generation device was developed. First, a commercially available air curtain with variable gust velocity (16 or 13 m/s at the outlet) was procured and characterized. While the gust speed was sufficiently high, it was observed that a non-uniform gust was generated across the length (1.2 m) of the device. Modifications in the form of diverging ducts were incorporated to achieve a uniform gust speed of  $6.3 \pm 0.2$  m/s. When compared to the non-uniform unmodified device which had a speed of  $6.3 \pm 0.7$  m/s, a 57% reduction in velocity variation over the length of the device was achieved. This novel gust generation device will be introduced in the flight path of a common Red-tailed Hawk (average wingspan 1.2 m) that is currently housed at the SRC. A combination of on-board sensors and high-speed imaging will be used to study the response of the Hawk to this gusty aerodynamic environment. Such an improved understanding of bird flight mechanics in turbulent/gusty weather will allow for improved design of UAVs.

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**Title:** Adolescent's willingness to change

**Primary Author (and presenter):** Williams, Reid

**Additional Authors:** Thompson, Kelli; Burkhart, Barry

**Department:** Psychology

**College/School:** Auburn University

**Description:**

A recent meta-analysis compared adolescents with illegal sexual behavior (AISB) and adolescents with general delinquent behavior (AGDB) on a variety of domains and found many similarities and differences (Seto & Lalumiere, 2010). Of note, AISB consistently score higher on internalizing disorders (depression and anxiety) while AGDB tend to score higher on externalizing disorders. Internalizing symptoms have been associated with increased amenability (Smith & Tran, 2007).

In this study, the University of Rhode Island Change Assessment (URICA) was used to explore differences in readiness to change in AISB and AGDB. The final sample consisted of 190 (AISB,  $n = 99$ ; AGDB,  $n = 91$ ) male juvenile offenders in residence at a correctional facility. Participants ranged in age

from 13 to 19 years old ( $M = 16.55$ ;  $SD = 1.40$ ). Data was collected 5-7 days after entry to the facility and reflect pre-treatment readiness for change.

Mean differences among AISB and AGDB were examined for each URICA scale independently. An independent-samples t-test indicated,  $t(187) = 2.58$ ,  $p < .05$ , that AGDB ( $M = 16.52$ ,  $SD = 4.46$ ) displayed higher pre-contemplation scores when compared to AISB ( $M = 14.66$ ,  $SD = 5.34$ ). Higher pre-contemplation scores represent less readiness for change. Conversely, AISB ( $M = 24.95$ ,  $SD = 4.80$ ) scored higher on contemplation scores when compared to AGDB ( $M = 22.95$ ,  $SD = 4.21$ ;  $t(187) = 3.03$ ,  $p < .01$ ). Higher contemplation scores represent increased readiness for change. There were no significant mean differences for action or maintenance scales. Finally, AISB ( $M = 54.20$ ,  $SD = 15.96$ ) scored significantly higher on overall readiness for change scores when compared to AGDB ( $M = 49.54$ ,  $SD = 13.18$ ;  $t(185) = 2.17$ ,  $p < .05$ ). Treatment implications will be discussed.

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**Title:** The processing and characterization of cellulose nanofibers from industrial wood residues

**Primary Author (and presenter):** Williford, Marcus, C

**Additional Authors:** Iglesias, Celestes; Aksoy, Burak; Peresin, Maria

**Department:** Forestry Products Development Center

**College/School:** Auburn University School of Forestry and Wildlife Sciences

**Description:**

“Obtained by mechanical disintegration of lignocellulosic pulp, cellulose nanofibers (CNF) are a high value forest product with unique properties and structure. Cellulose nanofibril diameters are 5-60 nanometers with a length in the micrometer range. This gives the product a high aspect ratio and high surface area. These characteristics create a unique product when combined with the benefits of cellulose: hydrophilicity, broad chemical-modification capacity, and formation of semi-crystalline structures, opening novel application opportunities in various fields (e.g., absorbents with medical, hygienic, and oil recovery application, thickeners in paint and food products, and the reinforcement of paper, plastics, and composite wood products).

Slash is residual biomass of timber harvests, and it is composed of tree limbs, tops, and non-merchantable species. Currently, slash is under-utilized and often burned. This resource is both wasted and contributes to carbon emissions. Its utilization would increase resource and financial efficiency for landowners and companies. *Triadica sebifera* is an invasive tree species in the southeastern United States that can regenerate through root sprouting. This creates thickets of small diameter stems, particularly near streams and dikes, which become slash. This study evaluates the potential usage of slash through the characterization of pulp and CNF produced from *Triadica sebifera*.”

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**Title:** Microbial quality of aquaculture water used for produce irrigation

**Primary Author (and presenter):** Willmon, Evelyn S.

**Additional Authors:** Santos-Norris, Geraldine; Tzou, Ywh-Min; Hayden, Michelle; Ren, Tian; Weese, Jean; & Huang, Tung-Shi

**Department:** Poultry Science

**College/School:** College of Agriculture

**Description:**

The use of recycled water from a fish tank to irrigate produce, or aquaponics, has grown rapidly in the past decades, with a large diversity of system designs. Since the water is reused from the fish tank, there are concerns about the produce grown becoming contaminated by foodborne pathogens such as *Escherichia coli*, *Salmonella*, etc. This study evaluated the microbial quality of the water from a tilapia production tank for irrigation and the soil used for tomato and cucumber growth. The existence of *Listeria*

*monocytogenes* and *Salmonella* in the tomatoes and cucumbers was also examined. Populations of generic *E. coli* and coliforms, commonly used as indicators of microbial contamination and water quality, were monitored every two weeks. Water effluents from the tilapia fish tank and the plant soils were collected, with 5 replicates for water samples and 15 replicates for soil samples. *E. coli* and coliform populations were detected using 3M Petrifilm *E. coli*/coliform plates, and the data were analyzed using ANOVA. *L. monocytogenes* and *Salmonella* were monitored on tomatoes and cucumbers by plating method, and confirmed by PCR. The *E. coli* population in the tilapia tank effluent was higher in November 2016 at 50 CFU/mL, then decreased to an undetectable level during winter, and rose to 41 CFU/mL in May. The coliform populations in the water followed a similar trend to the generic *E. coli*, with the highest and lowest populations of 1,958 CFU/mL and 3 CFU/mL, respectively. Higher populations of *E. coli* and coliforms were found in the soil versus in the water samples. ***L. monocytogenes* was detected in 5 cucumber and one tomato samples, and *Salmonella* were not found in any samples.** The *E. coli* population in irrigation water is lower than the FSMA regulation limit, which suggests the water is suitable for use in irrigation. The presence of *Listeria monocytogenes* in produce is a concern since some of the produce is for use in ready-to-eat foods.

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**Title:** Adaptations to seed size by scatterhoarders

**Primary Author (and presenter):** Wilson, Sarah B.

**Additional Authors:** Dobson, Steve

**Department:** Biological Sciences

**College/School:** College of Science and Mathematics

**Description:**

The value scatterhoarders place on food while hoarding is key for understanding the evolution of hoarding behavior. Scatterhoarders store food, such as seeds, when readily available to eat during the food scarce season when resources are limited. This strategy consists of selecting food items, burying, digging up to rebury (potentially numerous times), and digging up to consume. After the initial burial, scatterhoarded food is at risk of theft from other individuals digging up the food, spoilage or germination, or the original hoarder could forget the burial location. It is unknown whether scatterhoarders have adapted to treat food items differently throughout this process depending on future benefit. Seed size is often considered an indicator of nutritional quality and affects initial decisions of hoarding, such as whether to eat or bury food. However, previous studies did not investigate total costs to the hoarder or risk invested in each seed. It is unknown how seed quality affects time and energy invested in stored food or how risk of theft or predation impacts decisions during scatterhoarding. Scatterhoarders should invest more time and energy in food that has greater potential benefit when recovered and eaten. Starting summer 2018, I will follow scatterhoarded, radio-tagged acorns until consumption and determine whether different sized seeds are associated with different transport distances, theft rates, squirrel predation rates, and number of reburial events. Other factors investigated will include season and mast crop production. Game cameras will be used to monitor acorns and identify which individually tagged eastern gray squirrels handled each acorn. Squirrels will also be radio-collared and followed to determine seasonal mortality risk. This study will help determine whether higher quality stored food is more valuable to scatterhoarders than lower quality stored food, or if simply having stored food during winter provides enough value to be beneficial.

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**Title:** Pyrite biomineralization and arsenic sequestration at a Florida industrial site: imaging and geochemical analysis

**Primary Author (and presenter):** Wilson, Theodore J.

**Additional Authors:** Levitt, Eric; Ghandehari, Shahrzad; Lee, Ming-Kuo; Saunders, James; Redwine, Jim; Marks, Justin; Billor, Zeki; & Uddin, Ashraf

**Department:** Geoscience

**College/ School:** College of Sciences and Mathematics

**Description:**

A year-long field scale bioremediation experiment was conducted at a Florida industrial site, where groundwater in an unconfined aquifer was contaminated by arsenic-based herbicide. The bioremediation technique stimulated the indigenous sulfate-reducing bacteria with a nutrient-rich slurry solution containing labile organic carbon, ferrous iron, sulfate, and fertilizer. This amendment induced sulfate-reducing conditions and caused the co-precipitation and adsorption of the dissolved arsenic in biogenic pyrite. This research characterizes the biogenic pyrite formed and assesses the spatial and temporal changes in groundwater chemistry during the project. Pyrite was characterized using multiple techniques including, X-ray diffraction, X-ray fluorescence, scanning electron microscopy, and electron microprobe analysis. These analyses confirmed the rapid formation of pyrite one week after the injection. The pyrite formed as either a well-defined octahedral crystalline structure or as spherical aggregates. The electron microprobe analysis determined that the pyrite contained between 0.05-0.4 weight % of sequestered As. The dissolved As concentration in the water decreased from pre-injection levels of 300-500 ppb to below the site regulatory limit of 50 ppb during a six month period. The reactive transport of the injectant plume was investigated using a conservative chloride tracer and formation of pyrite along two flow transects. The results show that the stimulated pyrite formation accounts for more than 80% of overall arsenic removal. Saturation index calculations show that pyrite quickly became oversaturated in targeted wells in one week and remained saturated for the duration of the study, suggesting that the As was effectively sequestered. This research presents data showing through the amendment of a nutrient-rich solution, bacteria can effectively sequester As into pyrite at levels great enough to bring dissolved As concentrations below the regulatory standards.

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**Title:** Depression screening in primary care

**Primary Author:** Winter, Michelle L.

**Department:** Nursing

**College/ School:** School of Nursing

**Description:**

Depression is a common and significant health care problem seen frequently in primary care clinics. The purpose of this project is to explore the effectiveness of depression screening for the general adult population within a primary care setting. Despite evidence-based guidelines and reported benefits, depression screening is often underutilized or absent in primary care. The Patient Health Questionnaire (PHQ-9) is a depression screening tool used to aid in identification, diagnosis and management of depression. The participant population included adults age 18 years and older who were administered a PHQ2 depression screening tool in their primary care office and achieved a positive score. The full PHQ-9 was then administered and results were reviewed by the primary care to guide diagnosis, treatment options and management recommendations. The results of the PHQ-9 were recorded along with identification of their treatment plan. Management options were identified as watchful waiting, medication management, referral to mental health services or a combination of medication and mental health referral. This practice project also included an anonymous survey designed to explore the potential reasons providers choose not to administer the PHQ9. This information is intended to be used to improve the utilization of depression screening in primary care. PHQ9 screening improves patient understanding and leads to further provider evaluation and selection of a depression management method. Screening for depression with the PHQ9 in a primary care setting can assist with appropriate treatment and enhanced

outcomes. Early identification, effective treatment and management of depression is attainable in primary care with the utilization of depression screening measures.

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**Title:** American skullcap exhibits anti-inflammatory effects by acting through arachidonic acid pathway

**Primary Author:** Wire, Natalie E.

**Additional Authors:** Govindarajulu, M.; Lohani, M.; Ramesh, S.; Majrashi, M.; Shannon, D.; Schwartz, D.; Moore, T; Suppiramaniam, V.; Kemppainen B. W; & Dhanasekaran, M.

**Department:** Drug Discovery and Development

**College:** Harrison School of Pharmacy

**Description:**

American Skullcap (*Scutellaria lateriflora*), a native plant of North America contains abundant phytochemicals & nutrients, therefore has been used by native Indians, Americans & Europeans to treat neuropsychological disorders. Conversely, the pharmacological actions of American skullcap have not been well explained. In this study, we investigated the anti-inflammatory properties and immunomodulatory actions of American skullcap. We studied the effect of American skullcap on cyclooxygenase-1(COX-1), cyclooxygenase-2 (COX-2) and 15-LOX (15 Lipoxygenases) enzyme activities, T lymphocytes activation and effect on major histocompatibility complex class-II (MHC-II) expression on bovine monocyte derived dendritic cells (MoDCs). American skullcap dose-dependently inhibited COX-1, COX-2 and 15-LOX activities. American skullcap did not affect T cells proliferation, MHC-II expression on MoDCs and pro-inflammatory cytokines production by T cells. Thus, American skullcap possesses potent anti-inflammatory activities by specifically targeting arachidonic acid pathway. Based on the above pharmacological action of American skullcap, it can be a potential therapeutic agent to treat asthma, chronic obstructive pulmonary disorders, and other acute & chronic inflammatory disorders.

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**Title:** Time-restricted feeding as a method for improving metabolic health in a mouse model of diet-induced obesity

**Primary Author:** Woodie, Lauren N.<sup>1</sup>

**Additional Authors:** Luo, Yuwen<sup>1</sup>; Wayne, Michael<sup>1</sup>; Graff, Emily<sup>2</sup>; Ahmed, Bulbul<sup>1</sup> ; O'Neill, Ann Marie<sup>3</sup>; & Greene, Michael<sup>1</sup>

**Department:** Nutrition, Dietetics and Hospitality Management<sup>1</sup>; Pathobiology<sup>2</sup>; Biology<sup>3</sup>

**College/School:** <sup>1</sup>College of Human Sciences; <sup>2</sup>College of Veterinary Medicine; <sup>3</sup>Auburn University at Montgomery

**Description:**

The rate of obese Americans has increased within the past two decades partially due to over-nutrition through the consumption of diets high in fats and sugars. Although awareness about obesity and its associated diseases has risen in recent years, obesity continues to be a public health issue due to the lack of manageable treatments. Restricting food consumption to the active phase - time-restricted feeding (TRF) - is an easily implemented method to address obesity and diet-induced diseases. TRF does not restrict what an individual eats as long as it is during the allotted time. Previous research has focused on administering a high-fat diet only under TRF conditions with positive results on weight gain, physiology and metabolism. This does not adequately reflect the human condition, as most humans are already obese before turning to a dietary change. The objective of our research was to explore the impact of TRF on the metabolism and physiology of mice with established obesity. Mice were kept on either a standard rodent chow with tap water (Chow) or a high-fat Western diet with sugar water (WD) for 6-8 weeks prior to TRF. In our short-term study, mice were kept on a TRF schedule for 4 weeks while our long-term study maintained TRF for 10 weeks. Before beginning TRF, the WD mice had increased body mass and higher

average energy expenditure during the inactive period than Chow fed mice. 4- and 10-weeks following TRF treatment, WD-TRF mice exhibited a moderate decrease in body weight and body fat when compared to WD-ad libitum (WD-AL) mice. 4-weeks of TRF, however, significantly improved several markers of non-alcoholic fatty liver disease, while insulin resistance was partially abrogated after 10-weeks. Importantly, both 4- and 10-week TRF treatments improved the metabolic phenotype of WD fed animals. Our data indicate that TRF does not result in robust weight loss, but it is a potential method for improving metabolic and physiologic health in obese individuals.

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**Title:** Detection of Staphylococcal Virulence Factors by Western Blotting

**Primary Author (and presenter):** Wozniak, Dominique, R

**Department:** Department of Drug Discovery and Development

**College/School:** Harrison School of Pharmacy

**Description:**

*Staphylococcus aureus* (*S. aureus*) is a very dangerous type of staphylococci that utilizes staphylocoagulase to protect itself from host phagocytic cells. When *S. aureus* attacks a host, it utilizes this secreted staphylocoagulase to bind to the hosts' prothrombin to form a complex that makes removal from the host cell difficult. The Panizzi lab has developed a monoclonal antibody (mAb) is directed at the N-terminal portion of the staphylocoagulase protein which in turn prevents its production. Without coagulase, the pathogenicity of *S. aureus* is significantly reduced. In order for this antibody to be useful there must be a way to incorporate a fluorescent label onto the antibody. In determining this, five different strands of *S. aureus* supernatants (Xen29, Xen 36, Tager 104, Newman, USA 300) were freeze-dried and were analyzed using Western Blot Analysis with the mAb. It was found that further testing would be needed to determine whether or not the mAb was in fact tagging coagulase and was not also tagging Protein A, which is common throughout all strands of *S. aureus*. This project has tremendous clinical application as an adjunctive therapy for patients that are dealing with persistent methicillin-resistant *S. aureus* (MRSA) infections.

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**Title:** Comparing multiple definitions of knee valgus angle

**Primary Author (and presenter):** Wright, Taylor K.

**Additional Authors:** Patterson, Collin & Zabala, Michael

**Department:** Mechanical Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Female D1 athletes in basketball and soccer did a biomechanical analysis using a motion capture system with 10 cameras and 2 force plates. The subjects completed activities similar to their day-to-day activities and their sport. To evaluate the difference between a direct 3-D, implied 3-D, and 2-D difference in knee valgus angle measurements. Knee valgus angles have been used as a risk assessment tool for ACL injuries. With the wide use in clinical and research settings many different perspectives on this angle have been developed. A study in 1983 by Grood and Suntay defined the way to measure knee valgus directly through biomechanical means by relating the tibia to the femoral reference frame. More recent studies, including Hewitt a leading research on the relationship between knee valgus angles and ACL injuries, indirectly measure knee valgus angles by measuring the angle between the tibia and midline of the body. In clinical settings 2-D analysis of knee valgus angles provide simplicity in terms of testing individuals. The move to clinical settings and research studies focused on risk assessment testing or preventative exercises has led to measures of knee valgus angles that are more simple and ambiguous. While these types of angles hold a strong correlation to ACL injuries, the leave from a strictly defined angle could

limit ACL studies ability to define the source of the risk factor by reducing biomechanical variables. Female D1 soccer and basketball, and club soccer athletes from 17-25 years old. The athletes were not discriminated by past injuries. The athletes performed a LESS drop vertical jump test. Their activities were recorded using ten Vantage V5 Wide Optic cameras and two AMTI ground-embedded force plates. To show whether or not differences in knee valgus angle measures affect the outcome of the measures. In doing so, researchers can more precisely reduce biomechanical variables to focus on the cause of ACL injuries. With a better understanding of the cause of ACL injury, past knee valgus angle, more focused preventative screenings and preventative exercises can be developed.

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**Title:** Body Esteem, Presence of Anxiety and Depression, and Ethnicity in a Rural Population

**Primary Author (and presenter):** Wrolson, Madeline, A

**Additional Authors:** Davies, Kelbe; Young, Margaret; Chandra, Ritu; Gray, Wendy; Wagoner, Scott

**Department:** Department of Psychology

**College/School:** Auburn University

**Description:**

Current research shows conflicting results regarding differences in body image by ethnicity. However, additional studies show a relationship between body esteem and mental health outcomes, such as anxiety and depression. We hypothesized that minorities in rural Alabama would have lower reported body esteem and lower psychosocial functioning than Caucasians. The present study shows linkages between body esteem, anxiety and ethnicity. Seventy-seven children (54.55% Caucasian/White; 45.45% Ethnic minority) ages 8-18 were recruited from a rural, outpatient health setting. Each child filled out the Children's Body Image Questionnaire and the State-Trait Anxiety Inventory for Children. Parents reported child ethnicity. Groups were divided into "healthy" and "unhealthy" body image based on the discrepancy between their ratings on their current body image versus desired body image. Findings indicate a significant difference in body image between ethnicities  $F(2,74) = 3.59, p = .03$ , with post hoc testing showing a healthier body image ( $M = .14, SD = .38$ ) among Hispanic children compared to Caucasian children ( $M = .95, SD = 1.48$ ). Using these criteria, 59% of the sample was classified as unhealthy. Anxiety differed between groups with healthy and unhealthy body image  $t(72) = -2.53, p = .01$ . Children with healthy body image ( $M = 11.29, SD = 7.03$ ) experienced less anxiety than those with unhealthy body image ( $M = 16.16, SD = 8.92$ ). There were no differences in depression between groups. Children with a healthier body image reported a lower rate of anxiety, suggesting that healthy body image may serve as a protective factor for anxiety. Clinical care may benefit from assessing body image alongside anxiety. A higher rate of healthy body image in Hispanic children compared to Caucasian children was seen although reasons for this difference are unclear and in need for further research.

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**Title:** Quantitative determination of  $Zn^{2+}$  using Sciff-based fluorescent chemo-sensors

**Primary Author (and presenter):** Wyss, Kevin M.

**Additional Authors:** Hardy, Emily E.; Gorden, Anne E. V.

**Department:** Department of Chemistry and Biochemistry

**College/School:** College of Science and Mathematics

**Description:**

Zinc ions, known to be essential cofactors in many biological enzymes, is a topic of increasing interest in cell biology due to its complex ties to immune, nervous, and reproductive systems. Cellular zinc concentrations in human cells range from 200-300 $\mu$ M, and even slight variations have been correlated to increased instances of Alzheimer's or diabetes. Further understanding of the concentration of Zinc ions in cells, present in nearly 10% of human proteins, is of vital importance. To that end, a fluorescent chemo-

sensor has been designed using a Schiff base, pentadentate organic ligand. This characterized ligand, comparable to examples in literature, shows significant fluorescent enhancement and selectivity for zinc over competing ions in solution. Exhibiting linear dependence to the concentration of  $Zn^{2+}$ , this ligand shows promise to be used in being used as an intracellular, non-destructive, method of real time bio-imaging.

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**Title:** A probabilistic model to predict intermittent sight distance obstruction at unsignalized intersections on high-speed rural divided highways

**Primary Author (and presenter):** Xue, Chenann

**Additional Authors:** Dan Xu; Zhou, Huaguo

**Department:** Civil Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Adequate sight distance is a critical factor that provides safe operation for minor-road traffic at unsignalized intersections on divided highways. However, drivers' views are likely to be blocked by right turning vehicles on a major-road right-turn lane at unsignalized intersections. The main objective of this study is to develop a probabilistic model to predict intermittent sight distance obstruction for minor-road traffic at unsignalized intersections on high-speed rural divided highways. Field data were collected at six study locations on U.S. 280 near Auburn, Alabama. Historical crash data at the sites were also obtained to understand safety issues due to intermittent sight distance obstruction. A probabilistic model was developed to determine the probability of potential traffic conflict frequency caused by sight distance obstruction related to major-road and minor-road traffic volumes. The results implied that potential conflict frequency has a strong linear regression with major-road right-turn and minor-road left-turn traffic volumes. Findings provide practitioners with a method to identify locations with this type of safety issue for improvement by installing offset right-turn lanes or enhanced traffic control devices.

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**Title:** Cannabinoid treatments reduce pain: A meta-analysis of pre-post contrasts

**Primary Author (and presenter):** Yanes, Julio, A.

**Additional Authors:** McKinnel, Zach; Michel, Jesse; Reid, Meredith; Younger, Jarred; Gonzalez, Raul; & Robinson, Jennifer

**Department:** Psychology

**College/School:** College of Liberal Arts

**Description:**

Chronic pain is among the most pervasive medical conditions. In addition to being economically burdensome, this has led to over-dependence on opioid medication. Recent research suggests that cannabis and cannabinoid-based treatments have therapeutic effects related to pain reduction. Although several studies have shown that cannabis reduces pain, results have been inconsistent. Meta-analyses can combine results from many studies and provide a quantitative summary. Here, we aimed to provide clarification about cannabis's effects on pain, which may someday lead to better pain treatment options. First, we conducted an exhaustive literature search to locate studies that assessed pre-treatment and post-treatment severity (pre-post contrasts) in the context of cannabinoid and placebo treatments. This included cannabis, cannabis extracts, and synthetic cannabinoids. Two independent reviewers completed data extraction, which included demographics, pain population characteristics, cannabinoid treatment specifics, pre-treatment and post-treatment pain-severity means, and variance estimates. The search produced 20 peer-reviewed records that underwent data extraction. Pre-treatment and post-treatment means were used to compute standardized mean gain estimates for each cannabinoid condition ( $k = 31$ )

and placebo condition ( $k = 22$ ). Next, standardized mean gain estimates were inverse variance weighted and pooled across included studies for meta-analysis comparison. Results revealed that cannabinoid treatments produced a strong effect across included studies ( $d = -0.81$ ), while placebo treatments produced a moderate effect ( $d = -0.42$ ). Moreover, exploratory multiple-regression analysis revealed that treatment predicted pain reduction outcomes when controlling for age, gender, experimental design, and pain population characteristics. The current meta-analysis shows that cannabinoids may prove a viable option for pain management and treatment.

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**Title:** On the independence numbers of some hypergraphs related to Van der Waerden's theorem

**Primary Author (and presenter):** Yang, Zechun

**Department:** Mathematics and Statistics

**College/School:** College of Sciences and Mathematics

**Description:**

In 1927, Van der Waerden proved that for any integer  $k \geq 3, r \geq 2$ , for any  $N$  sufficiently large, for any coloring (partition) of  $[N] = \{1, \dots, N\}$  with  $r$  or fewer colors (into  $r$  or fewer subsets) at least one color class contains a  $k$ -term arithmetic progression. Van der Waerden's theorem can be regarded as addressing the chromatic number  $\chi(H(N, k))$  of the hypergraph  $H(N, k)$  whose vertices are the elements of  $[N]$  and whose hyperedges are the  $k$ -term arithmetic progressions contained in  $[N]$ . In this research, we prove a lower bound on the independence number, (a parameter closely related to chromatic number) of some the hypergraphs  $H_c(\mathbb{Z}_n, k)$ , which are closely related to the hypergraphs  $H(N, k)$ . In particular, for odd prime  $p$  and integer  $n > 1$ , we show how to find a set of  $(p - 1)^n$  congruence classes modulo  $p^n$  which contains no  $p$ -term cyclic arithmetic progression mod  $p^n$ . This improves an earlier result of Berglund and is a step along the way to generalizations and strengthening of Van der Waerden's theorem.

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**Title:** The representation of stream water temperature in the dynamic land ecosystem model (DLEM) and its applications to Chesapeake and Delaware Bay Watersheds

**Primary Author (and presenter):** Yao, Yuanzhi

**Additional Authors:** Hanqin Tian; Bowen Zhang; Shufen Pan; Ray Najjar; Marjy Friedrichs; & Eileen Hofmann

**Department:** Forestry

**College/ School:** School of Forestry

**Description:**

Stream water temperature is a key factor influencing the structure and function of stream ecosystems. Empirical equations based on the relationship between air temperature and water temperature are most commonly used for predicting stream temperature. However, empirical equations limit our ability to separate the contribution of each factor (such as climate, land-use change) to the stream temperature. Meanwhile, physical-based models are hard to simulate water temperature of intermittent water ways owing to the difficulty in predicting the effective surface area in headwater area. To solve these problems, we incorporate a new water transport scheme into a process-based land ecosystem model (DLEM). The water transport process in this new model is scale-adaptive, which is able to calculate the water temperature of tributaries and headwater areas. Driven by 4-km geo-referenced data sets, the improved DLEM with new water temperature scheme was used to quantify the spatio-temporal variations of water temperature in the Chesapeake Bay and Delaware Bay watersheds during 1960- 2015. The preliminary results show that water temperature increased significantly in the downstream area, but remain steady in the upstream mountainous area during the study period. Land use change significantly affected the

surface water temperature in downstream areas, whereas climate change was the dominant factor that regulated the water temperature in the upstream area.

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**Title:** Sequence Variation of Insulin-like Growth Factor One in the Brown Anole

**Primary Author (and presenter):** Yates, Shawn, D

**Additional Authors:** Beatty, Abby; Schwartz, Tonia

**Department:** Department of Biological Sciences

**College/School:** Auburn University, Auburn, AL

**Description:**

Insulin-like growth factor one (IGF1) is a hormone that regulates part of the insulin insulin-like signaling network. This molecular network is known to have an influence on lifespan, and reproduction. The coding region of the *igf1* gene has more sequence variation among snakes and lizards than would be expected based on its high conservation in mammals, thereby suggesting that it is evolving quickly in this group. The purpose of this experiment is to determine if there is variation in the coding sequence of *igf1* within the Cuban brown anole lizard, *Anolis sagrei*. Because *igf1* is expressed primarily in the liver, we isolate RNA from juvenile liver tissues to use as a template to make cDNA. This will then be amplified via polymerase chain reaction (PCR) and sequenced to identify variation among individuals. Comparison of these sequences will allow us to answer the question, Is there genetic variation in *igf1* (are there different alleles) within the brown anole species that may alter the function of the protein? These results will provide a foundation for our lab to use for future research to understand the function and evolution of the insulin insulin-like signaling network.

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**Title:** Effect of GxE Interaction on oil and oleic fatty acid contents of cultivated peanuts

**Primary Author (and presenter):** Yu, Yan

**Additional Authors:** Chen, Charles Y.

**Department:** Crop, Soil and Environmental Sciences

**College/ School:** College of Agriculture

**Description:**

Twenty-nine entries of varieties and advanced breeding lines were grown in two locations in three years with three replications to estimate the effects of G x E interaction on oil and oleic fatty acid contents of cultivated peanuts. Oil and oleic fatty acid contents were quantified by NMR and GC, respectively. The tested lines were genotyped with functional SNP markers from the FAD2A and FAD2B genes using real-time PCR and classified into four genotypes. Additive Main Effects and Multiplicative Interaction (AMMI) model which combines the conventional analyses of variance for additive main effects with the principal components analysis (PCA) for the non-additive residuals was applied to estimate additive effects from FAD2A and FAD2B genes and G x E interaction. The results indicated significant G x E interactions for oil and oleic fatty acid contents. Non-correlation between oil content and FAD2A and FAD2B genes was found. The FAD2B gene had a larger additive effect than FAD2A gene. The results from this study may be useful not only for peanut breeders, but also for food processors and product consumers to select suitable cultivars.

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**Title:** An exploratory study of the role of design in explaining consumer satisfaction and future behavioural intention with youth hostel accommodation services

**Primary Author (and presenter):** Zadrozinski, Mekala

**Additional Authors:** O'Neill, Martin

**Department:** Nutrition, Dietetics and Hospitality Management  
**College/School:** College of Human Sciences

**Description:**

With today's expansive variety of overnight accommodation offerings, an old, but always-present player is becoming new again: the youth hostel. While a constant and popular accommodation choice among young and budget minded travelers, youth hostels have recently undergone somewhat of a rebirth, attracting not only budget minded youth, but older adults, families, and now, even business travelers. As Mohn (2016) puts it "The modern day hostel has become a more popular alternative than traditional hotels for many business and leisure minded travelers". While still a cheap accommodation option, many of these hostels are becoming "city destinations" in their own right, through a mix of high design and an uncompromising focus on service and product quality delivery. The international hotel industry has long understood the correlation between good design, quality service delivery, repeat patronage and customer loyalty. Not surprisingly, hoteliers have invested heavily over recent decades in the design aspects of their physical product in order to grow their bottom line. It is not surprising then, that today's business savvy and more customer oriented hostel operator should understand the importance of good design and service, and the link to higher sales, repeat business and profitability. This study will address this very issue with the central research question being posited as follows: What influence does interior design have upon hostel guest satisfaction, and future travel intention? The presentation reports preliminary findings from a study of study abroad students who have stayed at a youth hostel while traveling. Findings provide evidence that point to tentative support for the fact that design does in fact have a key role to play when it comes to consumer satisfaction, intent to return and recommend hostel services to other would be travellers.

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**Title:** Fake news detection using event extraction  
**Primary Author (and presenter):** Zhang, Chaowei  
**Additional Authors:** Ashish, Gupta & Xiao, Qin  
**Department:** Computer Science and Software Engineering  
**College/School:** Samuel Ginn College of Engineering

**Description:**

Fake News has drawn unprecedented attention recently and has been a topic of much controversy. We analyze a corpora of fake news compiled by the team using a plethora of scraping technologies. Furthermore, we proposed a two-phase fake news detection system for detecting different type of fake news by leveraging a large legitimate news database. Our system includes a topic-based classifying mechanism to group legitimate news into multiple topic clusters; news in each cluster share common topics and an event-extraction mechanism to extract events from news articles; we implement a way to measure credibility of news by comparing events extracted from news and those of the legitimate news, then use a real world news dataset to evaluate our system that achieve a high fake-news detection accuracy.

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**Title:** Regulatory soft interventions in the Chinese market: Compliance effects and impact on option market efficiency  
**Primary Author (and presenter):** Zhang, Haoran  
**Additional Authors:** Hilliard, Jimmy  
**Department:** Finance  
**College/School:** Raymond J. Harbert College of Business

**Description:**

Securities Laws in China are administered by the Chinese Securities Regulatory Commission (CSRC). The CSRC has great flexibility in administering securities laws since the committee represents the will of the state. Under the state-controlled financial system, the CSRC works closely with state-controlled financial firms and suggests, but does not mandate, actions to be taken in the equity market, especially during periods of extreme market stress. These suggestions, or soft interventions, have been used to block trades associated with short-sales, significantly reducing short-sales volume. With daily and intraday data, we investigate the impact of these interventions on put-call parity and implied volatilities. There is overwhelming evidence of increased deviations from put-call parity and changes in implied volatility after soft interventions. Our results are robust after allowing for bid-ask spreads, taxes, transaction costs and Difference-in-Differences comparisons with control securities in the Hong Kong market.

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**Title:** Online quality learning based dynamic task allocation for quality-driven crowdsensing

**Primary Author (and presenter):** Zhang, Xiangyu

**Additional Authors:** Gong, Xiaowen

**Department:** Electrical and Computer Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Crowdsensing is a technology that leverages the “wisdom” of the crowd by recruiting a large group of individual users with mobile devices (such as the smartphone, tablet, wearable) to collectively measure, estimate or infer (predict) a variable of interest (e.g., wireless signal strength, weather condition). Crowdsensing has found a wide range of applications, including spectrum sensing (monitoring the states of spectrum bands, aiming to, e.g., identify vacant spectrum bands for secondary spectrum access) and environmental monitoring. The accuracy of the aggregated data is a key performance metric of crowdsourcing, which is determined by the quality of each individual user's data contributed to the task. In general, the quality of users' data varies for different users. To fully exploit the potential of crowdsourcing, it is important for the crowdsourcing requester to know users' data quality, based on which the requester allocates tasks to users and performs data aggregation. Such quality-aware crowdsensing can achieve high data accuracy and efficient resource utilization. However, in many situations, the quality of users' data is unknown to users and the requester. In this work, we consider a sequential multi-task crowdsensing framework. We devise an online quality learning algorithm that estimates the data quality of users while assigning tasks to users based on the estimated data quality. Compared to existing online learning algorithms (such as those for multi-armed bandit problems), our algorithm needs to overcome the challenge that the ground truth of the interested variable is unknown. We showed that our algorithm can find the users with the highest data quality over time, and have a logarithmic regret under mild conditions compared to the offline optimal allocation. We demonstrate the efficiency of the algorithm using simulation results.

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**Title:** High fat diet with sugar induces deposition of amyloid beta and hyperphosphorylated tau in mice skeletal muscle

**Primary Author (and presenter):** Zhang, Yuxian

**Additional Authors:** Rasool, Suhail; Woodie, Lauren; Greene, Michael; Glabe, Charles; Thangiah Geetha; Miller, Michael; & Jeganathan Ramesh

**Department:** Nutrition, Dietetics, and Hospitality Management

**College/School:** College of Human Sciences

**Description:**

Obesity is a major health problem associated with increased risk of several diseases such as diabetes and musculoskeletal disorders. Western or High-fat diet with sugar (HFS) promotes the development of obesity. The objective of this study was to determine the effect of HFS on degeneration in mice skeletal muscle. We observed a significant increase in peripheral inflammation, apoptosis and accumulation of myostatin in skeletal muscle of mice fed with HFS. Skeletal muscle of mice fed with HFS diet showed significant deposition of amyloid- $\beta$  and hyper-phosphorylated tau as compared to control diet mice. Significant increase in autophagy, ubiquitinated proteins, and deposition of misfolded protein were also observed in the skeletal muscle of mice fed with HFS diet as compared to control mice. In conclusion, our studies suggest that HFS plays a critical role in skeletal muscle degenerative process and induces a myositis phenotype.

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**Title:** Modeling and test generation for combinational hardware Trojans

**Primary Author (and presenter):** Zhou, Ziqi

**Additional Authors:** Guin, Ujjwal & Agrawal, Vishwani

**Department:** Electrical and Computer Engineering

**College/School:** Samuel Ginn College of Engineering

**Description:**

Due to the globalization of semiconductor manufacturing, the appearance of malicious circuitry known as hardware Trojan is now a recognized security threat. A hardware Trojan may be added to the verified netlist without the knowledge of the designer or user causing unexpected malfunction or data theft when the device is in use. In this research, we devise tests that would detect a Trojan in a manufactured chip. We recognize the fact that a Trojan must escape manufacturing tests provided with the netlist by the designer. Based on the two parts of a Trojan, namely, a trigger derived as a Boolean function of any set of signals and a payload (typically, an XOR gate) inserted on any signal line, we develop a test generation model. A single-line trigger combined with a single-line payload gives us a set of  $2^K \times (K-1)$  Trojans in this model for a circuit with  $K$  signal lines. Tests for these are shown to be vectors that detect “conditional stuck-at” faults, for which we give a test generation algorithm using standard ATPG tools. The model allows us to define and measure a Trojan coverage metric for tests. Results show scalability of these tests, besides being more effective in detecting real Trojans than  $N$ -detect stuck-at test vectors or random vectors.

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**Title:** Equal justice under law: The history and consequences of Gay Lesbian Bisexual Alliance v. Sessions, 1992-1997.

**Primary Author (and presenter):** Zinner, Max G.

**Department:** History

**College/School:** College of Liberal Arts

**Description:**

Most histories of gay rights have focused upon urban areas, such as New York and San Francisco. Of the few that have examined the South, scholars have only recently began to examine the state of Alabama. This paper is an attempt to fill a part of this void by examining legal issues faced by gay and lesbian students during the 1990s. I discuss the development and consequences of a 1992 law written with the goal of limiting the influence of gay and lesbian organization on state university campuses. I also discuss how the law would ultimately be overturned on first amendment grounds in 1996, in the case of Gay Lesbian Bisexual Alliance v. Sessions. Though there were numerous similar legal cases around the country in previous decades, the main precedent that was relied upon by the judge in this case did not involve the

LGBT community, instead it focused on a Christian newspaper. I conclude by discussing the larger ramifications of this case and its role in the debate on the first amendment today.

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**Title:** Tense, aspect, and mood in the Spanish of Southern Arizona

**Primary Author (and presenter):** Zurita Moreno, Irene

**Department:** Foreign Languages- Spanish

**College/School:** College of Liberal Arts

**Description:**

The Spanish language is the most common minority language in the United States. However, there is not yet a complete overview of the use of Spanish in this country. In this study I analyze the use of the Spanish verbal system in the Southern of Arizona across three sociolinguistic generations of heritage speakers from this area. Using 15 oral interviews from the Corpus of Spanish in Southern Arizona (CESA) I replicate the study that Silva-Corvalán developed in 1994, which studied the tense, aspect, and mood in Spanish speaker in Los Angeles. To my knowledge, no study has focused on morphosyntactic aspects of the verbal system in the Spanish of this region. Thus, this investigation will contribute to our understanding of the verbal system of Spanish speakers in Southwest region of the United States. My investigation intends to answer if there is any simplification or loss on the verbal system of the Spanish spoken in Southern Arizona, and if is so, which factors contribute to simplification. According with the results of previous studies, my hypothesis is that the Spanish verbal system of the South of Arizona will have simplification in the tense that affects the aspect and mood as well. This will happen more likely in the second and third generations and it will be influenced but some extralinguistic factors, such as the socioeconomic level.

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