Title: Effect of a multi-enzymatic solution dietary addition on broiler chicken growth performance and carcass characteristics
Primary Author: Abascal-Ponciano, Gerardo A.
Additional Authors: Shirley, Robert; Lemons, Mark; Starkey, Jessica; Starkey, Charles
Department: Poultry Science
College/School: College of Agriculture

Abstract:
Previous studies with corn-soybean meal diets demonstrate that a multi-enzymatic solution increases the degradation of non-starch polysaccharides, compensates for reductions in energy and amino acids, reduces feed cost, and maintains optimal broiler performance. A randomized complete block design was used to evaluate the effects of ROVABIO® ADVANCE T-Flex (ENZ) on the performance and carcass yield of male Ross 708 x Yield Plus broilers. The 4 experimental corn-soybean meal-meat and bone meal-based treatments were: 1) a positive control diet (PC) with no ENZ formulated to meet the birds' nutritional requirements, 2) a mid-control diet (MC) with a 277 kJ/kg reduction in energy, 3) a negative control diet (NC) with a 552 kJ/kg reduction in energy, and 4) NC diet + ENZ. The feed phases were starter (d 1 to 14; S), grower (d 15 to 28; G), finisher (d 29 to 42; F), and withdrawal (d 43 to 50; W). On d of hatch, chicks (n = 1,440) were assigned to 48 floor pens with 30 birds/pen and 12 pens/treatment. Means were separated with SAS V9.4 PROC GLIMMIX and PDIFF at $P \leq 0.05$. There were no differences in Body Weight (BW) during any feed phase ($P \geq 0.4000$). Feed Intake (FI), BW gain, and Feed Conversion Ratio (FCR) for S, F, and W phase were similar among treatment ($P \geq 0.1583$). However, during the G phase, broilers fed PC exhibited lower FCR when compared to NC and ENZ ($P = 0.0013$). Cumulatively (d 1 to 50), FCR for PC and MC were lower than NC and ENZ ($P = 0.0003$). PC-fed birds had heavier fat pads ($P = 0.0075$. Breast, tender, wing, thigh, and drum weights were similar among treatments ($P \geq 0.4987$). Breast yield, as a proportion of the cold whole carcass weight, was greater for ENZ and NC when compared to PC, while MC was intermediate ($P = 0.0410$). In this experiment, supplementing a calorically deficient set of diets with ENZ did not result in equal or improved broiler performance. Birds performed at a higher level than industry, making it difficult to observe differences.

Title: Disruption of blood-brain barrier increases the amyloid beta-related pathology in CAA mouse model

Primary Author: Abdallah, Ihab M.
Additional Authors: Al-Shami, Kamal; Kaddoumi, Amal
Department: Pharmacy
College/School: Harrison School of Pharmacy

Abstract:
Functional blood–brain barrier (BBB) is important to maintain brain homeostasis. Breakdown of the BBB with compromised tightness and function has been reported in Alzheimer's disease (AD). Efflux transporter proteins, P-glycoprotein (P-gp) and breast cancer resistance protein (BCRP) are located at the luminal membrane of BBB and play important role in the clearance of amyloid beta (Aβ) from brain to blood. Also, the receptor for advanced glycation end products (RAGE) is known to interact with Aβ and mediates Aβ access to the brain across the BBB. The purpose of this study was to investigate the effect of pharmacological disruption of BBB on Aβ pathology. For this, the model pharmacological compound elacridar was used to disrupt the BBB function. Elacridar is an investigational compound known for its P-gp and BCRP inhibitory effect and widely used in cancer research. The CAA/AD mouse model TgSwDI (males, 4 months old) was used in the studies. Mice were divided to 2 groups, vehicle group as control and elacridar treated group. Elacridar was administered intraperitoneally (10 mg/kg/day) for 28 days. At the end of treatment, mice were sacrificed for brains collection. Our results demonstrated that elacridar disrupted the BBB integrity as measured by increased IgG extravasation and reduced expression of tight junction proteins, increased amyloid deposition due to BCRP and P-gp downregulation and RAGE upregulation, and increased neuroinflammation. Further mechanistic studies revealed the effect was mediated by NF-kB pathway activation. In conclusion, our results suggest that BBB disruption by inhibiting BCRP and P-gp exacerbate AD pathology in AD mouse model. In addition, our findings indicate therapeutic drugs that inhibit BCRP and P-gp might increase the risk for AD.

Title: Comparison of lysosomal enzyme activity in cat tissue with or without saline perfusion
Primary Author: Abrams, John A.
Additional Authors: Gross, Amanda; Martin, Doug
Department: Biomedical Sciences
College/School: College of Sciences and Mathematics

Abstract:
Perfusion, which is the practice of passing saline through the vasculature to remove the majority of blood, is common practice during necropsies. Our laboratory, which studies feline models of two different lysosomal storage diseases, has developed disease-specific procedures for necropsy of animals with each disease, with the primary difference being perfusion. In an effort to minimize animal use and evaluate impact on downstream analyses, lysosomal enzyme activity in perfused and non-perfused normal animals was directly compared. Banked samples of frozen tissue from perfused and non-perfused normal cats were compared for enzyme activity throughout the central nervous system (CNS). Enzyme activity is determined using homogenates from specific tissues. Homogenates are then incubated with a synthetic fluorogenic substrates specific for each of four lysosomal enzymes: Beta-Galactosidase (β-gal), Mannosidase, Hexosaminidase A, and total Hexosaminidase will be evaluated with their corresponding substrates. Minimal differences in enzyme activity between the perfused and non-perfused samples were seen when testing for Mannosidase, Hexosaminidase A, and total Hexosaminidase. Although, in some instances, there may be a substantial increase in the activity of perfused samples. For example, β-gal activity was more than doubled, on average, in the perfused animals. This difference is important considering that β-gal is the deficient enzyme in GM1 gangliosidosis. We hypothesize that this difference is due β-gal instability. Cold saline is used during perfusion, which rapidly lowers the body temperature and perhaps stabilizes β-gal. Also, constituents of peripheral blood may destabilize β-gal. Additional research is planned to evaluate further differences between perfused and non-perfused samples.

Title: Evaluating different approaches for controlling toxic algal blooms
Primary Author: Adams, Anna C.
Additional Authors: Buley, Riley; Wilson, Alan
Department: Fisheries
College/School: School of Forestry and Wildlife Sciences

Abstract:
Harmful algal blooms (HABs) often occur in water bodies experiencing excess nutrient inputs. In freshwater systems, HABs are often dominated by cyanobacteria, such as Anabaena and Microcystis, that can negatively impact aquaculture ponds and recreational and drinking water reservoirs through the production of toxic secondary metabolites. Consequently, controlling HABs is imperative. Cyanobacteria are known to be vulnerable to a number of chemical compounds (e.g., hydrogen peroxide, copper sulfate) that can improve water clarity if dosed correctly. In this study, we evaluated the effectiveness of 7 different chemicals at reducing cyanobacterial abundance at two scales, including a 14-day microcosm laboratory trial and a 28-day field mesocosm trial. Results from the laboratory experiment showed dramatic decreases in phytoplankton, including cyanobacteria, for most treatments, including hydrogen peroxide and copper sulfate based products. In contrast to our laboratory findings, the decline in cyanobacteria was not as rapid or as sustained for several of the treatments. The disconnect between results produced from complementary laboratory and field experiments shows a greater need for further field experiments aimed at elucidating the mechanisms mediating the control of HABs with algaecides.

Title: Whole genome sequencing and PCR failed to detect bovine leukemia virus (BLV) and human T-cell lymphotrophic virus (HTLV) in breast cancer cases
Primary Author: Adekanmbi, Folasade S.
Additional Authors: Omeler, Sophonie; McNeely, Isaac; Kalalah, Anwar; Poudel, Anil; Merner, Nancy; Wang, Chengming
Department: Biomedical Sciences
College/School: College of Veterinary Medicine

Abstract:
Breast cancer is one of the leading cancers with a high mortality rate especially among women. Recent findings have suggested that bovine leukemia virus (BLV) – which is highly prevalent in cows worldwide – might be linked to human breast cancer. However, these observations initiated some skepticism within the scientific community, and controversy exists regarding the association of bovine leukemia virus (BLV) and breast cancer. Human T-cell lymphotrophic virus (HTLV) is an oncogenic virus genetically similar to BLV. In this study, Whole Genome Sequencing (WGS) and PCRs were performed to investigate the presence of BLV and HLTV in individuals diagnosed with breast cancer. Quantitative PCRs to detect proviral DNA of BLV and HTLV were carried out using blood-derived DNA of 238 breast cancer cases. Subsequently, blood-derived DNA of 20 selected breast cancer cases were submitted for WGS and analyzed for the presence of BLV and HTLV DNA. WGS data for each of the 20 cases was aligned to BLV genomes (AF257515, D00647, K02120, LC080667), as well as the HTLV genome (AF033817) using Burrows-Wheeler Aligner. PCR analysis revealed that both BLV and HTLV were undetectable in the blood of 238 breast cancer cases. Furthermore, WGS data for each of the 20 selected cases did not align to any of the viral reference genomes. Using WGS and PCRs, our preliminary studies showed that there is no evidence for the presence of BLV and HTLV in the blood of breast cancer cases. Since BLV and HLTV as retroviruses show the highest viral load in the whole blood of the infected individuals, the virus would be detected in the blood of breast cancers if infected with BLV or HTLV. Overall, in contrary to previous reports, we did not find an association between BLV infection and breast cancer.

Title: Evaluating the impact of land use dynamics on ecosystem services demand in Alabama
Primary Author: Adjei, Eugene
Additional Authors: Zhang, Yaoqi; Kinnucan, Henry
Department: Natural Resources Management
College/School: School of Forestry and Wildlife Sciences

Abstract:
The forest sector has contributed about $5 billion in timber investments and provided employment to thousands of inhabitants within the past 10 years in Alabama. These timberlands provide not only employment and wood-based products, but also ecosystem services such as conservation, hunting, bird watching and other recreation. The ecosystem service value has been increasing faster than the value from timber production, either for either enjoyment, or additional benefits in terms of added revenue like hunting lease. The driving factors include increasing labor and management cost, falling timber prices, increasing income and growing population. All these changes would affect the tree species structure and forestland use, for example, more forestland covered with hardwood species. This study intends to investigate how demand for ecosystem services has influenced tree species composition in Alabama by developing structural economic models to test these hypotheses. Cross sectional data for four different periods at county level will be employed for the empirical analysis. The expected results will help us better understand what factors drive the demand for ecosystem services and how ecosystem services is contributing to the trend in timberland dynamics in Alabama.

Title: Quantitative analysis of GABA-edited MR spectroscopy data in schizophrenia patients
Primary Author: Adnani, Seyedeh Nasim N.
Additional Authors: Bashir, Adil; Lahti, Adrianne C.; Kraguljac, Nina
Department: Electrical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Gamma-Aminobutyric Acid (GABA) is considered an inhibitory neurotransmitter because it blocks, or inhibits, certain brain signals and decreases activity in the nervous system. GABA helps in producing a calming effect and also helps with feelings of anxiety, stress, and fear. Alterations in the GABA neurotransmitter system may be involved in the pathophysiology of schizophrenia. In our current study which is in progress with our collaborators Dr. Adrienne Lahti, And Dr. Nina Kraguljac from the University of Alabama at Birmingham (UAB), we address this matter and estimate the GABA concentration in the frontal cortex of Schizophrenia patients (n =14) and age-matched healthy controls (n=32). The results show a decrease in the GABA Concentration in Schizophrenia Patients (Mean ± SD = 0.542 ± 0.098) compared to Healthy Controls (Mean ± SD = 0.579 ± 0.131). Data are gathered at the UAB and the analyses are done at Auburn in MATLAB using Gannet Toolbox. We report the GABA concentration relative to water and apply corrections for tissue segmentation (Gray Matter (GM), White Matter (WM), Cerebrospinal fluid (CSF)). Results are also reported for Glutamine and glutamate (GLX) (Mean ± SD = 1.824 ± 0.469 in Healthy Controls and Mean ± SD = 1.703 ± 0.475 in Schizophrenia subjects). Our analyses also address the N-Acetylaspartic acid (NAA), which is the second-most-concentrated molecule in the brain after the amino acid glutamate.

Title: Evaluation of insect dynamics in southeastern cover cropping systems
Primary Author: Akins, Joseph O.
Additional Authors: Jacobson, Alana; Gamble, Audrey
Department: Crop, Soil and Environmental Sciences
College/School: College of Agriculture

Abstract:
Current research suggests winter cover crops could be useful for improving insect pest control in southeastern row crop systems, but analyzing this relationship between plants and insects is complex. Certain cover crops may attract both beneficial and pest insects, so decisions regarding planting date and cover crop species should be weighed carefully. Producers seeking to manage insect pests with cover crops may also need to consider adapting their current tillage practices, crop rotations, or irrigation methods. Research is needed to determine the effect of various winter cover crop mixtures on the in-field insect dynamics of Alabama row crop systems. The three cover crop species evaluated in this study include crimson clover (*Trifolium incarnatum*), cereal rye (*Secale cereale*), and forage radish (*Raphanus sativus*). This study was replicated at two sites, the Tennessee Valley Research station in Belle Mina, Al and the Wiregrass Research and Extension Center in Headland, Al. All cover crops were fall planted before either a soybean/cotton or peanut/cotton rotation and were chemically terminated 2-3 weeks prior to cash crop planting. Insect presence was recorded using sweep nets, beat sheets, and visual observations of damage in cash crops. Pest, beneficial, and species totals will be organized according to treatment in Microsoft Excel bi-weekly and analyzed in SAS using PROC GLIMMIX. Achieving reduced pest proliferation depends on whether cover crops can attract and sustain complexes of natural enemies, so this study will help provide answers regarding the effect of cover crops and irrigation on insects before and during the summer growing season. Future research will examine insect populations in cash crops over a period of three years, with an additional focus on correlations with cover crop biomass, soil quality parameters, and cash crop yields.

Title: Non-competitive off-target inhibition of proteasome by BTK inhibitors
Primary Author: Akintola, Olasubomi
Additional Authors: Smith, John; Kisselev, Alexei
Department: Pharmacology
College/School: Harrison School of Pharmacy

Abstract:
Inhibitors of Bruton's Tyrosine Kinase (BTK) and inhibitors of the proteasome are currently in use for treatment of hematologic malignancies. While the proteasome is necessary for protein homeostasis in all mammalian cells, BTK is unique to B-cell malignancies. However, BTK inhibitors and LU-102, a specific inhibitor of the ß2 site of the proteasome have previously been shown to synergize in hematologic malignancies which do not express BTK, at a 100-fold higher concentration than is needed for complete inhibition of BTK, suggesting an off-target effect of these BTK inhibitors. Triple Negative Breast Cancer (TNBC), a cancer with poor prognosis and no current targeted therapy, also does not express BTK. We found that LU-102 and a specific BTK inhibitor, CGI-1764, are de-facto synthetically lethal to TNBC cells, and that effect of other BTK inhibitors varied from similar synergy to no synergy. This data further supports the idea that synergy is due to off-target effects of BTK inhibitors. We found that CGI-1764 is a non-competitive, allosteric inhibitor of all catalytic subunits of the proteasome 20S proteolytic core and exerts its effect in a unique, dose-dependent manner. These findings may pave the development of more potent allosteric inhibitors of the proteasome and suggest that kinase inhibitors should be screened for inhibition of the proteasome as potential off-target effect.

Title: A new methodology for sensitive detection of protein by using graphene oxide and Tris(bipyridine)ruthenium (II) chloride nanocomposites
Primary Author: Akteruzzaman, Md
Additional Authors: Masoud, Mehrgardi; Curtis, Shannon
Department: Chemistry and Biochemistry
College/School: College of Sciences and Mathematics

Abstract:
In clinical applications, identification and quantification of protein biomarkers have gradually become crucial for areas such as clinical analysis, identification, and treatment of specific diseases, which can be associated with the changes in protein biomarker concentration in biological fluids. Nucleic acid, protein, and small molecules are involved in the biological & physiological activity of the cell and its regulating transmitting genetic information, and they can be used as a biomarker for clinical analysis. The quantified protein biomarkers at low concentrations are useful diagnostic and prognostic tools for many diseases in biological samples. By using different recognition elements (e.g., antibodies, aptamers) and different sensing principles and techniques (e.g., optical, electrochemical), several strategies have been studied to improve accurate and simple diagnosis methodologies for protein biomarkers. Thrombin (TB) is a blood serum protein that converts soluble fibrinogen to insoluble fibrin. Many coagulation related reactions catalyzed by thrombin, which is associated with thromboembolic diseases. Usually, nanomolar to a low micromolar concentration of TB is present during the coagulation process of blood. Thus, TB is the key to the diagnosis of thromboembolic diseases. The composite of graphene oxide (GO) and ruthenium (II) ($Ru(bpy)_3^{2+}$) complex enhance the electrochemiluminescence (ECL) intensity. $Ru(bpy)_3^{2+}$and TB both are a positive charge. ECL signal is dropped down by substitution of $Ru(bpy)_3^{2+}$ by TB from (GO- $Ru(bpy)_3^{2+}$) complex. This study observed a fraction of fM of TB detection with a three-fold working range.

Title: Real-time monitoring biofilm formation of *Staphylococcus aureus* under flow condition in microfluidic chambers

Primary Author: Al Mouslem, Abdulaziz K.
Additional Authors: Naranjo, Eber; De la Fuente, Leonardo; Panizzi, Peter R.
Department: Drug Discovery and Development
College/School: Harrison School of Pharmacy

Abstract:
Staphylococcus aureus (*S. aureus*) causes most of life-threatening infections such as endocarditis, osteomyelitis and sepsis. Since biofilm development is often a key factor in the development of an infection of indwelling medical devices, we sought to study biofilm formation in real-time using a lab-made microfluidic device with the goal of assessing the efficacy of therapeutic agents. In this study, we monitored the bacterial growth of *S. aureus* in side-by-side microfluidic channels. The total volume of an individual microfluidic channel was 0.148 mm^3. Each independent micro-channel has three separated ports (two inlets and an outlet for waste) to allow for constant flow of both growth medium and the bacterial cells. Biofilm coverage of *S. aureus* was characterized under various flow conditions ranging from 0.1 to 1 µL/min. Optimal biofilm formation was evident at 0.5 µL/min, therefore that flow rate was used in all subsequent experiments. To more closely mimic the human plasma environment, the effect of fibrinogen (Fbg) supplementation was tested. We found that Fbg enhanced the process of biofilm formation ($P < 0.05$). To determine if we were monitored true biofilm formation rather than simple bacterial grow, we infused calcofluor white (CFW) into the channels and imaged by a real-time fluorescence microscope. We verified true biofilm formation by visualizing the production of expolysaccharides matrix by *S. aureus* indicated by positive CFW staining. These results may help to better understand the biofilm formation process and discover new drugs targets for the treatment of staphylococcal infections.

Title: Investigate the comparative neurotoxicity of 1-methyl-4-phenylpyridinium (MPP+) and kainic acid on dopaminergic neurons

Primary Author: Alghenaim, Fada A.
Additional Authors: Alturki, Mansour; Almaghrabi, Mohammed; Harshan, Aisha; Zhao, Mingliu; Ramesh, Sindhu; Smith, Forest; Clark, Randall; Deruiter, Jack; Dhanasekaran, Muralikrishnan
Department: Drug Discovery and Development
College/School: Harrison School of Pharmacy

Abstract:
Kainic acid is a well-known epileptic agent that induces seizure by binding mainly with kainate receptors (ionotropic glutamate receptors). Alteration of glutamatergic and dopaminergic neurotransmission is associated with various neurodegenerative diseases. The comparative neurotoxicity of 1-methyl-4-phenylpyridinium (MPP+) and Kainic acid on dopaminergic neurons (N27 cells, in vitro) was investigated using cytotoxicity (MTT assay) and drug computational modeling. Results showed that MPP+ exhibited significantly higher neurotoxicity as compared to kainic acid. Furthermore, the interactions of kainic acid and MPP+ with dopamine (D2) and NMDA receptors were validated.

Title: Atomistic simulation of peptide hydrolysis with serine protease: analysis of reaction mechanism and process variables
Primary Author: Ali, Ashraf
Additional Authors: Adamczyk, Andrew
Department: Chemical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
The industrial application of enzymes is a fast growing sector with a promise of a more sustainable green future. A potent tool to carry out this research on catalytic activity of enzymes is computational chemistry. There has been a variety of atomistic modeling tools that have shown promise for the study of enzymatic catalysis, including quantum mechanical (QM) cluster, hybrid quantum mechanical (self-consistent field)/molecular mechanics (QM(SCF)/MM), and hybrid QM(EVB)/MM methodologies. The empirical valence bond (EVB) method is a hybrid QM/MM method that describes reactions by mixing diabatic states that correspond to classical valence bond structures, which represent the reactant, intermediate (or intermediates), and product states. Here we will focus upon the QM(EVB)/MM methodology, where key force field parameters were estimated from experimental values or QM calculations. Active learning concepts were used to develop our initial model parameterization and will be discussed. In our talk, the computational study of a serine protease activity explored with empirical valance bond approach will be focused. In this study, the Gibbs free energy of activation, rate coefficient, and the Gibbs free energy of reaction were calculated and these values were then compared with empirical values. With these key thermochemical and kinetic parameters, detailed reaction path analysis was performed on peptide bond cleavage and free energy surfaces of reaction were developed for reaction in water and the native enzyme. Our studies also explored key environmental variables affecting catalysis including temperature and pH.

Title: High-performance acrylic-polyurethane based graft-interpenetrating polymer networks for transparent applications
Primary Author: Alizadeh, Nima
Additional Authors: Agrawal, Vinamra; Celestine, Asha-Dee; Auad, Maria L.
Department: Polymer and Fiber Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Polymers are known to show a wide range of properties 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 cross-linking 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 effect of changing the percentage of acrylic polymer precursors on the stiffness, glass transition temperature, transparency, fracture toughness, and phase separation of the IPN is studied by using several characterization methods. The results show that the flexibility of the polyurethane phase and the high glass transition and rigidity of the acrylic copolymer influence strength and stiffness to the IPN in addition to high fracture toughness. Moreover, excellent transparency of the IPN networks with different percentages of the acrylic copolymer precursors is obtained. The relatively high value for fracture toughness with excellent transparency shows the great potential of graft-IPNs in advanced applications.

Title: The Chinese outward directed investment influences on the level of income inequality in low-income African countries
Primary Author: Alkilany, Yousef A. A.
Additional Authors: Kinnucan, Henry
Department: Applied Economics
College/School: College of Agriculture

Abstract:
Between 2003 and 2012 China's foreign direct investment in Africa increased dramatically from 0.5 to 21.7 billion USD. These investments cover 49 African countries, total more than 2,200 enterprises, and employ over 250,000 Chinese workers. In this research, we investigate the impact of Chinese Outward Directed Investment (CODI) on income inequality in Africa. A panel dataset of 21 low-income African countries for the period 2003 – 2014 is employed to estimate the fixed-effects model. To correct for endogeneity, the 2SLS and GMM were implemented by incorporating several lags as instrumental variables. Results suggest CODI exacerbates income inequality. Consistent with the dependency hypothesis, an isolated 1% increase in CODI is significantly associated with a 0.0015% increase in income inequality. Non-CODI source of FDI is estimated to decrease income inequality by 0.0014%. An isolated 1% increase in secondary school enrolment rate relative to the total population is significant and increases income inequality by 0.36%. Therefore, income inequality is 240% more sensitive to secondary school enrolment than to CODI. Other variables included in the study, namely GDP, the labor force participation rate, and the inflation rate were found to have no effect on income inequality. Results are consistent with findings for other countries and are robust to model specification.

Title: Effect of thiol and amine-based crosslinking agents on curing behavior of crosslinked polyethylene glycol diglycidyl ether
Primary Author: Allen, Barbara G.
Additional Authors: Minkler Jr., Michael; Beckingham, Bryan
Department: Chemical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
With the world's supply of oil dwindling, more companies are turning to the extraction of natural gas and other carbon-based fuels through the process of hydraulic fracturing, or "fracking." As demand grows, so do the number of production wells to provide energy to customers. Despite the increased fuel recovery and economic benefits linked to fracking, serious environmental threats remain a barrier to the overall utility of the process. The intense drilling process each well undergoes in the crusade for hydro-carbon fuels eventually wears down the inside walls of the well itself, causing environmentally hazardous cracks. Slurries of water, sand, and harsh chemicals are funneled down at high pressures and temperatures to fill these cracks to prevent chemical leakage into nearby water tables. However, these slurries fail to effectively seal microfractures permeating the walls of the fracking well, therefore failing to prevent seeping of potentially hazardous chemicals into nearby water sources and ecosystems. Our work investigates a polymer system to address the potential hazard of chemical leakage. Utilizing a monomer, a blend of two crosslinking agents, and a catalyst as our sealant platform, we investigate the curing kinetics and thermal behavior of our system by conducting numerous experiments using traditional differential scanning calorimetry (DSC). These experiments yield information such as total cure time and curing temperature. Additionally, we are investigating how total cure time and mechanical properties vary in relation to the ratio of crosslinkers and the use of ultraviolet (UV) light while conducting our experiments. A strong understanding of curing kinetics, mechanical properties, and system chemistry will aid in the design of an effective polymer sealant for wellbore systems.

Title: A month in the life of a vocal fold pathology: stroboscopy, acoustic, and perceptual characteristics

Primary Author: Allison, Lauren H.
Additional Authors: Cutchin, Grace; Snell, Emily; Sandage, Mary J.
Department: Speech, Language, and Hearing Sciences
College/School: College of Liberal Arts

Abstract:
The purpose of this single participant repeated measures study was to investigate the evolution of a vocal pathology over a consecutive 28-day period to better understand and quantify variations of an individual's vocal lesion. It was hypothesized that the vocal pathology likely changes from day to day, based on an array of coexisting factors (i.e. vocal load, hydration, sleep, etc). Acoustic, laryngeal imaging (stroboscopy), and perceptual measures were recorded each day for 28 consecutive days. Acoustic measures observed were frequency, roughness, cepstral peak prominence (CPP), and harmonic to noise (H:N) ratio. Stroboscopic images were evaluated for glottic closure pattern, size of pathology, and tissue pliability for the left and right vocal fold. A daily, detailed record of hydration, hours of sleep, vocal load (via fitness instruction), alcohol consumption, and a rating of vocal effort (BORG- CR 10) was kept. Results of this investigation indicated that the size of the vocal pathology and its impact on vocal fold pliability varied from day to day. The inconsistency of the extent of the lesion across time suggests variability in the ultimate pathological diagnosis determined from the imaging study, which would have a direct impact on clinical recommendations for surgery versus therapy or a combination of surgery and therapy. Acoustic measures correlated with perceived effort, indicating that the more impaired the voice signal, the greater the perceived effort and negative impact of voice function on the participant's activities of daily living.

Title: Design, synthesis and analytical profiles of N-methoxybenzyl substituted chlorophenylpiperazine regioisomers as novel psychoactive agents
Primary Author: Almaghrabi, Mohammed H.
Additional Authors: Almalki, Ahmad; DeRuiter, Jack; Clark, Randall C.; Dhanasekaran, Muralikrishnan
Department: Pharmacy
College/School: Harrison School of Pharmacy

Abstract:
Over the past decade, a number of synthetic piperazine compounds have appeared in the illicit drug market in the US and abroad. These compounds represent a novel class of designer drugs. The most common piperazines encountered include benzylpiperazine (BZP), m-chlorophenyl piperazine (mCPP) and 1-(3-trifluoromethyl-phenyl) piperazine (3-TFMPP). BZP produces stimulant effects similar to d-amphetamine although only one-tenth as potent. The phenylpiperazines, such as 3-TFMPP, appear to produce their effects by interacting with serotonergic receptors. We have designed and synthesized a number of structurally novel piperazine derivatives in an attempt to further explore the analytical profiles and pharmacologic activities of this drug class. The series prepared are hybrid analogues which contain the molecular framework of mCPP substituted with N-methoxy- or N-dimethoxybenzyl group on the terminal piperazine nitrogen. Methoxylated aromatic substituents were incorporated since this functionality is commonly found in many other drugs of abuse structural classes. These derivatives were prepared by reacting the three commercially available regioisomeric methoxybenzaldehydes or the six available isomeric dimethoxybenzaldehydes with mCPP in the presence of a borohydride reducing agent. All products were isolated by extraction and purified by recrystallization as their hydrochloride salts. All three methoxybenzyl isomeric products displayed very similar fragmentation patterns upon GC-MS analysis and were not readily differentiated by this method. Similarly, the six dimethoxybenzyl isomers yielded very similar fragmentation patterns in the GC-MS. It was possible to separate the members of each set of regioisomers by gas chromatographic methods allowing for some degree of analytical differentiation. Detailed receptor binding profiles for these novels, potentially psychoactive agents are pending.

Title: Using generative adversarial networks to improve machine learning models training
Primary Author: Almohaishi, Moayad H.
Additional Authors:
Department: Computer Science and Software Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Recently, machine learning has gained popularity in many daily applications, particularly Artificial Neural Networks (ANN) implementations. However, ANN requires an enormous amount of labeled data and tremendous resources for training the model. In this paper, we propose a novel learning model that utilizes Generative Adversarial Networks (GANs) in training neural networks. Unlike traditional neural network models that increase the number of neurons to achieve better accuracy (i.e. deep learning), our solution minimizes the complexity of the model while maintaining high accuracy. We examine the influence of combining artificially generated data with real data for training. This model will alleviate the over-fitting problem as well as reduce the number of neurons needed for training. In this way, the proposed model overcomes the performance limitations both in terms of training and inferencing speed. Experiments on several datasets (i.e. MNIST and Fashion MNIST) demonstrate that the proposed model achieves convincing performance and reduces the resources needed for training and inferencing.

Title: Demographic variations in mindfulness levels
Primary Author: Almond, Lindsey L.
Additional Authors: McGill, Julianne; Adler-Baeder, Francesca
Department: Human Development and Family Studies
College/School: College of Human Sciences

Abstract:
Due to the health and relational benefits associated with mindfulness, interest has increased in researching the topic. Typically, samples have been more homogeneous with no attention given to variations in mindfulness levels that may exist based on individuals' characteristics. Therefore, this study assessed levels of three facets of mindfulness – non-reactivity, awareness, and non-judgement - with 1796 diverse individuals. Results indicate differences in mean level of non-reactivity based on sex, education level, income, and relationship status, with higher levels, on average, for males, individuals without a high school degree, individuals with an annual salary of $75,000+, and married individuals; differences in mean level of awareness based on sex and race, with higher levels, on average, for females and white individuals; and differences in mean level of non-judgement based on income, with higher levels, on average, for low income individuals. Findings highlight the value of considering social address in mindfulness studies.

Title: Effects of neonicotinoid exposure on honey bee (*Apis mellifera*) colony strength and health

Primary Author: Alparslan, Suleyman
Additional Authors: Bruckner, Selina; Neumann, Peter; Straub, Lars; Williams, Geoffrey
Department: Entomology and Plant Pathology
College/School: College of Agriculture

Abstract:
A growing body of research continues to suggest unintended effects of pesticides on non-target organisms such as predators, parasitoids, and pollinators. For example, neonicotinoids – a class of systemic pesticides – have been documented to negatively influence *Apis mellifera* honey bee health. Nevertheless, there is a gap in knowledge concerning the comparative sub-lethal effects of neonicotinoids on individual and colony-level health and productivity in honey bees. To understand this, we examined brood and adult worker quantities, honey and beebread stores, *Varroa destructor* mite quantity, and survival of honey bee colonies exposed to the neonicotinoids thiamethoxam and clothianidin in Switzerland and the United States. Exposure of colonies occurred via a recently established in-hive pollen patty feeding regime, and corresponds to several peer-reviewed publications that have up-til-now only studied the effects of this type of exposure on individual workers, drones, and queens. Our results highlight the subtle, sub-lethal consequences of honey bee exposure to field-relevant concentrations of neonicotinoid insecticides.

Title: Recombination rate plasticity and interchromosomal effect in *Drosophila pseudoobscura*
Primary Author: Altindag, Ulku H.
Additional Authors: Stevison, Laurie
Department: Biological Sciences
College/School: College of Sciences and Mathematics

Abstract:
Extrinsic and intrinsic factors influence recombination rate, impacting the ability of the population to respond to selection pressures. Similar to plasticity, chromosomal inversions act as global modifiers of recombination by stalling checkpoints and provide more time for double strand breaks known as, interchromosomal effect, (ICE). Here, we used *D. pseudoobscura* to study the interaction between recombination rate plasticity and ICE. For plasticity, we used both temperature and age to induce changes in recombination rates. For ICE, we crossed flies with inversion differences of the treeline vs arrowhead arrangement of the 3rd chromosome of D. *pseudoobscura*. Visual markers spanning the X chromosome: cut, scalloped, yellow, and sepia were used to measure recombination rates. First, homokaryotic F1 females with the treeline arrangement, were reared in high temperature, 26°C and control of 21°C. Second, the same strains were aged 35 days into adulthood and compared to 7 days old flies. These two experiments were repeated for heterokaryotic flies to examine the interaction of plasticity and ICE. Females in all experiments were transferred every 72h to compare temporal variation in plasticity. Results indicate a saturation in the recombination rates due to age; the heterokaryotype control and homokaryotype age were largely similar. Aging increases the recombination rates 10% and 13% in the 1-3 and 4-6 time points respectively ($p=.00027$ and $p=.0017$). Surprisingly, for temperature, ICE showed a subtractive effect in recombination rates. Temperature stress decreases recombination rate 60% in the heterokaryotypes compared to the homokaryotypes. Our future plans to investigate the coincidence and crossover control mechanisms. While plasticity and ICE have been studied independently, this is the first experiment to examine their interaction. Thus, our study shows preliminary results for the interaction between plasticity and ICE using a novel design.

Title: Enhanced bioavailability of boswellic acid by *Piper longum* in rabbits: a computational and pharmacokinetic analysis
Primary Author: Alturki, Mansour S.
Additional Authors: Vijayaranib, K. Reeta; Majrashi, Mohammed; Fujihashi, Ayaka; Kirubakaranb, N.; Almaghrabi, M; Babu, R. Jayachandra; Smith, Forrest; Dhanasekaran, Muralikrishnan
Department: Medicinal Chemistry
College/School: Harrison School of Pharmacy

Abstract:
Chronic inflammation substantially increases the risk of morbidity and mortality. Hence, novel therapeutic approaches are currently being designed to discover new treatment avenues or improve the pharmacokinetic and pharmacodynamic effects of existing synthetic/natural drugs. Boswellic acids are well-known natural products that have the ability to decrease inflammation effectively without severe adverse effects. However, the use of Boswellic acids is impeded due to its poor pharmacodynamic properties. Pharmacokinetics strategies that can increase the absorption and distribution of Boswellic acids can lead to a safe and effective pharmacological product that can be used prophylactically and therapeutically to decrease inflammation. In this study, we investigated the effect of *Piper longum* on the bioavailability of Boswellic acid in a valid animal model. Additionally, we also explored the computational pharmacodynamic interaction of *Piper longum* and Boswellic acid. *Piper longum* dose-dependently increased the bioavailability of Boswellic acid. Based on our drug-based computational studies, the cytochrome P450 mediated mechanism can be involved in the increased bioavailability, and these studies also confirm that these drugs can be administered orally for effective therapeutic efficacy. Thus, computational aided drug design with validated pharmacological experiments supports the use of *Piper longum* with Boswellic acid as the future novel therapeutic avenue for treating various types of inflammation.

Title: Size fractionation in cellulose nanocrystal dispersions: impacts on phase behavior and optical properties of solid films
Primary Author: Amit, Sadat Kamal
Additional Authors: Davis, Virginia
Department: Chemical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
This research investigates the effects of length fractionation in aqueous dispersions of sulfuric acid hydrolyzed cellulose nanocrystals (CNCs) on their liquid crystal (LC) phase transitions, dispersion microstructures, and the microstructures of films produced from the dispersions. Sulfonated CNCs are known to form chiral nematic domains which enable the creation of structural color in dried films. In this work, sedimentation of 2.2 vol% (4.0 wt%) aqueous CNC dispersions resulted in two fractions with distinct size distributions which were measured by atomic force microscopy. This is significant because the length to diameter ratio (aspect ratio) distribution of the CNCs has a significant impact on dispersion phase behavior and self-assembly into ordered (liquid crystal) domains. The liquid crystal self-assembly within the dispersion affects the optical properties that can be achieved in dried films. The effects of CNC size distribution on dispersion and film microstructures were determined using cross-polarized optical microscopy. These qualitative results were quantified using a computer-aided image analysis method and spectroscopic measurements. The methods and results from this research can be used to enable more uniform photonic films from CNC and other materials that form chiral nematic liquid crystals.

Title: Recruitment and retention of African Americans into health promotion research
Primary Author: Anderson, Traemond K.
Additional Authors:
Department: Nursing
College/School: School of Nursing

Abstract:
In the United States, African American adults are 80% more likely than non-Hispanic white adults to have been diagnosed with diabetes and are twice as likely to die from diabetes (US Department of Health and Human Services, Office of Minority Health, 2016). Strategies to prevent and manage diabetes must be culturally appropriate and include participants from the African American population to address this health disparity. However, mistrust toward clinical research is prevalent among African Americans due to a history of unethical conduct in the medical community (Luebbert & Perez, 2016). In order to effectively recruit and retain African American participants in a study designed to increase physical activity among people living with diabetes, a review of existing health science literature was conducted to identify best practices for recruitment. The purpose of this presentation is to discuss barriers and facilitators to the recruitment and retention of African American participants into health promotion research studies.

Title: Decreasing problem behavior in a juvenile residential facility
Primary Author: Anderson, Ashley N.
Additional Authors: Brogan, Kristen; Rapp, John
Department: Applied Behavior Analysis
College/School: College of Liberal Arts

Abstract:
Interdependent group contingencies are defined as a behavior management protocol where individuals earn a reward by engaging in target behaviors as a group of individuals. Several studies have used these procedures to decrease disruptive behavior and increase appropriate behavior by adolescents in group settings. Results from a recent study show that obtrusive observations alone did not decrease the problem behavior of adolescents in a juvenile residential facility. However, when researchers delivered behavior specific rules, problem behavior decreased and appropriate behavior increased. In the current study we evaluated the effectiveness of interdependent group contingencies using rules in a classroom within a juvenile residential facility. Consistent with precious research, results indicate that obtrusive observations did not decrease problem behavior; however, adding behavior specific rules did effectively decrease problem behavior. This study provides further support for the regular delivery of behavior specific rules as a behavior management protocol in juvenile residential facilities. This study also provides support for the use of component analyses to evaluate the active treatment components in interdependent group contingencies.

Title: Thermoplastic 3D printing: a future novel therapeutic drug delivery system to improve pharmacokinetics and pharmacodynamics parameters and decrease adverse drug reactions and hypersensitivity manifestations

Primary Author: Annaji, Manjusha
Additional Authors: Poudel, Ishwor; Ramesh, Sindhu; Dhanasekaran, Muralikrishnan; Babu, R. Jayachandra
Department: Pharmaceutical sciences
College/School: Harrison School of Pharmacy

Abstract:
Over the past 30 years there has been an increasing trend in the use of 3D printing and other additive manufacturing techniques in biomedical engineering for therapeutic applications in animals and humans. Moreover, the application of these technologies into the field of drug delivery has been approved by FDA. This further supports the capabilities of 3D printing to manufacture personalized medicine to improve pharmacokinetics, pharmacodynamics, decrease adverse drug reactions and hypersensitivity reactions. According to the estimation of the US national council for patient information and education, only half out of million prescriptions are correctly followed by patients each year, thus this can alarmingly induce drug-induced pathologies. There are numerous chronic diseases which has higher non-compliance to the treatment regimen such as oppositional defiant disorder, bipolar disorder, schizophrenia, Alzheimer's, attention deficit hyperactivity disorder, diabetes, osteoarthritis, cancer, stroke and HIV. In order to address this issue, a new approach of additive manufacturing technology-thermoplastic 3D printing will be utilized. In order for the drugs to be utilized for thermoplastic printing, they should be thermally stable and melting point should be lower than 200°C to achieve drug uniformity. Therefore, present aim is to test the suitability of drugs for thermoplastic 3D printing to improve pharmacokinetics, pharmacodynamics, adverse drug reactions and hypersensitivity reactions.

Title: IFN-λ regulates early events in HSV-I induced corneal immunopathology
Primary Author: Antony, Ferrin
Additional Authors: Pundkar, Chetan; Sandey, Maninder; Kumar, Anil, Jaiswal; Amarjit, Mishra; Suryawanshi, Amol *
Department: Pathobiology
College/School: College of Veterinary Medicine

Abstract:
Herpes simplex virus-1 (HSV) infection of the eye causes chronic inflammatory lesion in the cornea called as herpetic stromal keratitis (HSK). It is a leading cause of blindness worldwide. The lesion is considered to be immuno-pathologically orchestrated by neutrophils and IFN-γ producing $CD4^+$ T (T_h1) cells. The lack of proper therapeutic management in HSK patients can cause severe corneal tissue damage, angiogenesis, and corneal scarring with partial or complete vision loss. Thus, there exists an unmet need to develop novel therapies against HSK. The selective induction of strong anti-viral response with minimal activation of immuno-pathological responses embodies a powerful treatment approach. In this regard, regulating innate anti-viral type I (IFN-α/β) and type III interferon (IFN-λ) responses represent a promising therapeutic strategy in HSK patients. Recent studies have identified IFN-λ as the predominant anti-viral cytokine and first line of defense at epithelial surfaces during several acute and chronic viral infections. Interestingly, IFN-λ lacks the pro-inflammatory side effect of IFN-α/β and plays a non-redundant role in host protection during viral infections. IFN-λ can effectively control viral replication with minimal activation of inflammatory innate and adaptive immune responses, during corneal HSV infection. In this study using mouse model of HSK, we characterized the differential induction of type I and type III IFN responses and evaluated the therapeutic potential of recombinant IFN-λ (rIFN-λ) during ongoing corneal HSV infection. We show that direct topical application of rIFN-λ to the HSV infected corneas significantly suppresses the HSK pathology through reducing infiltration of neutrophils and T_h1 cells in the cornea and secondary lymphoid organs. Our results indicate that rIFN-λ therapy may represent a useful approach to control HSV-induced HSK pathology and associated vision loss.

Title: A new class of superatoms: solvated electron precursors
Primary Author: Ariyarathna, Isuru R.
Additional Authors: Miliordos, Evangelos
Department: Chemistry
College/School: College of Sciences and Mathematics

Abstract:

A solvated electron precursor (SEP) is “a complex that displaces one or more electrons from its coordinated metal atom to the periphery of its ligands”. The interactions between alkali metals and ammonia create SEPs with one peripheral electron. This outer electron occupies a quasi-spherical superatomic s-type orbital. Li and Na creates tetrahedral $Li(NH)_4$ and $Na(NH_3)_4$ SEPs with one electron around the $[M(NH_3)_4]^+$ core, mimicking H-atom. Neutral SEPs with alkali earth metals have two electrons orbiting around the $M(NH_3)n$ 2+ skeleton (e.g.: $Be(NH_3)_4$, $Mg(NH_3)n=4,5,6$, $Ca(NH_3)n=6,8$) resembling He atom. Fascinatingly, outer electrons of SEPs promote to higher angular momentum atomic shaped orbitals by excitation. Using excited state calculations 1s, 1p, 1d, 2s, 1f, 2p, 2d superatomic orbital order of SEPs is observed.

Title: Development of a multi-particle spectrometer
Primary Author: Arthur, Davis S.
Additional Authors: Tatum, Morgan; Laurent, Guillaume
Department: Physics
College/School: College of Sciences and Mathematics

Abstract:
The Cold Target Recoil Ion Momentum Spectrometer (COLTRIMS) is an extremely useful tool used to study the dynamics of atomic and subatomic particles at the timescale of their most fundamental processes. The motion of an electron is of particular interest due to its vast applications in electric power generation, computing, and beyond. Over the past two years, the Auburn Source of Attosecond Pulse (ASAP) Laboratory has begun to develop a unique COLTRIMS design. COLTRIMS devices are based on the assumption that measured particles are subject to uniform electric and magnetic fields throughout the duration of their flight. While most COLTRIMS designs use a helmholtz coil to create an approximately uniform magnetic field, our design employs a solenoid. This change offers potential improvements as a solenoid more closely approximates a uniform field and can be placed in closer proximity to the spectrometer's detector, minimizing the effect of extraneous magnetic fields. Our simulation results quantify the theoretical improvements of our design, and provide insight into the process of spectrometer construction. After we finish construction, our spectrometer will allow the ASAP lab to revisit several ultrafast experiments with improved resolution and more well defined error.

Title: Forecasting field-level potential evapotranspiration with numerical weather predictions and satellite remote sensing
Primary Author: Asadi, Parisa
Additional Authors: Tian, Di; Ortiz, Brenda; Kesikka, Isaya
Department: Biosystems Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Accurate maps of evapotranspiration (ET) have valuable local and global effects due to the ability of improving detection of crop water stress, refining irrigation scheduling, helping manage scarce water supplies and being incorporated within drought forecasting systems. Utilizing remote sensing of evapotranspiration provides timely and reliable estimation of crop evapotranspiration and Irrigation Water Requirements (IWR) at field level with high spatial and temporal resolution. Also, the satellite imagery provides a synoptic coverage at fixed time intervals and can, therefore monitor changes of crop characteristics over time. The purpose of this study is to develop and evaluate a framework to estimate high-resolution potential ET and IWR with Harmonized Landsat and Sentinel-2 (HLS) data and multiple numerical weather predictions from The International Grand Global Ensemble (TIGGE). Numerical weather predictions are used as input into the Food and Agriculture Organization (FAO) Penman-Monteith equation to produce reference evapotranspiration (ETo) forecasts. ETo forecasts are evaluated against meteorological observations and compare with the forecasts from the National Weather Service Digital Forest Database over Alabama and California. Crop parameters (leaf area index and surface albedo) and crop coefficients are derived from visible and near-infrared images from Harmonized Landsat Sentinel-2 product. The satellite derivations are also evaluated against ground crop measurements from agricultural fields in Alabama and California. Potential crop evapotranspiration (ETc) forecasts are estimated using two approaches: 1) crop coefficient based approach, and 2) crop parameter-based approach. The ETc and irrigation water requirement (IWR) calculated using the FAO-56 method with observed weather data and field-collected crop data are used as observational reference. ETc and IWR forecasts are evaluated against observational references using different

Title: Increasing cold tack of polymeric diphenyl methane diisocyanate pMDI resin with partial soy flour substitution

Primary Author: Adjaye, Osei A.
Additional Authors: Via, Brian; Peresin, Maria; Auad, Maria; Adhikari, Sushil; Barnerjee, Sujit
Department: Forestry
College/School: School of Forestry and Wildlife Sciences

Abstract:
Polymeric diphenyl methane diisocyanate's (pMDI) high moisture tolerance, less resin application, shorter pressing time, and low curing temperature makes it one of the most important adhesives in the wood composite industry. However, pMDI is expensive and its utilization in particle board production is limited because resinated wood particles from pMDI have less tackiness leading to unstable pre-mats and subsequently loss of material. Partial substitution of pMDI with soy was investigated to improve the cold tack without compromising the panel properties. The tack of pMDI substituted soy formulations were measured with a modified ASTM technique (ASTM, 2017). The mechanical and physical properties of particle boards from the pMDI-soy system was assessed. Partial substitution of pMDI resin with soy flour increases the cold tack of the resin to the level achieved by urea formaldehyde resin. The substituted soy improved the panel properties. The tack can be fine-tuned by adjusting the amount of soy flour added. The increase in tack is caused by the reaction of the isocyanate resin with the water contained in soy flour as well as with hydroxyl and other groups present in soy flour components. The higher cold tack should increase the stability of pre-mats, especially in particleboard manufacturing.

Title: Effect of maternal and post-hatch dietary 25-hydroxycholecalciferol supplementation on broiler chicken growth performance and carcass characteristics
Primary Author: Avila, Luis P.
Additional Authors: Avila, Luis; Leiva, Samuel; Abascal-Ponciano, Gerardo; Flees, Joshua; Sweeney, Kelly; Wilson, Jeanna; Pokoo-Aikins, Anthony; Litta, Gilberto; Starkey, Charles; Starkey, Jessica
Department: Poultry Science
College/School: College of Agriculture

Abstract:
Dietary inclusion of the vitamin D3 (D3) metabolite, 25-hydroxycholecalciferol (25OHD3), has been previously demonstrated to improve the broiler chicken growth performance and carcass yield. To evaluate the effect of combined maternal and post-hatch dietary 25OHD3 inclusion on broiler chicken growth performance and carcass characteristics, a randomized complete block design experiment with the main effects of maternal diet (MDIET) and post-hatch diet (PDIET) arranged in a 2 × 2 factorial treatment structure was conducted. From 25 to 38 wk of age, commercial broiler breeder hens reared without 25OHD3 were provided 1 of 2 MDIET: 5,000 IU D3 (MCTL) or 2,240 IU of D3 + 2,760 IU of 25OHD3 per kg of feed (M25OHD3). Their chick offspring (n = 448) hatched from eggs collected from 37 to 38 wk of age were reared in floor pens (7 per pen; 16 replicate blocks) and fed 1 of 2 PDIET: 5,000 IU of D3 per kg of feed (PCTL) or 2,240 IU of D3 + 2,760 IU of 25OHD3 per kg of feed (P25OHD3) from 0 to 40 d of age. Data were analyzed using SAS (V9.4) GLIMMIX and PDIFF for mean separation at $P < 0.05$. No MDIET × PDIET interactions were observed ($P > 0.05$). MDIET and PDIET did not alter d 0 to 40 growth performance ($P \geq 0.1284$). Broilers from 25OHD3-fed hens were 2.7% heavier on d 40 than those from hens fed only D3 (2.911 vs. 2.834 kg; $P = 0.0397$). Tender wt (123 vs. 117 g) and yield (5.63 vs. 5.44%) were greater in M25OHD3 broilers than MCTL broilers ($P = 0.006$). Breast, wing, thigh, drum, and fat pad yields were similar among MDIET ($P \geq 0.2120$). Broilers fed P25OHD3 tended to have heavier breasts (637 vs. 615 g; $P = 0.0503$), bone-in wings (215 vs. 210 g; $P = 0.0703$), and boneless thighs (279 vs. 270 g; $P = 0.0776$) compared with those fed only D3 (PCTL). Neither MDIET nor PDIET altered the incidence and severity of Wooden Breast and White Striping ($P \geq 0.1059$). Overall, the inclusion of 25OHD3 in maternal and post-hatch broiler chicken diets positively influenced carcass characteristics.

Title: Parental feeding practices and perceptions of child weight in relation to childhood obesity
Primary Author: Ayine, Priscilla
Additional Authors: Selvaraju, Vaithinathan; Thangiah, Geetha
Department: Nutrition
College/School: College of Human Sciences

Abstract:
Parental beliefs and feeding practices play a vital role in childhood obesity. This study aimed at assessing parental perceptions, concerns about weight, and feeding practices using the child feeding questionnaire (CFQ) and its association with body mass index (BMI) in elementary school children. Participants aged 6-10 years (n=169) were recruited, and anthropometric measurements were obtained. Pearson's correlation and hierarchical linear regression analysis were used to examine the association between BMI z-score and the seven factors of the CFQ. BMI z-score was positively associated with parental perceived child weight and concern about child weight and negatively associated with parents pressuring children to eat. Following the regression model, a path analysis was conducted to identify the relation between the constructs (endogenous or exogenous), the model provided an acceptable fit to the data. These findings indicate that there is a relationship between higher BMI z-score and parents who highly perceive their children's weight and show more concern about their weight. It was also revealed that lower BMI z-score had an inverse relationship with pressuring children to eat. Therefore, intervention models needs to be developed to assist parents to appropriately manage their children's weight.

Title: Study of reaction enthalpy for dissociating β-O-4 linkage in native lignin through homolytic cleavage

Primary Author: Azad, Tanzina
Additional Authors: Schuler, Jonathan; Torres, Hazl F.; Auad, Maria L.; Elder, Thomas; Adamczyk, Andrew J.
Department: Chemical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Lignin is the second most abundant natural polymer and one of the least utilized biomass sources. Due to the nature of its structure, lignin has the potential to be the largest renewable source for aromatic compounds to be used in the chemical industry. It is still largely utilized as a low-grade fuel because its degradation reaction mechanisms and energetics under various reactor process conditions, as well as basic atomic-level structure, are still not fully understood. While lignin modeling by the application of computational chemistry is an active area of research, electronic structure methods have been limited to structures in the dimeric or trimeric range. In this study, we have modeled a lignin structure composed of 10 β-O-4 linked guaiacyl (G) units, such that this work represents, to the best of our knowledge, the largest structure that has been examined to date using quantum chemical calculations. While computational results have been reported for this reaction for dimers, the objective of this work was to determine how or if reactivity within the oligomer changes as a function of position within the chain. To address this question, the Bond Dissociation Enthalpy (BDE) for the cleavage reaction between each G unit has been determined. The methods used classical molecular mechanics for conformational sampling and quantum mechanically based density functional theory (DFT) calculations. To our best knowledge, we have reported the standard thermodynamic properties including heat capacity, entropy and Gibbs free energy for lignin over a wide range of temperatures as the first work. Overall, this work demonstrates how theoretical investigations on lignin are currently impacting to better understand its pyrolysis as a means to valorize lignin for a sustainable future.

Title: Laser-assisted accelerated synthesis of 2D quantum materials
Primary Author: Azam, Nurul
Additional Authors: Samani, Masoud Mahjouri
Department: Electrical and Computer Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
The firmly defined dimensionalities of Two-dimensional (2D) layered materials including transition metal dichalcogenides (TMDCs) exposed numerous bizarre properties that recently been at the center of the quantum materials and information sciences research. In pursuit of the accelerated growth and discovery of 2D materials, many efforts have concentrated on developing new approaches including physical and chemical vapor deposition techniques. However, complex, uncontrolled gas-phase reactions, and flow dynamics has made the synthesis of these multi-component 2D crystals exceedingly challenging. This work demonstrates a novel laser-assisted synthesis technique (LAST), which significantly reduces the existing growth complexities and remarkably accelerates the growth of 2D materials. The uniqueness of this approach arises from the direct vaporization technique of stoichiometric powders by the laser heating process. We show that this directed laser heating permits pressure-independent decoupling of the growth and evaporation kinetics, enabling the use of stoichiometric powder as precursors for the growth of various high-quality 2D materials including MoS2, MoSe2, WSe2, and WS2.

Title: Drought tolerance of peanut using PGPR with orange peel amendment
Primary Author: Bagwell, John W.
Additional Authors: Hassan, Mohammad K.; Sanz-Saez, Alvaro; Liles, Mark R.; Sikora, Edward; Moen, Francesco; Kloepper, Joseph W.; Chen, Charles Y.
Department: Crop, Soil and Environmental Sciences
College/School: College of Agriculture

Abstract:
Peanut provides over $4 billion per year to the United States economy along with many health benefits. Drought is an issue that reduces these benefits, as it lowers nutrition and yield and can lead to disease in peanut. Because of factors such as an increasing global population and climate change, something must be done to manage drought stress in peanut. *Bacillus velezensis* (*Bv*) and orange peel powder amendments, which have increased growth promotion in legume crops, will be used to determine their effect on peanut drought tolerance performance. Orange peel is a cheap source of pectin that can provide *Bv* with carbon to supplement its growth promotion properties. It has also been used to help triple vegetation in a forest as well as control pathogens. A greenhouse experiment was conducted over 135 days to monitor the effects of the previously mentioned inoculants on five different peanut genotypes. Measurements taken to determine the effects of these inoculants and genotype-environment interactions include relative water content, pot weight, Soil Plant Analytical Development Chlorophyll Meter Readings, transpiration efficiency, mid-day photosynthesis, CO2 curves, specific leaf area, and biomass measurements. N2 fixation will be measured. These results will then be analysed and visualized using R. The first hypothesis for this experiment is that orange peel powder amendments may enhance *Bv* drought tolerance in peanut compared to using only *Bv*, and the second one is that genotype-environment interactions may occur between the genotypes and inoculation treatments. If these hypotheses are proven correct, these genotypes and inoculation treatments can be studied in later greenhouse and field trial experiments to help farmers grow peanuts more efficiently.

Title: Mitonuclear compatibility in the evolution of the Bear Macaque
Primary Author: Bailey, Nick P.
Additional Authors: Stevison, Laurie
Department: Biological Sciences
College/School: College of Sciences and Mathematics

Abstract:
Speciation, the origin of novel biological species, involves the evolution of reproductive incompatibility between different species. A relatively understudied but potentially common source of these incompatibilities are interactions between mitochondrial and nuclear genes, known as mitonuclear genes. The Bear Macaque (*Macaca arctoides*), is a unique species of primate that exhibits differential ancestry of its mitochondrial and nuclear genomes. Because mitochondrial function requires compatibility with mitonuclear genes this differential ancestry is expected to have caused mitochondrial dysfunction during the origin of this species. This would likely necessitate that mitonuclear genes either cotransmitted or coevolved with the mitochondrial genes in this species. To examine if this is the case, we used whole genome sequences of the Bear Macaque as well as its mitochondrial and nuclear ancestors (the fascicularis and sinica species groups respectively) to extract mitonuclear gene sequences. We then conducted introgression, divergence, and selection analyses of these genes relative to a control set of nuclear genes. On average mitonuclear genes did not differ from the nuclear genes in introgression and divergence patterns but selection shows more complex patterns. Examining this system provides insight into the relationship of mitonuclear incompatibilities to the speciation process.

Title: Polymeric adsorbents for heavy metal removal
Primary Author: Baird, Mary A.
Additional Authors: Beckingham, Bryan; Kim, Luca
Department: Chemical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Heavy metals are naturally occurring elements that are used in a variety of industrial applications, causing them to become distributed throughout the environment. As a result, many have raised concerns about their detrimental impact on humans and the environment. For example, produced water is a byproduct of the oil and gas industry, and contains a significant concentration of various heavy metals. Thiol-based polymeric materials are known to attract heavy metal ions due to the high binding affinity between the sulfur atom and the metal cation. We have designed, synthesized and conducted a preliminary examination of a polyether-based adsorbent to remove these ions from solution. Adsorbents are prepared by UV photopolymerization of poly(ethylene glycol) diacrylate, and methacroylcholine chloride in the presence of a solvent. The ratios of each component were varied to prepare membranes of varied properties including varied fractional free volume and ion exchange capacity. Fabricated hydrogel adsorbents were then ion-exchange with a sodium thiosalicylate solution. The thiosalicylate anion displaces the chlorine anion around the quaternary ammonium cation located on the MACC molecule, introducing metal-attracting thiol groups to the membrane structure. After characterizing the adsorbent, an aqueous solution of metal salt is passed through the membrane, and its ability to uptake heavy metal ions is quantified using inductively coupled plasma (ICP) mass spectrometry to determine solution cation concentrations.

Title: Analysis of airborne soldier load carriage gait
Primary Author: Baker, Cameron J.
Additional Authors: Zabala, Michael; Oldfather, Taylor; Minnich, Shannon
Department: Mechanical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Lower extremity injuries are common among Airborne soldiers due to the extreme loads they carry. These injuries occur at higher rates when the personnel carry increased loads, because of the increased joint reaction forces and moments and the altered gait caused by the load. In training, Airborne soldiers can carry up to 120 pounds of gear and up to 180 pounds during operations. These loads carried for greater lengths of time are a unique challenge for these soldiers. In this study motion capture data was collected on ROTC students and non-military Auburn students in order to understand the kinematics and kinetics of their gait in five different load conditions of airborne soldiers (unloaded, Hollywood heavy, Combat heavy, Hollywood light and Combat light). Visual3D software was used to evaluate the forces and moments acting on the ankle joint to determine the demand put on the muscles around the ankle. Analysis of this data shows that both the ground reaction forces, and the ankle moments increase by at least 40% from unloaded when walking with the “Hollywood heavy” configuration which weighs approximately 60 pounds.

Title: Effects of an extended release oxalic acid treatment on *Varroa destructor* mites & *Apis mellifera* honey bee colonies in the Southeastern US
Primary Author: Baker, Christian L.
Additional Authors: Bruckner, Selina; Evans, Jay; Berry, Jennifer; Williams, Geoffrey
Department: Entomology
College/School: College of Agriculture

Abstract:
The introduced ectoparasitic mite, *Varroa destructor,* is among the most detrimental biological stressors of *Apis mellifera* honey bees. Parasitism can result in multiple negative effects on individuals, including fat body loss, virus transmission, and impaired immunity that ultimately results in reduced *A. mellifera* longevity. To limit the negative effects of *V. destructor*, beekeepers rely on a variety of management practices, including the use of chemical controls. One such organic compound, oxalic acid, is often used by beekeepers due to its acaricidal properties. Unfortunately, these properties do not extend to within the wax brood cell cappings of *A. mellifera,* in which *V. destructor* also reproduces. Due to this limitation, there is an interest to develop a novel extended release technique that targets *V. destructor* as it emerges from *A. mellifera* brood cells alongside its host. To investigate this, we established 38 double-deep brood chambered colonies in an experimental apiary in Georgia; 19 of the colonies received 1.5 shop towels that were previously treated with 18 g oxalic acid diluted in distilled water and vegetable glycerin (1:1:1 weight ratios); the other 19 colonies did not receive shop towels. Colonies were treated with oxalic acid shop towels for 6 weeks, corresponding to two *A. mellifera* brood cycles. Experimental colonies were assessed weekly for *V. destructor* intensity, and every three weeks for *A. mellifera* adult worker populations, worker brood cell populations and colony mass. We found no significant difference between treatment groups for *V. destructor* intensity, or for adult worker populations, worker brood cell populations and colony mass. Furthermore, there was no difference in oxalic acid residues in honey between treatment groups. Future trials should investigate the influence of environmental conditions, as well as oxalic acid application delivery methods on product efficacy.

Title: ISPOR top 10 HEOR trends: results from a best-worst scaling survey
Primary Author: Banjara, Bidur
Additional Authors: Willke Richard J, Guerino John, Ngorsuraches Surachat
Department: Health Outcomes, Research and Policy
College/School: Harrison School of Pharmacy

Abstract:
The BWS object case (Case 1) design was used to develop a web-based questionnaire survey. A total of 25 HEOR topics and 11 real-world evidence (RWE) issues were obtained from the discussions among ISPOR Health Science Policy Council committee members. A balanced incomplete block design was used to generate three sets of 10 HEOR choice tasks and one set of 11 RWE choice tasks. A total of 777 ISPOR members, a 10% subsample of the full Top 10 survey, were asked to identify the most and least important topics or issues from one set of the HEOR tasks and the RWE task. BWS score was calculated as the difference between the frequencies of being chosen as most versus least important, divided by the availability of each attribute. A total of 90 members completed the surveys. The majority of them worked in either pharmaceutical industry (33.3%) or health research/consulting firms (18.9%). Almost 50% of them were from North America. Approximately 41% of them identified their principal professions as either economist or outcomes researcher. Based on the BWS scores, the top 10 HEOR trends were real-world evidence (0.49), universal health coverage (0.37), novel curative therapies (0.33), value-based alternative payment models (0.25), digital technologies (0.23), price transparency (0.21), value assessment frameworks and process (0.21), aging population (0.21), drug pricing (0.17), and precision medicine (0.14). The top three RWE issues were RWE to establish comparative and cost effectiveness (0.28), improving credibility of real-world data studies (0.27), and use of real-world outcomes for risk-sharing agreements (0.17). This BWS study identified RWE as the most trending HEOR topic. Among all RWE issues, the use of RWE to establish comparative and cost effectiveness was the most important issue.

Title: The sensitivity of attribution methods to hyperparameters
Primary Author: Bansal, Naman
Additional Authors: Aggarwal, Chirag; Nguyen, Anh
Department: Computer Science and Software Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
The breakthrough paper by Alex Krizhevsky in 2012 has led to an exponential rise in the popularity of deep learning algorithms among the scientific community. Deep neural networks (DNNs) have become ubiquitous and go-to solutions for all kinds of problems such as image recognition, object detection, digital forensics, recommender systems, etc., which were supposed to be unthinkable in the past decade. Even after all these advances, interpretability remains an Achilles' heel of DNNs. With the increase in the use of deep models for critical tasks such as medical diagnosis, self-driving cars, credit systems, etc., it has become imperative to open the mystery of these black boxes. To this end, various visualization techniques have been proposed that centre around attributing the network results to the dimensions of input features, thereby creating a heatmap/saliency map. These methods can provide powerful insights into the reasons for a classifier's decision. We argue that a key desideratum of an explanation is its robustness to input hyperparameters which are often randomly set or empirically tuned. High sensitivity to arbitrary hyperparameter choices does not only impede reproducibility but also questions the correctness of an explanation and impairs the trust by end-users. In this paper, we provide a thorough empirical study on the sensitivity of existing attribution methods. We found an alarming trend that many methods are highly sensitive to changes in their common hyperparameters e.g. even changing a random seed can yield a different explanation. In contrast, explanations generated for robust classifiers that are trained to be invariant to pixel-wise perturbations, are surprisingly more robust. Interestingly, such sensitivity is not reflected in the average explanation correctness scores over the entire dataset as commonly reported in the literature.

Title: Preparation of phenol-formaldehyde resins using the lignocellulosic biomass (lignin, lignin and lignocellulosic pyrolysis biooilbio-oil) for use as a wood adhesive
Primary Author: Bansode, Archana S.
Additional Authors: Barde, Mehul; Asafu-Adjaye, Osei; Elder, Thomas; Auad, Maria
Department: Polymer and Fiber Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
The first objective of this study was to characterize lignin macromolecule by various characterization technique such as FTIR (Fourier-transform infrared spectroscopy), Py-GCMS (Pyrolysis–gas chromatography-mass spectrometry), 2D HSQC (Heteronuclear Single-Quantum Correlation), 31P NMR (Phosphorus-31 nuclear magnetic resonance spectroscopy) and Gel permeation chromatography (GPC). After that, 50% of the phenol by weight in phenol-formaldehyde (novolac) resin is replaced by lignin in addition and condensation reaction between phenol and formaldehyde. The bionovolac is an integrated network of phenol and lignin which is fully cross-linked by common curing agent such as hexamethylenetetramine (HMTA). The wood composites adhesive strength is measured using the lap-shear test.

Title: Puerto Rico's iron deposits: developing a genetic model through field observations and geochemical analyses
Primary Author: Barefoot, Marisa N.
Additional Authors: Bilenker, Laura; Hudgins, Tom
Department: Geology
College/School: College of Sciences and Mathematics

Abstract:
Puerto Rico is a Caribbean island located on the eastern end of the Greater Antilles island chain. Between 1933 and 1954 Puerto Rico enacted a series of mining laws that restricted the exploitation of the island's mineral and metal resources. These laws required that the island's resources be utilized only for the benefit of the Puerto Rican people, and only when production would not have a negative impact on the environment. As a result, Puerto Rico is currently only exporting cement and lime from its open-pit quarries leaving many of its mineral resources completely untapped, and therefore, unstudied. These resources hold a key for understanding the overall geologic history and tectonic evolution of Puerto Rico. One example is Puerto Rico's iron deposits, which have been classified as skarns. Skarns are characterized by their mineral composition, and iron-copper skarns are the only types that form in oceanic island-arc settings like Puerto Rico. Iron skarns form as a result of magma bodies intruding into a limestone or volcanic host rock. Heat from the intrusion causes fluids from the magma and surrounding rocks to alter the chemistry of those rocks, ultimately forming new minerals. Preliminary analyses of iron in magnetite from Puerto Rico's Tibes iron skarn indicate a higher temperature system than what is required by typical skarns. One hypothesis suggests that the magnetite formed in the magma body and was later transported to its current position rather than by hydrothermal alteration of the host rock. This data highlights the need to study Puerto Rico's iron deposits to refine their classification and better understand the geologic history of Puerto Rico as a whole. This will be accomplished by analyzing iron, oxygen, and trace element compositions of magnetite at two iron deposits to identify its source and develop a genetic model of these deposits.

Title: Errors during practice may hinder motor learning: evidence from a self-controlled feedback paradigm

Primary Author: Barnes, Brandon M.; Holley, Jack
Additional Authors: McClure, Mark; Bacelar, Mariane; Parma, Juliana; Cabral, Daniel; Daou, Marcos; Lohse, Keith; Miller, Matthew
Department: Kinesiology
College/School: College of Education

Abstract:
Engagement in error estimation is suggested as one of the possible explanations behind the self-controlled feedback learning effect, yet error estimation has rarely been manipulated in self-controlled feedback paradigms. The present study aimed to address this shortcoming by crossing self-controlled feedback with error estimation in the same experimental design. Participants (N = 90) performed a beanbag toss with their non-dominant arm under one of four conditions wherein feedback schedule was either controlled by the participant (self-control) or matched to a counterpart (yoked) and error estimation was either mandatory (error estimation) or not enforced (traditional). After pre-test, participants were quasi-randomly (based on sex) assigned to their condition and performed ten blocks of ten trials of the beanbag tossing task in the acquisition phase. Self-control groups could choose when to receive feedback, whereas yoked groups received feedback on a matched schedule, but without choice. Additionally, participants in the error estimation groups were asked to estimate their performance after each trial, whereas engagement in error estimation was not enforced in the traditional groups. To assess learning, participants returned approximately 24 hr after Day 1 to complete a retention and a transfer test of the same/similar beanbag task. Radial error was indexed as a measure of tossing accuracy. Results showed that participants significantly improved from pretest to post-test, across groups. There were no main effects nor interactions involving self-control ($ps \geq .405$), but there was a main effect of error estimation ($p = .037$), such that error estimation led to worse learning. Thus, results are consistent with a recent bias-corrected meta-analysis that questions the effectiveness of self-controlled practice on motor skill learning, and suggest having learners estimate their errors during practice may hinder learning rather than help it.

Title: Hidden representation: an exploration of shared identity in social welfare policy
Primary Author: Barnes, Alicia C.
Additional Authors:
Department: Public Administration and Public Policy
College/School: College of Liberal Arts

Abstract:
For decades, the study of representative bureaucracy has mainly focused on understanding how a public administrator's two most distinguishable physical characteristics- race and gender- impact public organizations and administrative decision making. Bureaucratic representation has been said to exist in two forms: passive and active. This paper explores the possibility of a third form of representation- hidden representation. Hidden representation refers to less visible points of identification that explain the acting on behalf of individuals or groups who are from different social origins but share that less visible point of identification. Explicitly, the study examines how less visible points of representation impact the work of street-level bureaucrats in social welfare policy. Using original survey data and content analysis, the study explores the possibility of a hidden representation effect and its possible implications for representative bureaucracy theory.

Title: The influence of salt loading on the kidney injury biomarkers in healthy young adults
Primary Author: Barnett, Alex M.
Additional Authors: Babcock, C. Matthew; Watso, C. Joseph; Migdal, U. Kamila; Farquhar, B. William; Robinson, T. Austin
Department: Kinesiology
College/School: College of Education

Abstract:
The kidneys play a critical role in blood pressure (BP) regulation. Rodent studies demonstrate that high dietary Na+ increases levels of novel kidney injury markers, independent of changes in BP and glomerular filtration rate; (GFR). However, it is unclear if short-term high Na+ increases kidney injury biomarkers in healthy humans. Therefore, we tested the hypothesis that short-term high Na+ intake increases urinary excretion of the novel kidney injury markers Neutrophil Gelatinase-Associated Lipocalin (NGAL) and Kidney Injury Molecule-1 (KIM-1) in healthy, young adults. Methods: Twenty participants (age: 24±4 years; BP: 112 ±10/64 ±9 mmHg, mean ± SD) completed a randomized, crossover study. For 10-days, participants were asked to supplement with salt (3,900 mg/day of Na+) or placebo (dextrose) capsules. Participants collected their urine for the final 24 hours of each supplementation period to assess urine flow rate and Na+ excretion. Brachial BP was measured in the laboratory. We measured urine and serum creatinine to estimate GFR via creatinine clearance. We used enzyme-linked immunosorbent assays to measure urinary NGAL and KIM-1. Results: Compared to placebo, Na+ supplementation increased urinary Na+ excretion (139.9±68.4 vs. 282.5±69.8 mmol/24 hours, $p<0.01$) but there was no difference in mean arterial BP (77±7vs. 77±6 mmHg, $p=0.64$). Serum creatinine concentrations ($p=0.55$) were not different between conditions. Na+ supplementation increased creatinine clearance (110.5±32.9 vs. 145.0±24.9 mL/min, $p<0.01$) and increased urinary NGAL excretion indexed to urine flow rate (16.9±21.9 vs. 28.4±36.1 ng/min, $p=0.02$). KIM-1 excretion indexed to urine flow rate decreased (1.61 ± 1.08 vs. .94 ± .74) but was only measured in seven participants. Our preliminary data suggests that salt loading increases creatinine clearance and urinary excretion of the kidney injury marker NGAL but reduced KIM-1 excretion in healthy young adults.

Title: Rural studio thermal mass and buoyancy ventilation research
Primary Author: Barrett, Livia
Additional Authors: Subasic, Cory; Jeong, Jeff; Price, Rowe
Department: Architecture
College/School: College of Architecture, Design & Construction

Abstract:
Rural Studio's Thermal Mass and Buoyancy Ventilation Research, in partnership with McGill University, explores how to optimally proportion internal thermal mass within a space to create a predictable passive temperature and ventilation control system in order to reduce a building's environmental impact and energy usage. To do this, the researchers are applying the Optimal Tuning Theory, using an application to optimize the design. The designers calculate the proportions of the thermal mass and ventilation openings by using data on of the height of the building, the occupant load, and the surface area of thermal mass that can operate in a building. The resulting proportions of thermal mass and ventilation can be a starting point for design, and buildings could soon be passively ventilated, free of mechanical heating and cooling systems. The project will conduct building scale experiments to test the Optimal Tuning Theory and investigate the thermal, structural and ecological properties of the thermal mass materials. As an ongoing project, this research has the potential to further our understanding of alternative temperature control and ventilation systems, redefine expectations for thermal comfort, and reinvigorate the use of a local, west Alabama resource.

Title: Successful detection of ACCase-inhibiting herbicides resistance in southern crabgrass
Primary Author: Basak, Suma
Additional Authors: McElroy, Scott J.
Department: Crop, Soil and Environmental Sciences
College/School: College of Agriculture

Abstract:
The experiment was conducted for detecting acetyl CoA carboxylase (ACCase)-inhibiting herbicides resistance. Populations of the ACCase-resistant southern crabgrass (R1 and R2) were collected from sod production fields in Georgia. A susceptible (S) population with no known history of exposure to any ACCase-inhibiting herbicides was collected from Alabama. Leaves of southern crabgrass from R1, R2, and S phenotypes were placed in separate tubes containing three the discriminating dose of herbicides (0.8, 1.6, 3.2, and 6.4 μM). The leaves from each phenotype were placed in each tube and five tubes were used per treatment. Herbicides absorption of each leaf was evaluated at 12 hours after treatment with electroconductivity (EC) test. Both R1 and R2 were more resistant to sethoxydim than the others. The leaves of resistant phenotypes floated at the lower concentration to the surface, whereas the leaves of susceptible phenotypes failed to float within 12 hours after treatment. The susceptible phenotype contained higher EC value than the resistant phenotypes. This bioassay is effective in detecting the ACCase-resistant population with target-site resistance mechanisms. Moreover, it can be used to detect large numbers of plants to determine the resistance to ACCase-inhibiting herbicides without destroying the whole plants or preventing reproduction.

Title: An optimized bioactivity-based molecular networking for the discovery of antimicrobial compounds produced by *Streptomyces coelicolor* harboring metagenome-derived biosynthetic gene clusters

Primary Author: Baskiyar, Swati
Additional Authors: Sandoval-Powers, Megan; Athikala, Uma P.; Ren, Chang; Liles, Mark; Seals, Cheryl D.; Calderón, Angela I.
Department: Drug Discovery and Development
College/School: Harrison School of Pharmacy

Abstract:
Biosynthetic gene clusters derived from a soil metagenome were expressed in a *Streptomyces coelicolor* host to identify and characterize metabolites with antibacterial activity. *S. coelicolor* recombinant clones found to inhibit the growth of multidrug-resistant pathogens were analyzed with LC-MS to identify metabolites with bioactivity. The MS spectra were visualized as molecular networks in Global Natural Products Social Molecular Networking (GNPS), a web-based mass spectrometry ecosystem. This study intends to integrate the molecular networks generated by GNPS and bioactivity analysis to identify promising antibiotics produced by *S. coelicolor*. Compounds with a sufficient bioactivity score will be identified and analyzed. We have formed an interdisciplinary research team with members from Biological Sciences, Drug Discovery and Development, and Computer Science and Software Engineering developing a novel system that will identify and visualize Molecular Networks to identify unknown compounds to aid in drug discovery (i.e. identifying promising antibiotics with high bioactivity). The Software Engineering process began with requirements analysis with our participatory design partners to elicit the necessary functional requirements. We studied the baseline approaches of Dorrestein Labs, the creators of the GNPS spectrometry ecosystem, and Cytoscape (i.e. the traditional visualization method utilized) to investigate the design and functionality of these systems. After baseline investigations and requirements discussions, we began a cycle of refined requirements, design, and development until we have reached through a satisfactory level of expert usability, evaluation, and acceptance of this system. Our focus is to develop a system that will identify promising antibiotics by visualizing molecular networks based on their bioactivity to identify unknown compounds to aid in drug discovery.

Title: Changes to lake ecosystems from human inputs: a sediment study of 48 Florida lakes
Primary Author: Bass, William H.
Additional Authors: Lamb, Avery
Department: Environmental Science
College/School: College of Agriculture

Abstract:
Over the last century, runoff from agriculture and industrial activity has altered aquatic ecosystems throughout the state of Florida. Many lakes suffer from eutrophication and toxic algal blooms. Forty-eight lakes throughout central and north Florida were selected for the study. Three sediment cores were collected from each lake using a gravity core barrel. Each core was one meter in length, however only the top and bottom three centimetres were taken for analysis. The top portion of the core is representative of modern conditions and the bottom portion is representative the of pre-disturbance conditions of the late 19th century. This frame of reference was determined by matching 210Pb dating models from previous studies with data collected from our own samples. Samples were tested for percent organic matter, bulk density, the presence of photosynthetic pigments, and for elemental composition. Rates of change between top and bottom samples varied for each lake, however overall trends indicate an increase in nutrient deposition of human origin. Conclusions drawn from this study have the potential to contribute to better lake and runoff management practices in the state of Florida.

Title: The association of hip rotational kinetics on shoulder kinetics during a baseball pitch
Primary Author: Bell, Andrew P.
Additional Authors: Giordano, Kevin; Oliver, Gretchen
Department: Biomedical Sciences
College/School: College of Sciences and Mathematics

Abstract:
The baseball pitch requires sequential summation of forces through the kinetic chain. Specifically, energy is transferred from the proximal segments (lower extremities) to the distal segments (upper extremity) to generate power for an effective pitch. Therefore, the purpose of this study is to determine the effect of hip rotational kinetics on shoulder kinetics. Sixteen right-handed youth baseball pitchers (14.1 ± 1.2 years; 175.70 ± 10.3 cm; 66.37 ± 9.1 kg) volunteered to participate. Kinematic data were collected using an electromagnetic motion capture system during game effort fastball pitches. The fastest pitch from each participant was collected for analysis. Pitches were analyzed in the phases between the following events: foot contact (FC), maximum external rotation (MER), ball release (BR), maximum internal rotation (MIR), and follow-through (FT). Linear regression was used to analyze bilateral hip internal (IR) and external (ER) rotation torques on shoulder kinetics. Results indicate that increased throwing side hip IR torque from MIR to FT (ß=.045) could predict increased shoulder net normalized torque from MER to BR (F=19.046, r^2=.546, p=.001). Likewise, a significant association was found between greater throwing side hip IR torque from BR to MIR (ß=.006) and throwing shoulder net normalized torque between BR and MIR (F=9.076, r^2=.350, p=.009). In conclusion, greater throwing side hip IR torque predicts greater shoulder net torque. This potentially indicates decreased push from the throwing side leg. Decreased ER torque (more IR torque) means less force is acting to rotate the pelvis to the glove side, potentially requiring compensation at the shoulder to maintain pitch velocity.

Title: Using an interactive phonetics learning management system and user-centered design to inform phonetics education methods

Primary Author: Bennett, Abigail L.
Additional Authors: Speights Atkins, Marisha
Department: Communication Disorders
College/School: College of Liberal Arts

Abstract:
The understanding and use of phonetic transcription is a critical skill necessary for diagnostic decisions in clinical settings. Students often report the need for more practice to be confident transcribers. To address this need, the Communication Disorders (CMDS) and Computer Science departments developed the Automated Phonetic Transcription grading tool (APTgt). This learning management system allows students to practice transcription with an interactive IPA keyboard, and it also gives the student automatic feedback about their performance in transcribing. Students in a phonetic transcription class used the APTgt for a full semester, and completed pre-and post-course surveys about their level of confidence in transcription. Student confidence was observed to significantly increase with additional practice. The APTgt has been used in CMDS courses. The aim of the current research is to investigate methods for improving the current application. To obtain feedback on the application's functionality, survey data was collected from instructors and students of phonetic transcription across the country. This survey queried the methods used to teach phonetics, the confidence level of the students before and after the course, and other details about the phonetic transcription education process. Results of a mixed methods analysis and implications for future design considerations are discussed.

Title: The incidence of green signaling on environmental products
Primary Author: Bernard, Shaniel A.
Additional Authors: Rahman, Imran
Department: Hospitality Management, Marketing, Sustainability
College/School: College of Human Sciences

Abstract:
As environmental products continue to receive greater acceptance among hospitality consumers, it is imperative to detect consumers' reaction to various environmental products through the lens of newer theories to help marketers promote them. Although a handful of studies have applied green-signaling theory to investigate consumer behavior, this theory insofar has not been applied and tested on different types of green products in a hospitality context. Therefore, the purpose of this study is to examine whether green-signaling is applicable to three products that have implications for the hospitality and manufacturing industry: green hotels, organic wines, and hybrid cars. Through two quasi-experimental studies, the incidence of green-signaling was tested with respect to price and visibility of the green product. The results show that consumers had a significantly higher purchase intention for hybrid cars (with and without status) and organic wines when compared to their conventional counterparts, while the opposite effect was found for green hotels. The practical and theoretical implications are discussed in detail.

Title: Paying for the future: the increasing role of land vale capture finance in urban development
Primary Author: Berson, Scott S.
Additional Authors:
Department: Community Planning
College/School: College of Liberal Arts

Abstract:
Land value capture mechanisms seek to provide a way for governments to self-finance infrastructure improvements by leveraging the value those improvements add to surrounding developments. As rapid urbanization puts increasing stress on cities, especially those in the developing world, governments may struggle to provide enough capital investment to meet service needs of the growing metro populations. Value capture mechanisms can provide creative ways for governments to use the functions of the private market to offset some of these costs. The core concept is that public action and investments should add value to the public at-large, not simply to a handful of private "winners." These kinds of public investments could be manifold: the creation of a new land rail line, a new park, utility systems, waterworks developments, or even regulatory changes like amendments to a zoning ordinance allowing for increased densities. This paper examines the history development value capture methods over the previous 30 years by analyzing publication trends, and then provides a matrix of different land value capture tools and their international variants as a reference for practice.

Title: Population structure of bacterial leaf spot *Xanthomonas* in Alabama
Primary Author: Bhandari, Rishi R.
Additional Authors: Newberry, Eric; Potnis, Neha
Department: Entomology and Plant Pathology
College/School: College of Agriculture

Abstract:
Bacterial leaf spot (BLS) of tomato and pepper is an endemic pathogen to the southeast United States. The disease is caused by four distinct species of *Xanthomonas*; *X. perforans* (*Xp*), X. *euvesicatoria* (*Xeu*), *X. gardneri* (*Xg*) and *X. vesicatoria* (*Xv*). In the southeast, *X. perforans* is a dominant pathogen of tomato and *X. euvesicatoria* is responsible for the disease in pepper. BLS pathogen has undergone a great shift in pathogen population structure in Florida suggesting the evolution potential of this pathogen. Lack of effective management strategies has been a continuing problem for the growers. A diverse pathogen population of *Xanthomonas* would respond differently to different control strategies. So, generalizing management strategies across southeastern United States might not be effective. In order to study the pathogen population structure of BLS in Alabama, this study involves culture dependent and culture independent (shotgun metagenomics) approach. From 150 strains of BLS *Xanthomonas* collected in the year 2017 and 2018 from different places of Alabama, we sequenced 8 representative *Xanthomonas perforans* strains by illumina MiSeq Micro platform. Phylogenetic classification of these perforans strains along with other strains collected around the world suggest the presence of two novel sequence clusters within *X. perforans* population in Alabama. Presence of *X. perforans* in pepper samples from Alabama suggest the host range expansion. Culture-independent study of diversity using shotgun metagenomics of 15 tomato, pepper and weed samples predict *Xanthomonas perforans* and *X. euvesicatoria* as a dominant pathogen in tomato and pepper, respectively. The metagenomics analysis also showed the presence of *X. perforans* in pepper sample suggesting that it might be an emerging pathogen in pepper. Shotgun metagenomics provided strain-level resolution with presence of two or more lineages of *X. perforans* in tomato samples. We also observed presence of co-infection by multiple species/genera in tomato/pepper samples suggesting shotgun metagenomics can be used for higher resolution of pathogen population structure in diversity studies.

Title: Therapeutic applications of an algorithm for ultra-rapid binding interaction engineering
Primary Author: Bhattacharya, Ritankar
Additional Authors: Chauhan, Varun; Pantazes, Robert
Department: Chemical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:

Proteins mediate the fundamental processes of life and the ways in which they do so have been the focus of biomedical research for over 50 years. A growing field is the use of proteins as therapeutic agents, including both naturally and computationally developed proteins. Antibodies (Abs) or Immunoglobulins (Igs) are essential therapeutic immune proteins that are necessary for defending the body against invading pathogens. They do this by recognizing the sites, binding to markers and carrying out effector functions, which activates the immune system of the organism. However, designing Igs in the laboratory can be time-consuming, expensive and can end up being inefficient in binding with a specific epitope. Thus, to solve this problem, Igs and Ig-like scaffolds are being designed computationally and tested in the laboratory. These include nanobodies (Nb), single chain variable fragments (scFv), fibronectin domains (Fn3), etc. These alternative scaffolds offer several advantages such as higher tumor penetration and lower cost of design, while retaining high binding affinity and specificity. To rapidly design these proteins, our lab developed an Algorithm for Ultra-rapid Binding Interaction Engineering (AUBIE). It is used for the fast and de novo design of high affinity Igs and alternative scaffold. Here, we present the results of applying AUBIE to designing several varieties of binding proteins against various antigenic epitopes. Results include: Igs that bind the same epitope on HER2 as Herceptin, a multi-billion dollar medication; Fn3 domains that bind Campylobactor jejuni membrane proteins for use in biosensors; Fn3 domains to distinguish between methicillin-resistant *Staphylococcus aureus* and non-antibiotic resistant *S. aureus*; and Nbs that bind Interleukin-2 receptors for targeting cancer vaccines. These results demonstrate how AUBIE can be quickly used for designing highly-promising binding proteins for a variety of biomedical applications.

Title: Modelling carbon footprint for data centers worldwide
Primary Author: Bhattacharya, Tathagata
Additional Authors: Xiao, Qin
Department: Computer Science and Software Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Minimizing the global carbon footprint has become one most of the most discerned issues today. Data centers, throughout the world have managed to contribute significant amounts of Carbon dioxide, Methane and Sulphur dioxide in the air due to its enormous energy consumption and cooling technology. For example, US data centers consumed 91 billion kWh electricity in 2013, which is equivalent to two years worth of the energy consumption of New York City households. Currently data centers are consuming three percent of global energy which produces 200 metric tons of Carbon dioxide. In order to reduce the carbon emission, data centers have adapted several strategies like renewable energy consumption, virtualization, VM live migration etc. Due to Geographical locations, availability of renewable energy resources and a concrete prediction model, it is difficult for the data centers to figure out a solid strategy to optimize the Carbon Dioxide emission. Their approach should fulfil the overall energy demand, Service Level Agreement (SLA), Quality of Service (QoS) as well as reducing the carbon footprint. We focus to train a model with practical data from the google search engine in order to predict the carbon emission from the data centers. This model will analyse multiple strategies applied by the data centers globally and determine the best possible way the data centers can approach methods to reduce the carbon footprint in the world.

Title: Production and application of manure nitrogen and phosphorus in the continental U.S. during 1860-2017
Primary Author: Bian, Zihao
Additional Authors: Tian, Hanqin; Yang, Qichun; Xu, Rongting; Pan, Shufen
Department: Earth System Science
College/School: School of Forestry and Wildlife Sciences

Abstract:
Livestock manure, as organic sources for nitrogen (N) and phosphorus (P), plays an important role in nutrient cycling. Given the agricultural benefits and environmental pollutions brought by manure, it is of great importance to estimate the spatial variations and temporal trajectories of manure production and its application in countries with high livestock production. Here, we develop annual manure N and P productions and applications dataset in the continental U.S. at 30 arc-seconds resolution over the period of 1860-2017. The dataset combines multiple data sources including long-term information on populations of animal species and their excretion at the county level, the spatial distribution of livestock, as well as land-use types. Additionally, the change in livestock weight over time driven by advancing farming technologies is considered in this study, and its impact on manure nutrient production is captured. The total productions of manure N and P increased significantly from 1.4 Tg N yr-1 and 0.3 Tg P yr-1 in 1860 to 7.4 Tg N yr-1 and 2.3 Tg P yr-1 in 2017, driven by increased livestock numbers before the 1980s and enhanced livestock weights after the 1980s. The high-nutrient region, mainly enlarged from the Midwest toward the southern U.S., became more concentrated in numerous hot spots after 1980, stimulated by increased concentrated animal feeding operations (CAFOs). Manure application gradually expanded from the inland to seashore, which may cause massive nutrient export to the estuary. The South Atlantic-Gulf and Mid-Atlantic were identified as critical coastal regions with high environmental risk due to the intensive enrichment of manure nutrient production and application from the 1970s to 2010s. This long-term manure N and P dataset can provide detailed information for further research on nutrient allocations and cycling in terrestrial and aquatic ecosystems.

Title: Cost optimization of permeable pavements for storm water management
Primary Author: Biessan, Don Guy V. V.
Additional Authors:
Department: Civil Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Permeable pavements have the potential to greatly increase the sustainability of stormwater management in Alabama by reducing disturbance to surface water quantity and quality from urban development. To be widely adopted, permeable pavements must be able to compete with conventional practices on both performance and cost. Permeable pavements are currently perceived as expensive options, but there is a near infinite number of ways that permeable pavement systems could be designed to reduce cost while still meeting its performance requirements. Minimizing costs will promote the use of permeable pavements and maximize the environmental benefits received from investment in them. The product of this project is a tool that will benefit Alabama municipalities and owner agencies in that it will help achieve cost optimization for their permeable pavement systems for stormwater. This tool will support three types of permeable pavements (pervious concrete, porous asphalt and porous pavers) and it is important to note that no agency possesses a tool that help design these three types of permeable pavement at once. This tool will assist in identifying which, or in what combinations, the use of permeable pavement systems will minimize costs. The algorithm will be designed to be expanded to include other techniques in the future. Further, the product of this research will be intended for use in MS Excel, a common computing tool that most (if not all) design engineers and decision makers have available. Thus, there will be no need to invest in and learn complex modeling or optimization packages.

Title: Drivers of herbivorous insect diversity
Primary Author: Bird, Gwendolyn M.
Additional Authors: Hardy, Nate
Department: Biology (Evolution/Ecology)
College/School: College of Agriculture

Abstract:
Herbivorous insects are one of the most diverse groups of organisms on Earth, accounting for one third of all described species. It is often assumed that the diversity of these insects is related to the diversity of their hosts, especially considering that the vast majority of herbivorous insects are diet specialists. But the insects face pressure not just from host limitations, but from other aspects of their habitat, such as environmental variables and enemies. In this study, we utilize spatial autocorrelation-corrected path models to untangle the relationship of the spatial diversity of several herbivorous insect clades (*Aphididomorpha*, *Lepidoptera*, and *Chrysomelidae*) to the spatial diversity of their known hosts, enemies, and environmental conditions, to determine the causes of diversity. We find that plant diversity and other niche factors have an approximately equivalent effect on aphid diversity. Our results suggest that when researchers are attempting to explain the diversity of herbivorous insects, as well as other parasites, they need to take more into account than just the diversity of their hosts.

Title: Energy transfer in youth softball pitchers during a simulated game
Primary Author: Blackstock, Sarah A.
Additional Authors: Skinner, McLain; Downs, Jessica; Wasserberger, Kyle; Oliver, Gretchen
Department: Kinesiology
College/School: College of Education

Abstract:
Softball pitching involves the transfer of energy through the kinetic chain to achieve maximum performance. Energy is generated from the lower extremities then transferred to the trunk, arm, and finally into the ball. Optimal energy flow has been linked to higher pitching velocities and increased pitching efficiency. Alternatively, fatigue has been related to decreased performance and increased injury risk. Thus, the purpose of this study was to determine if youth softball pitchers exhibit a change in kinetic chain energy transfer between the first and last inning of a simulated game. Twenty-seven (12.4 □1.4yrs, 160.86 □8.86cm, 60.70□14.22kg) youth softball pitchers participated in this study. Participants were given an unlimited amount of time to warm-up before pitching a simulated game. Three changeups in the first inning and three changeups in the last inning were recorded and the averages from each inning were used for analysis. Energy transfer to and from the trunk and humerus during phase 1 and 2 in the pitching motion were analyzed. Phase 1 was defined from the top of backswing to foot contact and phase 2 was defined from foot contact to ball release. Due to non-normally distributed data, a Wilcoxon Signed Rank test (□ = 0.0125) was used to determine any significant differences in energy transfer to and from the trunk and humerus between the first and last inning. The test revealed no significant differences. Although there were no significant differences, the increase in energy transfer to the trunk during phase 2 was approaching significance (p=.037). The lack of significant differences may be a result of analyzing youth pitchers and their varying experience levels in this age group. Additionally, this study examined the changeup pitch, the slower pitch speed of the changeup may impact energy transfer. Future studies should continue to examine how energy is transferred among the kinetic chain, and how specific pitching mechanics may impact energy transfer.

Title: Synthesis and phase behavior of manganese dioxide (MnO2) nanowires
Primary Author: Bockhold, Mackenzie L.
Additional Authors: Hamade, Fatima; Parsons, Lindsey; Davis, Virginia A.
Department: Chemical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
The synthesis and self-assembly of manganese dioxide nanowires in polar solvents were investigated. Inorganic nanowires are of interest due to the novel electronic, optical, and mechanical properties that their chemistry and one-dimensional nanoscale morphology induces. Specifically, manganese dioxide nanowires are of note because of their potential uses as electrode materials and sensors. The manganese dioxide nanowires were synthesized via a quick-precipitation solution-based method. The dispersibility and self-assembly of the manganese dioxide nanowires were studied in both dimethyl sulfoxide (DMSO) and ethylene glycol (EG). The materials and all dispersions in this work were characterized using a combination of UV-vis spectroscopy, scanning electron microscopy (SEM), atomic force microscopy (AFM), and polarized optical microscopy (POM). Sheared and unsheared films were produced from these dispersions and studied via SEM and POM. These results represent a first step for producing a phase diagram for the nanowires in ethylene glycol.

Title: Psychopathy and risk for sexual offending in incarcerated adolescents
Primary Author: Bond, Tiana M.
Additional Authors: Thompson, Kelli R.; Roth, Andrew J.; McTier, Karrington L.
Department: Psychology
College/School: College of Liberal Arts

Abstract:
Psychopathy within incarcerated adolescent populations has been a primary research interest for several years. The Psychopathic Checklist: Youth Version (PCL:YV) has been considered the gold standard in measuring the interpersonal, affective, lifestyle, and antisocial dimensions characteristic of psychopathy. The PCL:YV can predict adjustment to a treatment program as well as recidivism after completion. For this reason, it is often a primary assessment tool when working with adolescents in residential and correctional settings. Adolescents adjudicated for sexual offenses represent a unique group of juvenile offenders with very specific treatment needs and risk factors. The Juvenile Sex Offender Assessment Protocol (JSOAP-II) is the most commonly used risk assessment tool for this population. The current study sought to examine which dimensions of psychopathy were associated with overall risk for sexual offending in a sample of detained adolescents. Participants (n = 671) included adolescents court mandated to complete the Accountability Based Sex Offense Prevention Program (ABSOPP) at the Mt. Meigs juvenile detention center. Data was collected upon entering the program, pre-treatment, to determine treatment needs and assist with treatment planning. Psychopathic traits were measured using the PCL:YV and overall risk for sexual offending was measured using the JSOAP-II. After data collection, linear regression analysis was used to determine if the four factors of the PCL:YV significantly predicted overall risk for sexual offending. Results indicated all four dimensions significantly predicted overall risk. The affective dimension carried the most amount of unique variance indicating that it was the best predictor of overall risk for sexual offending. The affective factor includes dimensions of remorse, guilt, and empathy which are often key targets in sexual offense specific treatment models.

Title: Dispossession of community: industrial animal production in rural Missouri
Primary Author: Boutwell, Crystal J.
Additional Authors:
Department: Rural Sociology
College/School: College of Agriculture

Abstract:
This paper connects dispossession and community in order to better illuminate the experiences of rural people who live near an industrial livestock operation. It expands the discussion around 'accumulation by dispossession', a concept created by David Harvey to explain the process of turning a previously non-profitable resource into a profitable use. Thus far the concept has been applied to the discussion of land-grabs, limited to "periphery" contexts, and the forms of dispossession discussed have remained primarily economic. The implications to people who remain on their land, and who live in "core" economic regions, and experience non-economic forms of loss such as cultural, social, psychological losses have yet to be taken into consideration. Expanding the scope of dispossession to non-economic examples such as the loss of positive associations to community serves to illuminate impacts of industrial agricultural operations on rural people. Applying dispossession to contexts where communities experience forms of loss due to Concentrated Animal Feeding Operations (CAFOs) are of political and social relevance as CAFOs are gaining increased attention in the media and academia due to public health concerns and nuisance lawsuits filed by neighbors of the operations. This paper draws upon the qualitative methods of open-ended interviews and participant observation to analyze major themes of loss experienced by rural Missourians who live near proposed or existing CAFOs. Based on the results of this study, I offer loss of positive ties as a form of dispossession related to community, with ties to ecological health, ties to place, and ties to people as three types of dispossessions experienced by rural Missourians who live near CAFOs. Finally, this article argues for exploration of other non-economic forms of dispossession as a means to bringing the experiences of rural people living near industrial agricultural operations into the critical analysis of capitalism.

Title: Development of algal-bacterial wastewater treatment systems that are effective in the presence of antimicrobial processing aids used in the poultry processing industry
Primary Author: Box, Justin T.
Additional Authors: Higgins, Brendan
Department: Bioprocess Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Poultry processing facilities utilize a range of antimicrobial processing aids to meet stringent food safety standards. While effective at killing pathogens, antimicrobials have the unfortunate side effect of harming the "good" bacteria that are critical in wastewater treatment processes. Past research on high-strength wastewaters has shown that adding algae to wastewater treatment processes can help bacteria more effectively carry out nitrification, even in a toxic environment. This algal-bacterial wastewater treatment process holds the potential to reduce the risk of wastewater process failure and the consequent liability to the industry. This research compares the effectiveness of an algal-bacterial process to a bacteria-only wastewater treatment process in the presence of two antimicrobial aids commonly used in the poultry industry: Peracetic acid (PAA) and cetyl pyridinium chloride (CPC). The results of two dose response studies show that Chlorella sorokiniana algae has similar sensitivity to PAA as nitrifying bacteria, with an EC50 of about 7.5 mg/L. Likewise, algal sensitivity to CPC was similar to activated sludge bacteria, with an EC50 of about 1.5 mg/L. These concentrations of PAA and CPC are close to the critical thresholds of toxicity to key bacterial groups in wastewater found in previous research. In a bacteria-only treatment process, results show that 1.5 mg/L of CPC does inhibit nitrification due to the suppression of ammonia and nitrite oxidizers to form nitrite and nitrate. The next step was to determine the effect of adding algae to an aerobic bacterial treatment of poultry processing wastewater in the presence and absence of PAA or CPC. Initial results show that 7 mg/L of PAA suppresses nitrification, however, the addition of algae to the process indicates an alleviation to this suppression. The next steps in this study is to confirm these results by repeating this experiment with PAA as well as performing similar trials using CPC.

Title: Effects of per- and polyfluoroalkyl substances on sex steroid hormone secretion in the male rat gonad

Primary Author: Bradley, Samantha M.
Additional Authors: Knight, Rachel; Jeminiwa, Bamidele; Feltman, Meredith; Hayworth, Joel; Akingbemi, Benson
Department: Biomedical Sciences
College/School: College of Veterinary Medicine

Abstract:
Per- and polyfluoroalkyl substances (PFASs) are used in the manufacture of fire safety foams, non-stick dishware, photo-imaging products, and many other everyday items. Unregulated disposal contaminates groundwater for both drinking and agriculture. It's speculated that short-chain PFASs, i.e., perfluorobutanoic acid (PFBA) and perfluorobutanesulfonic acid (PFBS), may be safer than long-chain perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS) due to faster metabolism and degradation. There is little data on hormonal activity and/or endocrine-disruption from short-chain PFASs. Thus, we compared the effects of long and short-chain PFASs in the male neuroendocrine axis, focusing on testicular toxicity. First, male Long-Evans rats were administered PFOA or PFBA in drinking water at 1, 10, 100, and 1000 ng/L for 14 days, from 21-34 days of age. Second, animals were administered PFOA or PFBA in drinking water at 10 or 100 ng/L for 28 days, from 21-48 days of age. In both cases, testicular tissue and Leydig cells were incubated without (basal) or with 100 ng/mL ovine LH for 3 h. The concentrations of testosterone (T) in serum and spent media were determined by RIA. Results showed that exposure to 10 ng/L PFBA increased serum T compared to control ($p<0.05$) in both experiments. In experiment two, basal and LH-stimulated Leydig cell T production was increased after exposure to 10 ng/L PFOA and PFBA. These data demonstrate that PFOA and PFBA may exert dose-dependent effects on serum and testicular T concentrations. Any disparity in trends of serum and testicular T concentrations may be due to changes in Leydig cell population and/or LH sensitivity. Moreover, either prolonged androgen excess or deficiency will impact germ cell development and sperm production. These possibilities warrant further studies. Investigation of additional exposure paradigms will help identify differences in testicular toxicity between long- and short-chain PFASs.

Title: Consequences of seeking the best alternative: a preliminary meta-analytic examination of the maximizing construct and wellbeing
Primary Author: Brashears, Sydney B.
Additional Authors: Acosta, Joshua; Willits, Taylor; Michel, Jesse; Franco-Watkins, Ana
Department: Psychology
College/School: College of Liberal Arts

Abstract:
The maximizing decision-making style is distinguished by desiring only the best option among competing alternatives. Research shows that maximizers exhibit better objective performance, but their subjective well-being often suffers as a result. Due to a host of conflicting literature on this topic, the goal of the following research is to clarify the relationship between maximizing and well-being by conducting a meta-analysis. Originally conceptualized by Schwartz and colleagues, maximizing is comprised of three factors: decision difficulty, alternative search, and high standards. Decision difficulty refers to the internal conflict incurred when one is presented with a decision-making opportunity. Alternative search reflects the propensity to seek out additional alternatives to reach or exceed the threshold of typically high standards. We examine the most prevalent well-being variables found in the maximizing literature. Across the span of the forty-three articles analyzed, initial results suggest a generally negative relationship between maximizing and well-being: subjective happiness (rho = -.08), satisfaction with life (rho = -.05), and positive affect (rho = -.13). Our results suggest that maximizers have a predisposition to lower levels of well-being, posing the question: do the risks to well-being outweigh the reward of seeking the best possible outcome?

Title: Past and future of designer drugs: a meta-analysis
Primary Author: Bricco, Katherine E.
Additional Authors: Ramesh, Sindhu; Govindarajulu, Manoj; Deruiter, Jack; Clark, Randall; Dhanasekaran, Muralikrishnan
Department: Pharmacy
College/School: Harrison School of Pharmacy

Abstract:
Designer (or synthetic) drugs are defined as "illicitly produced with the intent of developing substances that differ slightly from controlled substances in their chemical structure while retaining their pharmacological effects". Designer drug production initially arose as legal regulatory bodies began to ban and regulate various chemical compounds due to their various psychostimulatory effects. Currently many drug manufacturers produce drugs of abuse in clandestine labs and distribute them illicitly to mimic and/or enhance psychostimulatory effects. As of 2017, United Nations determine that 5.5% of the global population aged 15-64 had used illicit drugs. Over the past years the use of illicit drugs globally has steadily increased. As the use of illicit drugs increases so have the increase in development and use of designer drugs. With the rise of synthetic or designer drug abuse and substantial diversity in adverse effects among formulations available there is an increase in crime and health concern on global populations. Combined meta-analysis of statistics in illicit drug use and abuse trends. The primary conclusion was determined by analysis of lifetime and first-time use of illicit drug trends from global safety and anti-drug databases. Secondary conclusions and reasoning for future research were determined by overdose trends compiled by the CDC. The most common drugs of abuse in the past 5 years included: cocaine, methamphetamine, marijuana, heroin, and hallucinogens. Of these common illicit drugs there are over 200 identified synthetic or designer versions of the drug circling the globe. Over the past years as the increase in designer drug production increases there has also been a large jump in the number of overdose deaths due to designer drugs. This increase in the number of overdose death leads to an increase in global concern and need for further research regarding adverse health outcomes of these unregulated substances.

Title: Characterization of left ventricular noncompaction engineered cardiac tissue
Primary Author: Brien, Hannah J.
Additional Authors: Ellis, Morgan; Lipke, Elizabeth
Department: Chemical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Left ventricular non-compaction (LVNC), which can cause arrhythmias, blood clots, and even cardiac failure, is the third most prevalent type of cardiomyopathy observed in children. LVNC is characterized by deep, extensive trabeculations of the left ventricle which resembles the embryonic “spongiform” myocardium. Although LVNC is linked to genetic mutations, the exact mechanism behind this mutation has not yet been determined. Therefore, the purpose of this study is to examine LVNC in vitro using patient-derived cell lines specifically in terms of cell proliferation and tissue stiffness by producing both diseased and corrected engineered cardiac tissues (ECTs). These ECTs are formed by combining human induced pluripotent stem cells (HiPSCs) with a biomaterial, PEG-fibrinogen, to form both microsphere and microisland hydrogels that are directly differentiated. To examine differences in tissue stiffness, the LVNC and corrected ECTs undergo mechanical compression testing both before and throughout differentiation. To visually compare the size and shape of the ECTs, phase contrast images are also taken at various time points before and throughout differentiation. After differentiation, the cell population and differentiation efficiency is examined using flow cytometry. Based on the characteristics of LVNC, it is expected for the diseased tissues to show less proliferation, exhibit a lower stiffness, and have a lower number of cardiomyocytes when compared to the corrected tissues. The results of this study will help advance the understanding of LVNC and its mechanisms as well as aid in the overall development of in vitro drug testing.

Title: Manipulation of copolymer compositional drift and quantitative analysis of copolymers using low-field 1H NMR
Primary Author: Brimmer, Bradley T.
Additional Authors: Beckingham, Bryan
Department: Chemical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
The properties of polymer materials are intrinsically linked to the chemical structure and composition of the polymer constituents. In the case of copolymers, the compositional ordering of monomers along the polymer chain has a profound impact on bulk polymer properties. Over the last several decades there have been significant advances in utilizing simultaneous polymerization of multiple monomers, and manipulating the relative composition of the comonomers as a strategy for tuning polymer properties. Recently, our group has leveraged in situ ATR FTIR spectroscopy to fully characterize the compositional drift during the anionic copolymerization of styrene and isoprene as solvent polarity is varied. For these two comonomers we have been able to tune the compositional profile between extreme block copolymer formation and compositionally flat profile. Here, we apply this methodology and investigate the translation of this behavior in compositional drift for the anionic copolymerization of isoprene with other substituted stryrenics. Furthermore, the ability to quantitatively characterize the composition of copolymers and polymer blends is important for understanding both the preceding polymerization reactions as well as connecting polymer structure to the ultimate material properties. Here, we also benchmark the use of low-field 1H NMR spectroscopy as a low cost and quantitatively effective technique for characterizing the composition of multicomponent polymer systems such as copolymers and polymer blends.

Title: An evidence-based design approach to a transition center that promotes health equity for individuals with autism spectrum disorder
Primary Author: Brown, Courtney A.
Additional Authors: Lushina, Bailey
Department: Consumer and Design Sciences
College/School: College of Human Sciences

Abstract:
More than 3.5 million Americans live with Autism Spectrum Disorder (ASD) and each year the prevalence increases between 5 and 16 percent (The Centers for Disease Control and Prevention, 2019). As ASD becomes more common, the need for spaces that accommodate these individuals and their sensory needs are increasingly essential (Center for Autism Research, 2016). Healthcare and educational options for individuals with ASD are limited and lacking in quality due to difficulties in diagnosis, clinical qualifications and stigma related to the disorder (U.S. Department of Health and Human Services, 2017). These limitations lead to the lack of support for families and proper evidence-based design intervention programs. To better support for adults transitioning from school into the workforce a conceptual project, Node Transition Center, was developed to be a diverse facility that address the unique needs of individuals across the autistic spectrum. When transitioning from school to work these individuals are especially vulnerable to social exclusion and bullying due to the absence of visible markers of the developmental disorder. The intention of this facility is to aid this vulnerable population through this transition. Because each individual with ASD is uniquely affected by sensory stimuli, the design is flexible to accommodate the various ways in which individuals may respond. The interactive design of the transition center is modeled after nodes in the brain, a point in which lines or pathways intersect or branch; a central or connecting point. Similar to nodes in the brain, the Node Transition Center aims to provide connectivity within the wayfinding scheme, integration of technology and the end user's sense of connection to their environment and community.

Title: Survey of commercial sprayers in Alabama for dicamba residue retention following triple rinse with water
Primary Author: Browne, Frances B.
Additional Authors: Li, Steve; Price, Katilyn; Langemeier, Ryan
Department: Crop, Soil and Environmental Sciences
College/School: College of Agriculture

Abstract:
Field experiments were conducted to investigate the risk for sprayer contamination following dicamba applications. Three commercial sprayers were evaluated in 2017 for dicamba residue retention following four cleanout protocols. Dicamba was applied at 1.12 kg ae per ha with a carrier volume of 93.5 L per ha. One cleaning method was triple rinse with water and the remaining three included a first rinse of 3% v/v ammonium and third rinse of water and the second rinses were either glyphosate, Fimco, or Protank detergent at 5.11 kg ai, 0.90 kg, and 0.95 L per 378.5 L water, respectively. For each rinse, 378.5 L of water and assigned cleaning agent were added. Samples were collected at each rinse and a fourth rinse using only water was included to demonstrate efficacy. Dicamba concentrations of final rinsates did not exceed 1.25 ppm regardless of cleanout method or sprayer and at least 99% of initial dicamba contaminant was removed by the third rinse. Furthermore, fourth rinsates were applied to sensitive soybean and no plant response was observed. These data suggest triple rinse with water is comparable to commercial tank cleaners for dicamba removal. To further test efficacy of this protocol, a survey of 25 commercial agriculture sprayers was conducted in 2019. Sprayers were mixed for 15% tank capacity with dicamba at 560 g ae per ha + a drift reduction agent (Intact) at 0.5% v/v and calibrated for a carrier volume of 140 L per ha. Following applications, four rinses of water were conducted at 15% tank capacity and rinsates were collected from the left, middle, and right sections of the boom at each of the four rinses. Similar to the replicated study, majority of sprayers retained less than 1% of initial dicamba contaminant by the third rinse. Rinsates collected at the fourth rinse did not exceed 1 ppm and are not likely to result in soybean yield loss. These data suggest triple rinse with water is sufficient for dicamba removal from sprayer equipment.

Title: Role of mineralogy in controlling fracture formation
Primary Author: Brunhoeber, Olivia M.
Additional Authors:
Department: Civil Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
In subsurface CO_2 systems, including geologic sequestration, impermeable caprocks are needed to prevent fluid leakages and maintain system integrity. Consequently, caprock fractures have the potential to induce system failure but the formation and evolution of such fractures is not well understood. If the injected CO_2 phase encounters exposed minerals at the fracture surface, dissolution and precipitation reactions may occur. The rate and impact of these reactions, and resulting changes to fracture aperture and permeability, are dependent upon what mineral phases constitute the fracture surface. Rock matrices are often heterogeneous and it is not known what minerals will be exposed on the fracture surface. In this work, we investigate what role mineralogy plays in controlling fracture formation to enhance understanding of what phases will be most prevalent on the fracture surface to ultimately providing better estimations of the reactions and impacts thereof. Here, fractures in Marcellus shale cores are examined after fractures are induced using unconfined compression. A scanning electron microscope (SEM) is used to examine unaltered fracture surfaces and the surrounding matrix to identify mineralogy and mineral volume fractions. Processed images are then compared to examine the distribution of mineral phases at the fracture surface in comparison to the overall distribution, determining whether or not the fracture surface mineralogy is unique.

Title: Quantifying variability in soil macropore characteristics in a pasture field
Primary Author: Budhathoki, Suman
Additional Authors: Lamba, Jasmeet; Srivastava, Puneet; Malhotra, Kritika; Way, Thomas; Katuwal, Sheela
Department: Biosystems Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Soil macropores largely control the transport phenomenon of water and solutes in subsurface flows. Preferential flow via soil macropores can affect water quality substantially. Hence, it is important to quantify soil macropore characteristics and link this information with the preferential flow behavior in soils. In the past few years, X-ray Computed Tomography (CT) has emerged as a powerful technique to quantify and visualize the 3D soil macropore characteristics. The objective of this study was to use X-ray CT and image analysis to characterize soil pore structure required to describe the water and solute flow in the soil profile. A total of 36 undisturbed soil columns (16 cm outer diameter and 50 cm depth) were collected from a pasture field located at the Sand Mountain Research and Extension Center, Alabama, during May and September of 2019. Six cores were collected from each topographical location within the field. The cores were scanned using a medical CT scanner to produce images with a voxel size of 0.3516*0.3516*0.625 cubic mm. A public domain software program Fiji (a distribution of ImageJ) was used to analyze and quantify macropore characteristics. Results on variability in soil macropore characteristics (e.g., macroporosity, macropore number, macropore density, macropore length, length density, tortuosity) as a function of soil depth in a pasture will be presented.

Title: Does a defendant's ascribed socio-economic status impact mock jurors' verdict and sentencing decisions?

Primary Author: Burgos, Denise E.
Additional Authors: Cox, Brittany D.; Carol, Rolando N.
Department: Clinical Psychology
College/School: College of Sciences

Abstract:
The current study examined the effect of ascribed Socio-economic status (SES) on mock juror verdicts and sentencing. Ascribed SES refers to a financial status that was determined for the individual by his/her family, but not earned by the individual him/herself. The present study is a follow-up to a previous study where the defendant's ascribed SES and crime type were manipulated. This study focused on one particular crime type, (i.e., Robbery II), which was perceived as most ambiguous by mock jurors during the previous study. We predicted defendants with a low ascribed SES would receive more guilty verdicts and more punitive sentences than defendants with a high ascribed SES. Participants (N = 223) read and listened to a case summary where evidence was ambiguous and the defendant either had a high or low SES (determined by random assignment). Next, they gave a verdict, a written justification, and then recommended a prison sentence (ranging from probation to 20 years). Participants also completed the following questionnaires: the PJAQ, the revised BJW Scale for Others, a defendant trait assessment measure, and a demographics survey. Lastly, participants were fully debriefed. Analyses revealed no main effect of ascribed SES on jurors' verdicts or recommended sentences. This finding is consistent with prior research, as many studies have noticed interactive effects (e.g., juror/defendant ethnicity and SES) on verdicts, but not a main effect of SES. Regarding the defendant's perceived traits, mock jurors rated the high SES defendant as significantly more selfish, greedier, and less mature than the low SES defendant at the .05 level, although these ratings did not translate into harsher punishments. Further, our manipulation check confirmed that participants perceived the high SES defendant as holding a higher status in society than the low SES defendant. Data analysis for participants' written justifications of their verdicts is ongoing.

Title: Social video game play behaviors and adult mental health and social support
Primary Author: Burke, Benjamin M.
Additional Authors: Lucier-Greer, Mallory; Duncan, James; Frye-Cox, Nicky
Department: Human Development and Family Studies
College/School: College of Human Sciences

Abstract:
Despite extensive investigation into the effects of video game play on adolescents, less is known about the role of this leisure activity on the individual and relational well-being of adults. This is surprising given that over 70% of video game players are 18 years old or older and video games may be a mechanism for social engagement and connection. Using the Social Organization Theory of Action and Change (SOAC), this study sought to address this gap by examining the associations between social video game play (e.g., playing with friends, family) and the individual and relational well-being of adults. The SOAC posits that individual outcomes are improved through feeling a sense of connection with one's communities. Because gaming is often a social experience, engagement in social gaming behaviors may reflect a sense of community connection, which could be related to individual and relational outcomes. To test this hypothesis, data were collected from an online survey completed by 230 adult video game players. Participants reported on social gaming behaviors as well as individual and relational outcomes. More specifically, we explored the associations between social video game play behaviors (e.g., frequency of/satisfaction with playing with friends, family, and romantic partners, social motivation for play) and measures of mental health (e.g., stress, loneliness, depression) and social support. Results indicate that frequency and satisfaction of play with others, as well as social motivations for play, were not correlated with loneliness, depression, or perceptions of social support. However, social motivation to play was positively correlated with stress, which may suggest that adult gamers engage in more community gaming behaviors when stressed. Non-significant findings may indicate that gaming does not support community engagement or that this engagement is better measured through other social gaming behaviors (e.g., communication).

Title: Events boundary effects on speech in physical and virtual reality environments
Primary Author: Burks, Brianna P.
Additional Authors: Bailey, Dallin J.; Seals, Cheryl; Lusta, Majdi; Xie, Tianshi; Sargsyan, Nikolay; Liu, Jueting; Korlapati, Soundarya
Department: Communication Disorders
College/School: College of Liberal Arts

Abstract:
Speech-language pathologists (SLPs) provide rehabilitative services for persons with communication disorders such as aphasia and apraxia of speech. Both of these disorders disrupts an individual's ability to communicate. While SLPs often see strides of progress during session work, the progress may not carry over to other environments, such as home. This problem with generalization affects people with aphasia. One possible reason for this may be that patients are changing learning contexts, which has an impact on memory and speech, especially for older adults. Event cognition states that the mind automatically separates events, often by physical boundaries. We wanted to see if event cognition effects on memory and speech production, which have been found in physical reality, could also be found in a virtual reality environment. To test this, we collaborated with a software engineering team at Auburn University to create a replica of the physical environment, two labs in Haley Center, and all of the doors and hallways in between, to allow experiment building and testing of memory and speech production in both the physical and virtual environments. In addition, a table and moveable picture cards, matching the physical picture cards allows for basic experiments concerning memory and speech to be carried out in both the physical and virtual realities. The virtual environment is now ready for experiments into event cognition and the event boundary effect. Experimental studies currently being carried out include replicating the speech production findings of Meagher and Fowler (2014). Results of this and other studies have implications for better understanding event cognition effects on speech production, which may impact generalization in speech therapy for individuals with aphasia or apraxia of speech.

Title: Developing MATLAB code for analysis of calcium propagation through heterogeneous engineered cardiac tissue
Primary Author: Bush, Michaela Z.
Additional Authors: Lipke, Elizabeth; Ellis, Morgan; Finklea, Ferdous
Department: Chemical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Cardiac disease is one of the leading causes of death globally. In order to replace damaged heart tissue, the Lipke lab is developing engineered cardiac tissue (ECT). Analyzing the calcium propagation of ECT is one way to determine how well it functions. The calcium propagation is captured using a high-speed camera via optical mapping. The purpose of this study was to develop a custom MATLAB interface to quantify the calcium propagation captured in the video recordings. The interface is intended to be self-explanatory, containing all information about how to operate it within itself. Due to the heterogeneous nature of ECT, not all parts of the tissue sample can be analyzed, nor do all pixels in the video represent ECT. Some pixels only contain ECT due to contractile motion. None of these pixels are fit for analysis, so multiple methods were designed to both detect and remove unusable pixels. After the data is filtered and processed, the number of calcium propagations is counted, which appear as waves of a pixel's fluorescence over time. This tells the code how many peaks and troughs of waves it should find. Next, an interface was designed to calculate the calcium transient duration (CTD) and heterogeneity index of the tissue using peaks and troughs of the waves. The code that finds peaks, troughs, and the CTD is optimized for speed and accuracy, and it can check itself for invalid results. The interface can also export Isochrone maps of calcium propagation and the plot of any pixel over time with the transient duration displayed. Finally, an interface was developed to calculate conduction velocity (CV) of the calcium ions by determining the speed calcium travels between pairs of points on the tissue chosen by the user. Using the CV, the propagation frequency can be calculated using the wave equation. This data can all be exported into an Excel spreadsheet for further analysis. This code allows us to quantify calcium propagation to test the functionality of our ECT.

Title: Comparison of dynamic and non-dynamic weighing methods for determination of individual broiler chicken body weight over time
Primary Author: Calderon, Allan J.
Additional Authors: Avila, Luis; Flees, Josh; Starkey, Charles; Starkey, Jessica
Department: Poultry Science
College/School: College of Agriculture

Abstract:
Human error can be a cause of variation when conducting research projects, especially when experiments involve obtaining bird weight data as birds tend to move when performing this measurement. Additionally, the weighing of individual animals can take a significant amount of time and, therefore, pen weights are often used instead. However, pen weights do not allow for the calculation of BW variation over time. Therefore, the objective of this experiment was to evaluate the accuracy and efficiency of using an Ohaus Defender® 7000 scale with a 2-s, semi-automated dynamic weighing mode (DM) compared with the conventionally used, non-dynamic weighing mode (NDM). DM measures the weight 10 times per s and provides the user with the most frequent weight observed during the weighing period. On d 21, 42, and 56, 20 birds were randomly selected to be individually weighed using both weighing methods to record a live weight (LIVEBW) using a static analytical scale on both methods. After measuring LIVEBW, birds were euthanized to obtain the true bird BW (TRUEBW). The absolute difference between LIVEBW and TRUEBW was calculated for both methods to assess accuracy. For both DM and NDM, the time required to obtain a still BW (TSBW) was measured from the moment that the bird was placed on the scale until the BW fluctuation was 0 g. Data were analyzed using the GLIMMIX procedure of SAS (v9.4) and means were separated using PDIFF when $P \leq 0.05$. On d 21, the use of DM reduced the absolute difference of LIVEBW from TRUEBW compared with NDM (1 vs. 4 ± 1 g; $P = 0.0210$) but was similar on d 42 or 56 ($P \geq 0.2453$). As importantly, on d 21, the TSBW using DM was 4-fold lower than NDM (3.0 vs. 15.7 ± 2.4 s; $P < 0.0001$), 10-fold lower on d 42 (3.0 vs. 34.7 ± 3.4 s; P < 0.0001), and 11-fold lower on d 56 (3.0 vs. 37.4 ± 3.1 s; P = <0.0001). The use of DM for weighing broilers resulted in a faster, more efficient, and in 3-wk-old birds, a more accurate method to determine individual broiler BW.

Title: Evaluation of the Effects of Work and Heat Exposure on Cognitive Function in Firefighters
Primary Author: Campbell, Abigail C.
Additional Authors: Burns, Angela; Lyons, Kaitlin; Dadematthews, Oluwagbemiga; Parks, Aaron; McHenry, Paige; McNeal; Sefton, JoEllen
Department: Kinesiology
College/School: College of Education

Abstract:
Firefighters are required to perform physically and mentally challenging job requirements under a range of extreme conditions. The National Fire Protection Agency suggests that fire departments have standard operating recovery procedures for firefighters during firefighting, recovery, salvage, and rescue operations. There is currently no universal protocol for firefighter recovery and return to activity. Current data on firefighter recovery indicates cognitive decline resulting from heat stress may occur during firefighter operations, and for an extended period even after operations have ceased. The purpose of this study is to determine how exercise in different environmental conditions may affect cognitive function and decision-making capabilities. Firefighters performed 4 rounds of two exercises: walking on a treadmill at 4.5% incline at a speed of 4.5 km/h for 5 minutes; followed by 5 minutes of deadlifts every 15 seconds at 40% body weight. Firefighters performed these rounds of exercises in full turnout gear during 3 sessions, a session at 26.7ºC, 40.6ºC, and 46.1ºC. Firefighters were able to end the session at any time, and their session was terminated if their core body temperature exceeded 38.9^{O}C. At the end of the session, firefighters removed their jacket, gloves, and helmet and were given cool water. Core temperature, heart rate respiration, and exertion were recorded throughout recovery. The recovery period lasted until the firefighter had reached their original resting core body temperature or 60 minutes had elapsed. The firefighters were asked to perform a go-no-go test to measure reaction time and decision-making capabilities before entering the chamber, immediately after the session ended, 20 minutes into recovery, and at the end of the recovery period. Our data suggests there is a decrease in event-related brain potentials (P300 curve) from the time firefighters entered the chamber to 20 minutes into recovery. Our results are indicative of cognitive fatigue which may impact reaction time and decision-making ability. We are working with Auburn City Firefighters to use this data to develop work to rest recommendations for firefighters on calls to maximize safety and cognitive performance.

Title: PDC: a popularity-driven cache system
Primary Author: Cao, Ting
Additional Authors: Taha, Tekreeti; Chaowei, Zhang; Jianzhou, Mao; Xiaopu, Peng
Department: Computer Science & Software Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Caching frequently accessed data items is an effective technique to improve system performance in a data storage system. Due to cache size limitations, cache replacement algorithms are used to find a suitable subset of items for eviction from the cache. In this project, we develop a novel popularity-driven cache replacement policy in the Web proxy caching system. We advocate for the caching systems to set the priority of the data which fetched from our PDC system. To achieve this goal, we employ a user-based collaborative filtering algorithm to offer the popularity value in the web proxy caching systems. Our cache replacement technique is conducive to the maximizing cache hit ratio while optimizing read performance for end-users who are accessing popular data objects. Our system is reliant on a recommendation module where a recommendation list is created by keeping track of user historical accesses. The recommendation list (a.k.a., popularity list) provides predictions on files that are likely to be accessed in the not-too-distant future. The recommendation module is responsible for computing similarities among users, thereby setting priority levels for data replacement policy in the cache system. We implement our data replacement policy scheme in a web proxy cache system to manage the cache replacement with guidance from the popularity list. Our experimental results confirm that our system speeds up the I/O performance of storage systems by boosting the cache hit ratio.

Title: Chromosome-wide characterization of tissue-specific x-chromosome dosage compensation in a marsupial model, *Monodelphis domestica*
Primary Author: Cao, Wenqi
Additional Authors: Douglas, Kory; Samollow, Paul; Wang, Xu
Department: Biomedical science
College/School: College of Veterinary Medicine

Abstract:
In mammals, females have two X chromosomes while males only have one, resulting in an imbalance of X-linked genes. To cope with the inequality and achieve dosage compensation, one of the two Xs in females is transcriptionally silenced, a phenomenon called X chromosome inactivation (XCI). Random XCI (rXCI) and paternally imprinted XCI (pXCI) are the two major forms in mammals. Under rXCI, the two Xs have an equal chance of being inactivated; whereas the paternal X is always inactivated in pXCI. rXCI occurs in somatic tissues of eutherian mammals and pXCI was found in the placenta of mouse, rat, and cow. Marsupials diverged 160 mya from eutherian mammals, and incomplete pXCI is the exclusive form in embryonic and adult tissue. The leakiness of marsupial pXCI suggests that many genes can escape and the XCI patterns can vary across species, tissue types, and developmental stages. To investigate the XCI escaper genes in marsupials, chromosome-wide profiling was done in *Monodelphis domestica* fetal brain and placenta. 24 escaper genes are identified and the brain and placenta tissues share the same escaping pattern. Our previous study focused on fetal pattern and the XCI profile in adult tissues remains unclear. In this study, we conducted RNA-seq experiments in adult liver, heart, brain, and fibroblast cell samples from 24 individuals. After read counts summary at informative SNP positions, we identified 67 candidate escaper genes in the adult brain, 48 in the liver, 82 in heart, and 63 in fibroblasts. All 24 fetal escapers remain their escaping status in all adult tissues, and adult tissues have significantly more escapers. This finding is consistent with a relaxation of XCI epigenetic regulation to allow more genes to escape in adult tissues, which could be critical for the development. We also discovered several tissue-specific escapers that only show in one tissue, such as DLG3 in the brain and CDX4 in the heart, which may be associated with tissue-specific functions.

Title: Testing and developing recycled 3-D printing filament for use in space
Primary Author: Cardon, Rylee A.
Additional Authors: Celestine, Asha-Dee
Department: Aerospace engineering
College/School: Samuel Ginn College of Engineering

Abstract:
This research seeks to develop 3-D printing filament from recycled printers which will ultimately lead to advancements in recycling technology for space exploration. The filament is created using ground-up plastic parts from printers that are no longer in use. This strategy can minimize unnecessary weight on spacecraft. A single screw extruder is used to combine and heat the ground-up material to its melting point and then extrudes it into filament. 3-D printed specimens will be tested to examine their composition, as well as their flexural, tensile, and compressive strengths. After extensive testing, an optimized procedure for making the filament will be developed and documented. This study will also look at the possibility of adding chopped carbon fiber to recycled plastic during the extrusion process to strengthen the material. The filament made from recycled printers can be used to 3-D print lightweight, low-cost tools and replacement parts while in orbit.

Title: Investigating ribosomal protein duplication in yeast *S. cerevisiae*
Primary Author: Carlton, Mary C.; Koebernick, Jenny
Additional Authors: Orie, Rosaleny; Thomas, Caleb; Petrov, Alexey
Department: Microbiology
College/School: College of Sciences and Mathematics

Abstract:
The ribosome is a ribonucleoprotein complex that translates mRNA into proteins within the cell. The yeast *S.cerevisiae* genome includes 137 highly conserved genes encoding ribosomal proteins, 19 of which encode for a unique ribosomal protein and 59 pairs of duplicated ribosomal proteins. Duplication of ribosomal genes occurred via whole-genome duplication 150 million years ago. Despite rapid evolution rates over millions of years, duplicated genes have remained virtually identical, and the deletion of one of the paralogs is deleterious to the cell. Thus, duplication of ribosomal protein genes is proposed to serve a specialized function within the cell, yet this purpose remains unclear. To reveal timing and expression patterns of duplicated genes, we tagged each paralog with either GFP or RFP proteins. The insertion of fluorescent proteins into the yeast genome is a two-step process. First, the URA3 gene from the yeast *C. albicans* is inserted downstream of the gene of interest using homologous recombination. In the second step, the URA3 gene is replaced with either GFP or RFP, resulting in the genome encoded ribosomal protein-GFP fusion protein. This approach preserves DNA and RNA regulatory elements that govern paralog expression. Current research efforts are focused on optimizing the gene insertion procedure. These methods will allow for future visualization of individual cells marked with fluorescent tags. Each paralog's expression can then be measured and observed under varying growth conditions and durations. We hope to elucidate the function these ribosomal gene duplications serve in a cell and the consequences associated with deletions of each duplicate.

Title: Circadian disruption of core clock genes Bmal-1, Reverb-a, Per2, and Cry-1 in adipose tissue due to western diet-induced obesity
Primary Author: Carmona, Beatriz A.
Additional Authors: Greene, Michael; Woodie, Lauren
Department: Nutrition Science
College/School: College of Human Sciences

Abstract:
Metabolic disease and obesity can arise from consumption of a Western Diet (WD) of high fat and sugar which can also disrupt hypothalamic light-induced circadian gene rhythmicity. WD-induced obesity can also disrupt peripheral circadian rhythms. Circadian rhythmicity of peripheral tissues beyond the hypothalamus is controlled by four core clock genes Bmal-1, Reverb-a, Per2, and Cry-1. Their expression in epididymal white adipose tissue (eWAT), which has a role in whole-body energy and glucose homeostasis, can serve as a control to verify that WD alters peripheral clock rhythmicity in metabolic tissues related to obesity. Male C57NL/6N mice were fed a standard chow or WD diet for 16 weeks, to induce obesity in the experimental group. To examine the core clock gene expression, tissue RNA was analyzed using Real-Time Quantitative Polymerase Chain Reaction (RT-qPCR). Using gapdh as a housekeeping gene, core clock gene rhythmicity, and expression levels were determined and compared between Chow and WD using their acrophase (highest level of expression in a 24-hour period). Reverb-a and Cry-1 were both phase-advanced, meaning earlier acrophases, by 12 hours in WD compared to Chow. Bmal-1 and Per2 were phase-advanced by 4 hours and dampened, or less expressed, in WD. Altogether the acrophase window of all 4 genes doubled in range, from a 9-hour window (12-21 hours) to 18 hours (0-18 hours). Additional analysis of core clock genes in the liver and hippocampal tissue confirmed similarities to eWAT rhythm disruption. Consistent with our hypothesis that peripheral rhythmicity is disrupted by WD induced obesity, the eWAT of obese mice showed phase advanced and dampened core clock gene expression.

Title: Analyzing the parameters that influence soft-tissue artifact frequencies
Primary Author: Carpenter II, David S.
Additional Authors: Marino, Anthony; Larson, Jacob; Zabala, Michael
Department: Mechanical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Motion capture systems are commonly used during biomechanical analyses to collect human movement data. These systems use infrared cameras to track the absolute position of reflective markers placed on various predetermined locations on the body. After reflective markers are placed on the human body, their relative positions with respect to one another can be reconstructed to create a model for each segment of the body. The created model gives an approximate location of the position of the bones during a movement, which is then used to measure anatomical variables such as knee flexion or shoulder rotation. One current issue with this method of data collection, however, is the relative movement of skin over the bone. This phenomenon is known as soft tissue artifact (STA) and refers to the slight distortion of the marker location with respect to the bone during a given trial. STA can cause significant error in data processing and can account for errors of up to 6.3 degrees in rotation and 8.0 mm in translation during data collection. To accommodate this discrepancy, low pass filters can be applied to remove frequencies deemed to be too high for a human to display in a data collection, thus lowering the likelihood of error due to STA. The goal of this study was twofold: to establish a relationship between skin oscillation and a persons' traits such as age, gender, height, body mass index (BMI), and to determine if the current standard lowpass frequency of 6Hz is filtering too much or too little data from current models. The results of this study can be used to determine the types of low pass filters which will allow for more accurate data collection.

Title: The effect of load magnitude on muscle activation during unilateral overhead dumbbell carries

Primary Author: Cassidy, Molly M.
Additional Authors: Bordelon, Nicole M.; Wasserberger, Kyle W.; Oliver, Gretchen D.
Department: Kinesiology
College/School: College of Education

Abstract:
INTRODUCTION: Unilateral carries may increase the stability of the lumbo pelvic-hip complex (LPHC) and scapular musculature by challenging muscle activation to maintain trunk alignment. PURPOSE: To examine the effect of load magnitude on muscle activation during unilateral overhead dumbbell carries. METHODS: Eighteen participants (22.6±2.6y, 173.3±8.1cm, 74.6±24.9kg) completed overhead dumbbell carries across a 12 m distance. Three trials of three load conditions, relative to body weight (10%(light), 15%(moderate), and 20%(heavy)), were performed. Muscle activity was collected via electromyography on the dominant-side upper and lower trapezius (UT, LT), latissimus dorsi (LD), and serratus anterior (SA), as well as bilateral gluteus medius (GM) and external oblique (EO). Data were normalized to maximum voluntary isometric contractions (MVIC). A 3(load) x 8(muscle) RM×ANOVA compared % MVIC between load conditions. RESULTS: Post hoc analysis revealed a significant load by muscle interaction [$F(4.799, 81.577)=7.834$, $p<0.001$]. There were significant differences between light and moderate loads in the UT, LD, SA, dominant EO, and non-dominant EO (p<0.001-0.047), with moderate loads showing greater activation. There were also significant differences between light and heavy loads in the UT, LD, SA, dominant EO, non-dominant EO, dominant GM, and non-dominant GM(p<0.001-0.031) with heavy loads showing greater activation. There were also significant differences between moderate and heavy loads in the non-dominant EO ($p=0.007$) and the dominant GM ($p=0.048$) with heavy loads showing greater activation. CONCLUSION: Muscle activations increased with load magnitude; however, changes were muscle specific. Future research should analyze the training effects of unilateral overhead carries on stability. Strength and conditioning professionals should consider the muscle-specific effects of an increasing load when programming overhead carries into training regimens.

Title: Students' sense of place at Auburn
Primary Author: Bell, Rachel; Caudill, Brook; Driskell, Sara
Additional Authors:
Department: Psychology
College/School: College of Liberal Arts

Abstract:
Students' sense of place, or feelings of belonging, on campus, is linked with many important educational and community outcomes. In this work, we examined Auburn students' sense of place across many student characteristics, including demographics. We administered a student survey to 498 Auburn undergraduates. They completed 11 items about their sense of place at Auburn (e.g., "I feel at home at Auburn."), reported the biggest factor that influenced their decision to attend Auburn, and reported their demographics. The survey results showed that White American students feel a significantly higher sense of place at Auburn compared to Black American and Asian American students. They also showed that women on Auburn's campus feel a significantly higher sense of place compared to men. Contrary to our predictions, we found no differences in sense of place by year in school, indicating that even Freshmen see Auburn as a true home. Breaking this down further, however, we did find that factors influencing students' decisions to attend Auburn had a significant impact on a sense of place, such that students who chose Auburn because of Family Legacy or Culture had a significantly higher sense of place than students who chose Auburn because of Financial Aid, the Campus itself, and even because they had Friends also attending Auburn. Auburn puts a strong emphasis on all students feeling like a part of the Auburn Family. However, this research suggests that some students still face barriers to feeling like they have found a home here and that more could be done to welcome and encourage these students. Future work is needed to investigate interventions to improve at-risk students' sense of place.

Title: The influence of perceived human values on attitudes toward corporate social responsibility PR messages and company
Primary Author: Chakraborty, Swagata
Additional Authors: Kwon, Wi-Suk
Department: Consumer and Design Sciences
College/School: College of Human Sciences

Abstract:
Researchers have argued the potential linkage between consumer values and various forms of consumer response toward corporate social responsibility (CSR). However, there is a dearth of empirical literature delving into this linkage. This study addresses this gap by investigating (i) how various human values expressed in CSR public relation (PR) messages differentially relate to consumers' attitudes toward the PR message and the company, (ii) how consumers' existing values moderate these relationships, and (iii) the mediating role of attitude toward CSR PR message for this moderation effect. An online survey was conducted with a convenience sample of 384 college students. Participants completed items measuring perceived message values and attitudes toward the message and the company, in response to an existing company CSR PR message that was randomly assigned among 20 CSR PR messages selected from the corporate websites of Fortune 500 companies using a systematic random sampling procedure. Then, participants completed a consumer value scale and demographic items. Results revealed varying influences of different human value dimensions perceived from PR messages; perceived benevolence value in the PR message positively influenced consumers' attitudes toward both the message and the company, whereas perceived conformity value in the PR had a negative influence on the attitude toward the company. Perceived PR values in achievement and stimulation did not significantly predict the attitudes. In addition, the relationship between perceived PR conformity and company attitude was significantly, positively moderated by consumers' existing conformity value. The findings provide a managerial recommendation that it is not enough just to frame CSR PR messages by incorporating human values but understanding the values the target consumer highly appreciates and crafting PR messages to match consumer values is critical to maximize the impact of companies' CSR PR efforts.

Title: Targeting p38 MAPK as a novel approach for the treatment of aggressive forms of human prostate cancer

Primary Author: Chakravarti, Sayak
Additional Authors: Mazumder, Suman; Mitra-Ghosh, Taraswi; Arnold, Robert D.; Mitra, Amit K.
Department: Pharmacology
College/School: Harrison School of Pharmacy

Abstract:
Prostate cancer (PCa) is the 2nd most common cancer among men. The standard treatment option for early-stage PCa includes radical prostatectomy or radiation therapy with androgen-deprivation therapy. However, many PCa patients develop more aggressive forms called androgen-independent or AR negative (AR -ve) or metastatic castration-resistant prostate cancer (mCRPC) whereby the tumor can grow despite hormonal therapy. Although treatment with taxanes (TX), the standard-of-care therapy, shows good initial response, most patients eventually encounter drug resistance. In this study, we identified and validated novel drugs as potential secondary approaches to treat androgen-independent/castration-resistant and taxane-resistant PCa, alone or as combination therapy. Our top predicted drugs belong to the p38 MAPK inhibitor family. In vitro validation studies using cell cytotoxicity assay on a panel of AR -ve PCa cell lines PC3, PC3M, DU145, and DU145-TXR (acquired TX resistant line) showed high potency of our predicted drugs as single agents, as well as in combination with taxanes (CI = 0.68±0.2, calculated using Chao and Talalay combination index method, CI<1 represents synergism). Further, our results also showed that using a combination therapy regimen was also able to lower the effective dose of DTX required to achieve appropriate therapeutic response by more than a factor of 10 (Dose Reduction Index 10.62±11.42), thereby making the cell lines relatively more taxane-sensitive. Moreover, our caspase 3/7 apoptosis assay data was also consistent with these findings. Currently, we are working on RNA-Seq transcriptome analysis followed by Ingenuity Pathway Analysis (IPA) and functional validation experiments including Western Blot and activity assays to investigate the impact of p38MAPK inhibitors on regulating crucial cellular mechanisms and to explore the underlying mechanism of synergistic drug action between taxanes and p38MAPK inhibitors.

Title: The sexually dimorphic response of the mouse adrenal inner cortex to thyroid hormone treatment
Primary Author: Zheng, Huifei S.
Additional Authors: Lyu, Qiongxia; Kang, Yuan; Wang, Hui; Huang, Chen-Che Jeff
Department: Biomedical Sciences
College/School: College of Veterinary Medicine

Abstract:
The gender bias in adrenal diseases has been noticed for a long time. However, the mechanism behind the high prevalence of adrenal diseases in females is unclear. Mouse studies have shown that the adrenal gland is sexually dimorphic at different levels such as transcriptome, histology, and cell renewal. Here, we used RNA-seq to demonstrate how male and female adrenals respond differently to the same external cue, the thyroid hormone (T3) treatment, which directly elicits its function on the adrenal inner cortex by changing the cell fate of this population. Through the comparison of the adrenal gland transcriptomes from males and females with T3 or saline treatment, we found that more genes in female adrenals were responsive to the T3 treatment, whereas the fold change of the gene expressions was higher in male adrenals. Statistical analysis identified 104 sexually dimorphic T3-responsive genes. Immunostaining results showed that many of these genes were expressed in the adrenal gland inner cortex, which contains a unique cell population called X-zone (20αHSD-positive). Previous studies showed that T3 treatment leads to the expansion of the 20αHSD-positive zone both in males and in females. Here we found that the top sexually dimorphic T3-responsive gene was expressed in the adrenal inner cortex partially colocalized with X-zone. Under T3 treatment, this unique cell population that surrounds the 20αHSD-positive X-zone became obvious only in females but not in males. Our findings not only identified several novel marker genes for the adrenal inner cortex but also highlighted the sex-specific response of thyroid hormone action in the mouse adrenal gland.

Title: Evaluating official methods for the microbial quality in irrigation water from small Alabama farms and Alabama agricultural experiment stations
Primary Author: Chevez, Zoila
Additional Authors: Gradl, Janet; Monu, Emefa
Department: Food Science
College/School: College of Agriculture

Abstract:
Produce can become contaminated with foodborne pathogens from water applied in the field. Therefore, the Food Safety Modernization Act (FSMA) Produce Safety Rule (PSR) includes regulations on microbial quality of applied irrigation water. Objectives of this research were to determine: 1) average *E. coli* presence in agricultural water used to irrigate produce during two growing seasons from eight locations across Alabama; 2) whether the water sources evaluated met the PSR criteria of 126 CFU/100 mL generic *E. coli* and 3) differences between three approved generic *E. coli* enumeration methods. Sampling locations consisted of three locations (identified as A, B, and C) at Alabama Agricultural Experiment Stations (AAES) and five locations (identified as D, E, F, G, and H) at small Alabama farms. Irrigation water came from either surface water (Locations A, B, D, E, G, H) or groundwater (Location A, B, C, F, G). Each location was sampled at least 3 times in a growing season. Generic *E. coli* were enumerated using EPA 1103.1, EPA 1604, and Hach method 10029. A complete randomized block design was used for the statistical analysis. *E. coli* in surface water was 2 - 460 CFU/100 mL at AAES locations and, from 2 - 118 CFU/100 mL on small farms. There were no detectable *E. coli* in the groundwater at any location. All of the water sources met the PSR criteria and there was no statistical difference (P> 0.05) between the three enumeration methods. Identifying generic *E. coli* levels can aid in identifying further actions to reduce product contamination and foodborne outbreaks in the state of Alabama. Overall, the results from this research indicated that all the locations evaluated met the requirements with groundwater having no detectable *E. coli* from the PSR, and the 3 enumeration methods produced equivalent results.

Title: Size effect study on ultimate load of slender concrete-filled steel tube columns
Primary Author: Chinivar, Supriya N.
Additional Authors: Sener, Kadir
Department: Civil Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Concrete filled steel tubes (CFT) columns have gained immense popularity in the bridge and high-rise building industries in recent years due to its high strength, stiffness, and ductility. The size of CFT columns in these applications can get very large, wherein diameter can range from 24 in-to-48 in. The strength estimations of these large diameter columns become uncertain as size effect in concrete becomes prevalent in these member dimensions. Size effect is a phenomenon that is observed as a strength reduction of concrete members with an increasing scale. Therefore, the goal of this research is to investigate the strength reduction due to the size effect observed in CFT columns. Testing of different scale CFT columns will be conducted by subjecting to axial compressive loads. The test parameters will include steel tube diameters of 2, 4, 6 inches, and slenderness ratio (length/radius) of 20, 40, and 57. The maximum aggregate size used for concrete filling the steel tubes will also be studied and scaled based on the outside diameter ranging from 0.25, 0.50, and 0.75 inches. The specimens will have steel reinforcement ratios that are representative of their practical applications, so are designed to have a longitudinal reinforcement ratio of less than 7%. The results from the experimental study will be validated by benchmark numerical models using the finite element method. The models will be developed/analyzed using advanced concrete and steel plasticity models. Out-of-plane imperfections induced during the fabrication or handling of the pipes will also be incorporated in the numerical models. Benchmark numerical models developed based on the experimental results will be further used in conducting parametric studies. The results obtained in terms of stiffness, peak capacity will be used for developing size effect reduction factors that can be used for estimating member stiffness and capacities more accurately, and ultimately leading to designing safer structures.

Title: Building a new thermodynamic database for fundamental kinetic study of silane and ammonia co-pyrolysis
Primary Author: Choi, Yeseul
Additional Authors: Geetha, Anjitha S.; Martin, Christian; Wyller, Guro M.; Preston, Thomas J.; Adamczyk, Andrew J.
Department: Chemical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Silicon nitride (Si3N4) is a wide band-gap (5.3eV) semiconductor material, silicon nitride thin film is used as insulating, masking, and passivating materials in integrated circuits in the microelectronics industry. To prepare the Si3N4 mask layer for insulating layers on the semiconductor chip or anti-reflection layers in the solar cell PECVD is considered one of the most efficient methods comparing to thermal or low-pressure chemical-vapor-deposition (LPCVD). Although silicon nitride has been researched intensively and the conditions of silicon nitride synthesis have been demonstrated in many studies, it appears that the fundamental understanding of how silicon nitride synthetic process is still unknown. Homogeneous gas-phase nanomaterials formation of silicon nitride is a more complex than monosilane pyrolysis in which hundreds, or possibly thousands of species, undergo simultaneous reaction. Detailed knowledge of thermodynamics and the nature of Si-N bonding is still required to understand the spontaneous processes leading to the formation of self-organized structures. Compared to the vast data available on solid-state materials, theoretical solid-state studies on materials possessing Si N bonds and comprehension of the SiN chemistry, especially for small clusters, are very rare. For this purpose, we conducted a computational study of Si and SiN alloy acyclic hydrides and clusters (SixNyHz, 1< X+Y≤6) to predict structures, thermochemistry, and electronic properties using Gaussian 16. The composite method of G3//B3LYP was used to calculate the electronic energy, and then statistical thermodynamics was applied to all the hydrogenated Si and SiN clusters to incorporate temperature effects. These predicted thermodynamic properties will be extended to understand one of the elementary reaction classes of silane and ammonia co-pyrolysis and calculate kinetic parameters of the reactions.

Title: Towards cable-to-cable connectors for flexible thin-film superconducting transmission lines

Primary Author: Chowdhury, Md Fahim F.
Additional Authors: Gupta, Vaibhav; Yelamanchili, Bhargav; Rashid, Asmaul Smitha; Peek, Sherman; Goteti, Uday Sravan; Shah, Archit; Sellers, John; Tuckerman, David; Hamilton, Michael
Department: Electrical and Computer Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
There is a significant need for a suitable and useful method to connect multiple flexible superconducting cables. In this work, a cable-to-cable connector for superconducting (SC) thin-film flexible parallel transmission line cables has been demonstrated, which incorporates improvements compared to our previously published work. The connector assembly connects two SC stripline thin-film flexible cables that are arranged end-to-end and are comprised of multiple components including a bridging connector and additional components for high-precision mechanical alignment and maintenance of sufficient pressure at the multiplicity of contact points. The flexible SC cables are constructed using multiple layers of Nb and polyimide, which has been described in our previous work. The cables and the bridging connector used in this work had 12 parallel stripline transmission lines with a 300 μm pitch between signal traces. The contact points on the SC traces were coated with a thin Au layer to prevent oxidation. The connector design is tolerant of the small coplanarity variations that are inherent in the several components. The connector assembly incorporates alignment features to allow precise alignment of the multiple components. DC resistances of fully-assembled cable-connector-cable test structures were measured across a temperature range from 293 K to 4 K, in an evacuated cryogenic chamber. Furthermore, connector assemblies were characterized for multiple thermal cycles, to explore thermal-cycle reliability, and multiple assembly/disassembly operations were performed, to investigate reproducibility during reassembly. Design, simulation, fabrication processes of the components, assembly methods, and characterization results will be presented. This work provides information needed for the realization of a useful cable-to-cable connector scheme for use with densely integrated, flexible superconducting cables for integration into future cryogenic electronics systems.

Title: Effectiveness of distinguishing soil types using unoccupied aerial vehicles (UAVs)
Primary Author: Clark, Brett A.
Additional Authors: Rogers, Stephanie; Wolf, Lorraine
Department: Geosciences
College/School: College of Sciences and Mathematics

Abstract:
The study of earthquake-induced soil liquefaction deposits and their ages is of interest in the characterization of seismic sources and their history of faulting. The current methodology for identifying potential sites for detailed study relies on relatively low-resolution satellite imagery. This study seeks to determine the effectiveness of using high-resolution multispectral imagery taken from unoccupied aerial vehicles (UAVs) to distinguishing prehistoric sand deposits from those caused by historic earthquakes. To develop the technique, we conducted local test flights on agricultural fields reported to have different soil types. A Parrot Sequoia multispectral sensor taking images in the green (550 nm), red (660 nm), red edge (735 nm), and near-infrared (790 nm) wavelengths were mounted on a DJI Phantom 4 Professional UAV. The returns for each of these bands were then algebraically manipulated to calculate spectral indices. Each index is intended to highlight spectral soil characteristics, some of which may be useful for distinguishing younger soils from more well-developed soils (e.g., an index sensitive to soil organic carbon content). Preliminary results indicate that while our chosen study site was not ideal, the methodology is promising for distinguishing between soil types. Future flights will be conducted at sites in the New Madrid Seismic Zone, where the ages of earthquake-induced liquefaction deposits are known. These data will directly test the effectiveness in differentiating prehistoric deposits from historic ones. If effective, this research will contribute to assessing seismic hazard by better characterizing the earthquake history of this region.

Title: Reduced SIRT3 potentiates injury in the diabetic heart
Primary Author: Cocke, Brett J.
Additional Authors: Yoo, Sieun; Schaedig, Taylor; Ghana, Nila; Govindarajulu, Manoj; Zhong, Juming; Amin, Rajesh
Department: Biomedical Sciences, Pre-Medicine
College/School: Harrison School of Pharmacy; College of Veterinary Medicine

Abstract:
The leading cause of morbidity associated with diabetes occurs from congestive heart failure triggered by myocardial ischemia-reperfusion (IR) injury. Despite significant research efforts, effective therapies to fight the destructive outcomes of IR are not yet available. Therefore, there exists a critical need to develop novel therapies to help mitigate the damaging effects of ischemic injury in the diabetic heart. In the current study, we are investigating the role of diabetes mediated post-translational modification of frataxin towards mitochondrial iron dyshomeostasis. We predict that the modification of FXN promotes the injury observed in the diabetic heart in response to ischemia-reperfusion stress. Ischemia-reperfusion injury in diabetic mice was accomplished by 30 minutes of left coronary artery ligation followed by two hours of reperfusion. SIRT3, pAMPK, mitochondrial acetylation patterns, and FXN acetylation were evaluated in diabetic and control diabetic (db/db) heart lysate as well as H9C2 cardiomyocytes treated with 4 bromo-resveratrol (Sirt3 inhibitor) by western analysis. Mitochondrial iron levels, mitochondrial respiration, and ROS measurements were determined in frataxin overexpressing and knock out cells following hypoxia (6 hours) / reoxygenation (24 hours). We observed an increase in iron accumulation in 4-month-old db/db hearts when compared to younger diabetic mice and control aged mice hearts. Interestingly we also observed in 4-month-old mice altered expression levels of sirt3 and frataxin. In addition, we observed increased mitochondrial acetylation patterns in diabetic mice and enhanced acetylated FXN levels. We are the first to report that frataxin is post-translationally modified (acetylated) in the diabetic heart and maybe due to reduced SIRT3 levels. Further, regulation by SIRT3 may offer cardioprotection against the enhanced ischemic injury observed in the ischemic diabetic heart.

Title: EMG and joint angle-based machine learning to predict future joint angles at the knee
Primary Author: Coker, Jordan C.
Additional Authors: Zabala, Michael; Chen, Howard; Schall, Mark
Department: Mechanical engineering
College/School: Samuel Ginn College of Engineering

Abstract:
The synchronization between exoskeletons and human users is critical for implementation and wide acceptance of the technology. In this paper, an artificial neural network is proposed to create motion trajectory predictions of the knee using the current positional data and muscular activation readings through surface electromyography (EMG). By creating a motion trajectory prediction, the exoskeleton can counter any synchronization delays caused by data transfer or computational times of processing data. Then these trajectories can be sent to a motor to move the exoskeleton in harmony with the human user in real-time. This paper assesses the accuracy of varying time gaps at which these motion trajectories can be made. With a sufficient time gap and accuracy of predictions, the exoskeleton can reduce the overall effort of the human user or assist a disabled user to achieve mobility that would be otherwise impossible.

Title: Evaluation of nondestructive testing methods in assessing concrete deterioration
Primary Author: Coleman, Zachary W.
Additional Authors: Jetzel, Christian; Schindler, Anton
Department: Civil Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
To facilitate locating subsurface concrete bridge deck defects and to determine the corresponding severity of the defects, the state and federal departments of transportation rely on nondestructive testing (NDT) methods. However, the difficulty in consistently locating concrete deterioration with any one method has inspired investigations of the accuracy of each relevant nondestructive testing method in detecting various forms of defects. Research suggests that the use of several NDT technologies in conjunction with one another allows for the development of a more accurate profile of concrete deterioration in a distressed bridge deck. The chief goal of this project is to assess the accuracy of nondestructive technologies available to the Alabama Department of Transportation (ALDOT) in identifying concrete bridge deck deterioration. To accomplish this, twenty lab specimens were fabricated to be representative of a typical deteriorated concrete bridge deck with a portland cement concrete overlay. Typical defects such as delaminations, corrosion, and voids were entrained into the 3 ft by 7 ft specimens by using plastic/foam inserts and water/clay-filled balloons or corroding the reinforcing steel in a specimen using electrical current and chlorides. The focus of this presentation is corrosion specimen C2. The specimen was tested using ground-penetrating radar (GPR), half-cell potential (HCP), and electrical resistivity (ER) to identify zones of delamination and corrosion. The contour maps of the projected deterioration produced from the aforementioned technologies suggest that the specimen is corroded/delamination in the intended zones of entrained defects. Future forensic analyses to verify the accuracy of the NDT methods will be performed by coring and cutting through specimen C2 and visually inspecting it.

Title: Development of a comprehensive measure for the cognitive attentional syndrome
Primary Author: Conboy, Natalie E.
Additional Authors: Bardeen, Joseph R.
Department: Psychology & Biomedical Sciences
College/School: College of Liberal Arts

Abstract:
Approximately one in five Americans experience mental health problems each year, and mental illness costs approximately 200 billion dollars annually in the United States (NAMI). This significant public health problem warrants further research to identify underlying mechanisms to target during treatment. The metacognitive theory of psychological disorder suggests that maladaptive metacognitive knowledge, experiences, and strategies create a negative response style to inner experiences, ultimately leading to prolonged psychological suffering (Wells, 2009). This negative response style is known as the cognitive attentional syndrome, or the CAS, and consists of several forms of maladaptive behavior, including worry, rumination, internal and external threat monitoring, thought suppression, avoidant coping, and substance use (Wells, 2009). Despite support for the metacognitive theory and the central role of the CAS in various forms of psychopathology, a psychometrically sound measure of the CAS does not currently exist. We aimed to address this problem by creating a self-report measure designed to assess the CAS. In the first phase of the study, demographic questionnaires and a collection of 69 items representing the CAS were administered to a community sample of adults (N = 323) via Amazon's Mechanical Turk. Exploratory factor analysis was conducted and the results supported a 7-factor model, which included the CAS domains of worry, rumination, substance use, thought suppression, behavioral avoidance, internal attentional fixation, and external attentional fixation. For the second phase of the study (currently underway), the 4 best-performing items for each factor will be administered to a new adult community sample, and the data from that collection effort will undergo confirmatory factor analysis. The results of this analysis and its conceptual, clinical, and research implications within psychopathology will be discussed.

Title: Psychophysiological correlates of pain in cannabis users and non-users
Primary Author: Conner, Lona K.
Additional Authors: Yanes, Julio A.; Robinson, Jennifer L.
Department: Psychology - CLA
College/School: College of Liberal Arts

Abstract:
As the opioid crisis continues to plague the United States, research on alternative pain-management methods is becoming increasingly necessary. One substance that has shown promise as a treatment for pain, particularly for patients suffering from chronic pain, is cannabis. The purpose of this cross-sectional study is to determine if a correlation exists between the habitual use of cannabis and the body's psychophysiological response to pressure-based pain. To do this, self-reported cannabis users and non-users were matched based on gender, age, Beck's Anxiety Index score, prodromal psychotic symptoms, and other criteria to assess behavioral indices of pain, as well as sympathetic nervous system activation, as measured by electrodermal activity. All sixty-six subjects selected for the study were chosen from a college undergraduate student population. Somatosensory testing was conducted in-laboratory using an MR-compatible pressure-based pain apparatus which utilized an inflatable blood pressure cuff to exert force on a plastic disk placed between the first and second knuckles of the subject's non-dominant hand. Skin conductance data were continually collected throughout the pain task as the subjects were asked to evaluate their pain both subjectively and objectively. Analysis of the collected electrodermal activity for all participants is being completed using the BIOPAC application, AcqKnowledge, and will be finalized in the spring of 2020. The hope is that the results of this study will be used to help support the existence of a correlation between the subjects' psychophysiological responses to pressure-based pain and their use of cannabis. This could potentially reinforce a basis for the wider acceptance of medical marijuana as an alternative means of symptom management for chronic pain sufferers.

Title: ACEs, mindfulness, and romantic self-efficacy's influence on relationship functioning: A risk and resilience approach
Primary Author: Cooper, Erin M.
Additional Authors: Adler-Baeder, Francesca; McGill, Julianne
Department: Human Development and Family Studies
College/School: College of Human Sciences

Abstract:
Adverse childhood experiences (ACEs) are common in the United States, and research shows that early traumatic experiences are associated with later decreased relationship stability and lower couple quality. Studies find positive effects of couples therapy for those with trauma history; however, less is known about community-based prevention programs that likely serve individuals who have ACEs. This study provides a novel examination of the links among reports of ACEs, mindfulness, romantic self-efficacy, and relationship quality in a diverse community sample. Taking a risk and resilience approach, the current study explores the relative association between ACEs and relationship quality in the context of levels of mindfulness and romantic self-efficacy. The current study also explores the differential influence of ACEs on changes in couple relationship functioning after participation in a couple of relationship education (CRE) program. Results from a combination path and structural equation model indicate, for men and women, ACEs and romantic self-efficacy are both associated with relationship quality; however, romantic self-efficacy is more strongly associated with relationship quality compared to ACEs. Mindfulness was not related to relationship quality in the context of the other variables. Results from repeated measures analyses of covariance indicate that those who report four or more ACEs demonstrate greater improvements in couple relationship functioning immediately after a CRE program compared to those who report fewer ACEs. This validates a "do no harm" approach for offering CRE to more vulnerable populations. Results also validate efforts to emphasize the promotion of self-efficacy as a protective factor that can be targeted in CRE, due to its stronger link with relationship quality compared to ACEs. Overall, this study supports the further use of a risk and resilience approach and the consideration of ACEs of CRE participants in practice and research.

Title: Trunk lateral flexion differences between the fastball and curveball pitch in collegiate softball pitchers
Primary Author: Cramer, Abigail M.
Additional Authors: Downs, Jessica; Oliver, Gretchen
Department: Kinesiology; Exercise Science
College/School: College of Education

Abstract:
Softball pitching requires the transfer of force from the lower extremities to the upper extremities via the trunk. This linkage of segments is commonly referred to as the kinetic chain. Since the trunk is the central link in the kinetic chain, any sub-optimal mechanics can not only impact performance but also result in pain in softball pitchers. Most studies examining pain and softball pitching have focused on one specific pitch type. To our knowledge, no studies are investigating kinematic differences between pitch types in softball, thus it is unknown if the trunk kinematics associated with pain hold across different pitch types. Therefore, the purpose of this study was to investigate trunk lateral flexion (TLF) while throwing two different pitch types, fastball (FB) and curveball (CV), in collegiate softball pitchers. Thirty-one (20.10±1.81yrs,176.05±5.53cm,113.95±12.07kg) college softball pitchers participated. Participants were instructed to throw three FB and CV pitches to a catcher at a regulation distance (43ft). A motion capture system was used to collect TLF at two pitching motion events: foot contact (FC) and ball release (BR). The average of three trials at each pitching event was used in a repeated measures multiple analysis of variance (MANOVA) to determine any TLF differences between the FB and CV. A statistically significant difference in TLF at FC and BR was revealed. Specifically, at FC there was significantly more TLF toward the pitching arm side in the CV than FB. At BR the FB had significantly more TLF toward the glove arm side than the CV. These results provide important information as they are one of the first to describe kinematic differences between pitch types in softball pitching. Suboptimal trunk kinematics may result in a faulty kinetic chain link and increased injury risk. Future research will be needed to investigate if different pitch type kinematics places softball pitchers at increased risk of injury.

Title: Does social media influencer marketing increase donations?
Primary Author: Crayton, Mac-Jane M.
Additional Authors:
Department: Public Administration and Public Policy
College/School: College of Liberal Arts

Abstract:
This paper assesses whether the presence of social media reporting increases individual donations to nonprofit organizations. This research matters as social media offer an emerging way for nonprofits to engage with donors and raise awareness regarding the causes they are interested in. However, the use of social media networks is beginning to go beyond making daily posts on social media or advertising through traditional means. Nonprofit organizations just like for-profit companies are resorting to using influencer marketers or celebrities to draw awareness to their causes and ultimately request funding. Literature suggests that several factors motivate donors to give to nonprofits, and one of those motivating factors include the words of an influencer. Hence, this paper tests this theory by assessing whether there is a relationship between social media influencer marketing on individual donations.

Title: Effects of chronic, adult exposure of dietary methylmercury on zebra finch pancreatic physiology
Primary Author: Cronin, Jamie E.
Additional Authors: Pavlou, Skyler; Brittain, Cara; Wada, Haruka
Department: Biomedical Sciences
College/School: College of Sciences and Mathematics

Abstract:
Mercury is an environmental pollutant with negative effects on many physiological processes in humans and wildlife. Methylmercury (MeHg) is a known endocrine disruptor, but the effect of dietary methylmercury in pancreatic function and stress response has not been explored in depth. In times of stress, the body mobilizes energy resulting in increased blood glucose levels. Using captive zebra finches, a model songbird species for physiology and ecotoxicology, we examined the effects of dietary MeHg and interaction between MeHg and restraint stress on blood glucose levels. Thirty-one birds were fed a control diet (n=15) or an experimental diet (n=16) laced 1.2ppm MeHg, an environmentally-relevant dose based on polluted sites, for four months with periodic blood sampling at 0, 2, 10, and 18 weeks. Using glucometers, we analyzed the glucose levels before and after restraint stress at each sampling point. We predict that birds on the MeHg diet will have higher blood glucose levels before the restraint stress than the control group, and the difference to be even greater after the restraint stress. We also sought to analyze the effects of methylmercury on other aspects of pancreatic function and physiology.

Title: A pilot study of a single-session, internet-based insomnia treatment for college students with insomnia symptoms and a history of suicide ideation
Primary Author: Crosby, Eric S.
Additional Authors: Witte, Tracy
Department: Clinical Psychology
College/School: College of Liberal Arts

Abstract:
Insomnia is a particularly promising avenue for suicide prevention efforts because it is amenable to treatment, and insomnia treatment is relatively lower in stigma than treatment specifically targeting suicide ideation (Downs & Eisenberg, 2012; Trockel et al., 2015). Cognitive-behavioral therapy for insomnia (CBT-I) is an evidence-based treatment for insomnia (Geiger-Brown et al., 2015) that reduces suicide ideation at post-treatment (Batterham et al., 2017; Manber et al., 2014; Pigeon at el., 2017; Trockel et al., 2015). However, current formats of CBT-I (i.e., traditional face-to-face, internet-based, and brief CBT-I) are time-intensive (i.e., six to eight weekly sessions; Batterham et al., 2017), require a trained treatment provider (Pigeon at el., 2017), or both (Manber et al., 2014; Trockel et al., 2015). Thus, the goal of the current study is to establish the acceptability and feasibility of a single session, self-guided, internet-based insomnia treatment among college students with a lifetime history of suicide ideation and current insomnia symptoms. Participants (N = 38) completed seven daily sleep diaries before being administered self-report surveys and a single session, self-guided, internet-based insomnia treatment. Immediately after the treatment, participants completed post-treatment measures of acceptability and feasibility. One week and one month after the insomnia treatment, participants completed follow-up self-report surveys and were given personalized suggestions for improving their sleep derived from their daily sleep diaries. Data collection is complete; data analysis will be completed by March 1, 2020. Descriptive statistics will be used to analyze the screening and recruitment rate; utilization, satisfaction, and adherence to treatment; attrition rates; and variability in clinical outcome measures. Results from this study will inform a future randomized controlled trial that will test the effectiveness of this intervention.

Title: Impact of winter cover crop grazing on soil health in southeastern cropping systems
Primary Author: Crowell, Hayley R.
Additional Authors: Gamble, Audrey; Feng, Yucheng; Prasad, Rishi; Balkcom, Kip
Department: Agronomy and Soils
College/School: College of Agriculture

Abstract:
Soils in the Coastal Plain are often degraded and characterized by low organic carbon as a result of historically intense row cropping. A rotation of cotton (*Gossypium hirsutum* L.) and peanut (*Arachis hypogaea* L.) under conventional tillage is typical in this region, but an opportunity to encourage diversification of rotations that improve soil quality exists. If managed properly, combining annual winter grazing of cover crops in a cotton-peanut (CP) rotation under conservation tillage may provide additional soil organic matter to improve soil health and fertility. Studies are needed to establish guidelines for integrated livestock systems (ICL) which maximize soil health benefits while maintaining yield and providing quality forage for livestock. A study was established at the Wiregrass Research and Extension Center in Headland, AL to determine the effects of an ICL in which winter grazing livestock was incorporated into a CP rotation with a winter cover crop mixture of 'Cosaque' oats, 'FL401' rye, 'Sunrise' crimson clover, and 'T-raptor' brassica. Three treatments of cattle removal dates (i.e., mid-February, mid-March, mid-April) and an ungrazed control were compared to assess the effect of grazing period length on permanganate oxidizable carbon (POXC), microbial biomass-carbon (MBC), and arbuscular mycorrhizal fungi (AMF) colonization rates. POCX, MBC, and AMF colonization rates are known to be reactive to management changes. This study will be conducted over two years. Significant differences in soil health were not detected between cattle removal dates in 2019, but 2020 data may provide insight on the effects grazing livestock have on soil health, as more time under this management may be needed to measure effects.

Title: Unveiling the path of Parkerson Mill Creek on the Auburn University campus
Primary Author: Cummings, Andrew M.
Additional Authors:
Department: Landscape Architecture
College/School: College of Architecture, Design & Construction

Abstract:
For many years, the Parkerson Mill Creek flowed freely from its headwaters throughout the Auburn University campus. Today, it is channeled underground due to the growth of the University and hidden from the public's view. Evidence of where the creek once flowed on campus is found in the topography and the current stormwater infrastructure. The Parkerson Mill Creek is an impaired urban watershed with E. coli and other pathogens. This research focused on the historical path of the Parkerson Mill Creek headwaters on the campus of Auburn University and developed a landscape design strategy that educates the public to where Parkerson Mill Creek flows underground. It also used a planting scheme that helps remove pathogens, such as E. coli, from the watershed. This landscape design strategy consists of locating where Parkerson Mill Creek once existed, based on historical soil maps and aerial photos, to strategically connect each location of where the Parkerson Mill Creek once flowed by bringing the fragmented areas together in a cohesive manner until it reaches the daylighted portion of the stream. Case studies of similar design approaches and current research provide design inspiration. The design strategy engages a series of plan, section, and perspective drawings as well as discussions with faculty and professionals who have studied the Parkerson Mill Creek. This landscape design strategy exemplifies the use of fauna, signage, and structure to bring public attention by telling the story of Parkerson Mill Creek. The plant selection includes existing native plants currently located along the stream banks of the daylighted portion of Parkerson Mill Creek. The importance of this research is that it provides a new landscape strategy that embraces the natural heritage of Auburn University more organically and educationally. It also teaches the importance of urban runoff and its effects on a watershed in an urban context.

Title: 3-PG model parameterization and prediction of long-term growth on longleaf pine forests
Primary Author: Custodio Mendonca, Caren
Additional Authors: Samuelson, Lisa; Stokes, Tom; Gonzalez-Benecke, Carlos; Johnsen, Kurt; Leduc, Daniel; Roberds, James
Department: Forestry
College/School: School of Forestry and Wildlife Sciences

Abstract:
The 3-PG (Physiological Process Predicting Growth) model is a process-based model that integrates climate, physiology, and stand attributes to predict net primary production (NPP), stand dynamics, and soil water balance. Longleaf pine (*Pinus palustris*) forests may offer a pathway to increase the resilience of southern forests to changing climate due to their drought tolerance and resistance to disturbances. The objective of this research is to incorporate species-specific functions and modify the model structure to enable the use of 3-PG to predict the growth of longleaf pine forests under varying climate and management scenarios. The long-term datasets used in parameterization are from sites located across the natural range of longleaf pine. Datasets include plantation data from the Harrison Experimental Forest, T. R. Miller Mill Company, the Palustris Experimental Forest, The Nature Conservancy, Virginia Department of Forestry, the Southwide Southern Pine Seed Source Study, and the Longleaf Pine Throughfall Reduction Experiment. We developed functions for NPP allocation, canopy conductance response to vapor pressure deficit, needle fall patterns, specific needle area, density-independent mortality, self-thinning, and the fertility rating. To date, parameter estimates generated for longleaf pine are different from the other southern conifers, which proves the need for species-specific longleaf pine parameterization. The model will be tested against data from measurement plots covering a range in stand characteristics. We aim to predict how growth and water use of longleaf pine will respond to projected changes in climate and compare the results to published predictions made for loblolly pine and slash pine using the 3-PG model.

Title: A systematic review of motor sequelae of acute and chronic use of methylphenidate
Primary Author: Dade Matthews, Adefunke
Additional Authors: Brittain, Abby; Grabowsky, Adelia; Neely, Kristina
Department: Kinesiology
College/School: College of Education

Abstract:
Background: Methylphenidate (MPD) is a first-line pharmacological treatment for Attention-Deficit/Hyperactivity Disorder (ADHD). This systematic review explores the effects of MPD on movement in humans and other mammals. We focus on objective measurements of movement in combination with the manipulation of MPD. Although cognitive and behavioral effects of MPD have been extensively studied, fewer studies have investigated movement. There are substantial differences in measurement techniques and statistical analyses across studies. Search strategy: The PRISMA checklist for systematic reviews was followed (Moher et al., 2009). The concepts of Methylphenidate and Motor activity along with synonyms, related terms, and subject headings were searched on 9/30/2019 in PubMed, PsycINFO, International Pharmaceutical Abstracts, and ProQuest Dissertations and Theses. The initial searches yielded 1819 results, 1202 remained after deduping. Titles and abstracts were examined against the inclusion and exclusion criteria, and 886 were found to be non-suitable. The evaluation of full-text articles is in progress. Inclusion criteria: Primary and peer-reviewed research including observational studies, cohort or cross-sectional design, in vivo studies, studies with measures of motor output, methylphenidate comparison to control, studies in English, and those published before 10/1/2019. Exclusion criteria: Secondary and/or non-peer-reviewed research including books, reviews, systematic reviews, meta-analysis, editorials, commentaries, meeting abstracts, case studies, case, and laboratory notes. Studies with simultaneous administration of more than one drug, without original data, or without control. Discussion: Although this systematic review is in the screening and eligibility phase, it is clear that limited reports of quantitative and objective measures of movement in relation to MPD exist. This project will review the findings of the included studies and provide tabulated summaries

Title: The effect of economy and graduate rate growth on female labor force participation
Primary Author: Dai, Yan
Additional Authors: Shi, Yuewei
Department: Educational Psychology
College/School: College of Education

Abstract:
With the development of the economy and higher education expansion, the number of female college graduates is continually increasing. In some sense, the growth of female college graduate rate promoted the progress of gender equality and improved women social status. Additionally, the growth of the economy and female college graduate rate (FPR) also triggered the change of female labor force participation rate in the U.S. The purpose of this study is to explore the relationship of economic growth, female college graduate rate, and female labor force participation. It is expected that the finding could help higher education administrators and policymakers to understand the reasons caused the changing trend of female labor force participation rate, and approach the suitable policy to adjust labor structure or allocate proper resources for higher education. This research uses a correlational analysis method and the original data are retrieved from the Integrated Postsecondary Education Data System (IPED) and U.S. Bureau of Labor. The author chooses economic and educational statistics from 50 states. The female college graduate rate and GDP data are applied to the correlational analysis for female workforce participation. This research is divided into four parts. The first part introduces the current situation of economic development and women in higher education. The second part presents the reasons that affect female workforce participation. The third part introduces the correlational analysis for economic growth, female graduate rate, and female workforce participation. The fourth part will discuss the findings for the current women employment situation.

Title: Self-deploying springs from shaped memory polymers
Primary Author: Dai, Yurou
Additional Authors: Mailen, Russell W.
Department: Aerospace Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
In the field of self-deploying structures, researchers seek to make compact systems that transform into large, three-dimensional shapes in response to an external stimulus. For example, shape memory polymer (SMP) sheets change shape after heating. Researchers have used the shape-changing properties of SMPs to convert flat sheets into a variety of complex three-dimensional shapes, including grippers which can be used to grasp and carry an object. In this poster, we take advantage of the heat-shrinkage properties of SMPs to make an SMP spring that elongates after heating. We assemble two rectangular SMP strips by manually folding them to form a spring-like structure. When exposed to infrared light, black ink on the fold creases make the structure expand as the creases attempt to unfold. To make the spring grow longer, we put tape on the folded edge, which increases the force in the spring. Additionally, we investigate the effects of cutting the corners of the hinges to reduce the resistance of the spring to elongation. We hope this study will make SMPs stretch like spring after heating, and by cutting the structure, we hope that this shape can add more elongation at a lower density.

Title: Impact on body image satisfaction
Primary Author: Dale, Lindsey A.
Additional Authors:
Department: Human Development and Family Studies
College/School: College of Human Sciences

Abstract:
Eating disorders (EDs) are common across college campuses. A known crucial criterion for Anorexia Nervosa and Bulimia Nervosa is Body Image Satisfaction (BIS), or how an individual views their body size and shape. BIS could play a role in this relationship because the development of one's identity is often based on their experiences. It is common for self-esteem to be correlated with body image. Additionally, on average, males score higher on questions related to BIS. Therefore, there may be sex differences in the relationship between Adverse Childhood Experiences (ACEs) and BIS. The current study evaluates the association between ACEs and BIS in a college student sample. Data were collected from 263 college freshman and sophomore students (53% female; Mage = 19.21 years) at Auburn University. Approximately half of the sample were either underweight or of normal weight (55%) in relation to Body Mass Index (BMI), while the other half were either overweight or obese (45%). BIS is measured by the question "my current body size is attractive" on a scale of strongly disagree to strongly agree. The ACEs scale includes items related to physical, sexual, and psychological abuse/neglect. Approximately 45% of the sample had experienced at least 4 adverse childhood experiences. Regression analyses indicated that individuals who experienced more ACEs were less satisfied with their body image (B = -.692, SE = .230, p = .003). No statistical difference was found by gender or BMI. Therefore, childhood experiences influence BIS in college and this may affect the frequency of eating disorders on college campuses. Additionally, this relationship did not change across sex or BMI categories, indicating that the relationship between ACEs and BIS remains stable across these groups.

Title: Impact of e NAM on the market arrivals and prices of cotton in India
Primary Author: Das, Abhipsita
Additional Authors:
Department: Applied (Agricultural) Economics
College/School: College of Agriculture

Abstract:
This paper provides evidence on the effectiveness of the technology-driven scheme, e NAM on the market arrival and prices of cotton in India. I use the introduction of e NAM in mandis (markets) of cotton, one of the most important cash crops of India, where the variations in market arrivals and prices were brought by the adoption of e NAM by some mandis, not in others. My difference-in-difference (DID) estimates show that there is a significant increase in market arrivals of cotton, through the adoption of e NAM. While, there is a decrease in the prices of cotton, due to the adoption of e NAM, though statistically significant. The results withstand the robustness check including the use of sub-samples in which the unreported daily prices of some mandis are not included. The results of the prices of cotton, especially, suggest the farmers are hurt by the decrease in prices as the traders create an excess supply through inventories. These low prices have a detrimental effect on farmers, here the traders are gaining from the high market arrivals as well as the low prices they pay the farmers. The results make the efficacy of the e NAM contentious. The government must create a 'price floor' so that the prices cannot go below that threshold level.

Title: Fatigue behavior and microstructural evolution of additively manufactured inconel 718 under cyclic loading at elevated temperature
Primary Author: Dastranjy Nezhadfar, Pooriya
Additional Authors: Johnson, Alexander S.; Shamsaei, Nima
Department: Mechanical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
This study investigates the fatigue behavior of Inconel 718 (IN718) fabricated through a laser beam directed energy deposition (LB-DED) process. Fully-reversed (R= -1) strain-controlled fatigue tests are conducted on LB-DED IN718 specimens at 650 °C and the results are compared with those of LB-DED IN718 specimens tested at room temperature as well as the ones obtained from wrought counterparts at both room temperature and 650 °C. The microstructure is characterized after fabrication, heat treatment, and fatigue tests at elevated temperatures. Microstructure characterizations reveal that as-built LB-DED IN718 has a dendritic structure. The heat treatment applied could not eliminate the dendritic structure, and needle-like δ phases are formed on the grain boundaries. The comparison of LB-DED and wrought fatigue results show that the LB-DED IN718 possesses slightly lower fatigue resistance at room temperature, while exhibits a comparable fatigue strength at elevated temperature. In the low cycle regime, the fatigue resistance of LB-DED IN718 tested at elevated temperature is somewhat inferior to the ones tested at room temperature, which can be explained by the formation and growth of brittle needle-like δ and Laves phases on the grain boundaries during fatigue testing at elevated temperature and their effects on increasing the fatigue crack growth rate. In the high cycle regime, however, LB-DED IN718 specimens tested at elevated temperature had somewhat similar fatigue lives to the ones tested at room temperature. This may be partially explained by the surface oxidation during fatigue testing at elevated temperature, which can retard the microstructurally short cracks to grow.

Title: Characterization of pathogenic fungal species associated with needle damage of loblolly pine in the southeastern USA
Primary Author: Datta, Debit
Additional Authors: Enebak, Scott A.; Coleman, Jeffrey J.; Eckhardt, Lori G.
Department: Forestry
College/School: School of Forestry and Wildlife Sciences

Abstract:
Loblolly pine (*Pinus taeda*) is a crucial economic and ecological component of forests in the southeastern USA. Currently, thousands of acres of loblolly trees are infected with emerging needle disease which causing extensive loss of 1st and 2nd-year needles. Repeated needle defoliation results in lower photosynthesis rates, stunted tree growth, devastating yield losses, and ultimately, death of the trees. However, there is still uncertainty about the causal agent of the disease. We aim to isolate and characterize the pathogenic fungi through morphological and molecular analysis. Data were collected from symptomatic needles across Alabama throughout the 2019 growing season. Chlorosis, necrosis, and defoliation were consistently found in the lower branches of the infected trees. Symptoms are characterized by tip necrosis followed by yellow banding in the middle which progressively turns brown. To date, a total of 22 fungal strains were isolated, and fungal isolates exhibiting analogous phenotypic and morphological markers were grouped, thus arriving at 7 isolates for molecular analysis. *Pestalotiopsis* and *Trichoderma* were the most frequently recovered fungi present in the infected needles. Moreover, *Alternaria, Penicillium, Epicoccum,* and other 2 species were also found. Pestalotia needle blight was previously reported in the young loblolly pine stands in Chinese forests. However, there have been no such reports of pathogenic *Pestalotiopsis spp*. association with loblolly pines in the USA. Therefore, the study requires more sample analysis throughout the southeast to confirm *Pestalotiopsis spp*. causing needle damage of loblolly pine. The research findings will significantly help landowners and forest managers to successfully control the disease and ensure sustainable loblolly production in the southeast.

Title: Psychotropic stigma among pharmacy students
Primary Author: Davis, Brandy R.
Additional Authors: McDaniel, Cassidi; Garza, Kimberly
Department: Health Outcomes Research and Policy
College/School: Harrison School of Pharmacy

Abstract:
Objective: To measure student pharmacist stigma towards mental health and psychotropic medications. Methods: A cross-sectional survey was conducted in first, second, third, and fourth professional year student pharmacists enrolled in a Doctor of Pharmacy program, using both paper and electronic formats. The Perceived Devaluation and Discrimination (PDD) Scale and a modified Beliefs about Medicines Questionnaire (BMQ) were used to measure mental health stigma and psychotropic stigma, respectively on a 5-point Likert-type scale with lower values indicating greater stigma. MANOVAs were conducted to investigate relationships between student pharmacists' characteristics, preferred mental health treatment, and stigma towards mental health and psychotropic medications. Paired t-tests were conducted to compare the stigma toward mental health and psychotropics. Results: A total of 390 participants completed the survey and was mostly female (67%), white (79%), non-Hispanic (96%), and 19-24 years of age (80%). Most respondents had prior interactions with patients with mental health conditions (55%) or taking psychotropic medications (65%). Students' personal preferences for mental health treatment were primarily psychotherapy (42%) or a combination of psychotherapy and psychotropic (40%). A positive association was found between preferring psychotherapy treatment and greater stigma towards psychotropic medications (p<0.001). Students also had increased stigma towards psychotropic medications (M = 2.650, SD = 0.602), compared to stigma towards mental health conditions (M= 3.154, SD = 0.615, p<0.001). There were no differences in stigma among first, second, third, and fourth-year students. Conclusions: Our results indicate a presence of stigma toward mental health conditions among student pharmacists, with an even greater degree of stigma towards psychotropic medications. Future research should focus on methods to decrease stigma through awareness-raising and education.

Title: Characteristic karst hydrology in the southeastern United States
Primary Author: Davis, Eian M.
Additional Authors: Kumar, Sanjiv
Department: Geospatial and Environmental Informatics
College/School: School of Forestry and Wildlife Sciences

Abstract:
Karst geology type represents areas of high permeability comprising of highly fractured, soluble bedrock, and unconsolidated materials. Hence, it is hypothesized that karst makes the water flow faster in the watershed. To test the hypothesis, I investigated the relationship between the base flow recessional constant, which is a measure of groundwater contributions to the streamflow, and the karst percentage area for 44 watersheds in AL and GA. We divided 44 watersheds into three categories: Low Karst (0-10%), Medium Karst (11-50%), and High Karst watersheds (51-100%). I computed the base flow recession constant using daily streamflow observations from 1951 to 2015 and the United States Geological Survey (USGS). We found a statistically significant difference in the base flow recession constant between high and low karst watersheds. High Karst watersheds show a significantly higher rate of baseflow recession than the low karst region. A greater base flow recession rate represents a higher streamflow variability in the high-karst region. Further investigations are required to better understand the finding presented here. Especially, if there is a relationship between the soil moisture residence time, and the base flow recession rate?

Title: Treatment of 3D tumor spheroid models using schedule dependent dosing of traditional chemotherapeutics
Primary Author: Davis, Joshua T.
Additional Authors: Arnold, Robert D.
Department: Pharmaceutics
College/School: Harrison School of Pharmacy

Abstract:
Traditional in vitro models such as growing cancer cells on 2D multi-well plates are a mainstay in drug development due to their ease of use and manipulation, compatibility with a large array of assay techniques, and ability to scale using high throughput techniques. However, it has been shown that many well-controlled and orchestrated in vitro studies do not translate adequately to human patients. Many of these failures can be traced back to issues with toxicity/ADRs, compatibility with environments found in vivo, or drug formulation issues; however, poor translation of drug efficacy is a more problematic and costly issue due to it being the first step in drug development. Because drugs are chosen almost exclusively based on in vitro performance, more representative models must be used to evaluate drug efficacy to ensure the best drugs are chosen, especially in an environment where developmental cost is becoming more important. We compared treatment response to metronomic or conventional dosing schedules using IC50s from mitochondrial assays (MTT, Resazurin) for cells grown in 2D or 3D formats. Conventional dosing was only given on day one to simulate typical dosing of chemotherapy in human patients. Metronomic dosing was given every day at a fraction of the conventional dose to simulate realistic doses achievable in human patients. We demonstrated a dramatic shift for the IC50s of multiple drugs for both metronomic and conventional dosing schedules when comparing 2D to 3D models over multiple time points. The shift in drug efficacy demonstrated here using a 3D model may help explain why traditional chemotherapeutic regimens have largely failed to provide consistent and meaningful reductions of tumor volume for human patients. The ability for patients to achieve drug concentrations demonstrated in this study to be necessary for adequate therapeutic response is not possible without extreme toxicity.

Title: *Sigmodon hispidis* and *Peromyscus gossypinus* characteristics influence enteric parasitic nematode prevalence and species diversity
Primary Author: Davis, Breanna R.
Additional Authors: Gitzen, Robert; Zohdy, Sarah
Department: Wildlife Ecology and Management
College/School: School of Forestry and Wildlife Sciences

Abstract:
Intestinal parasites can cause health concerns for a wild population and be difficult to control. Parasitic nematodes have been documented for cotton mice and cotton rats but never studied simultaneously and compared between species. We hypothesized that species, sex, and age of the rodents would influence enteric parasitic nematode prevalence and species diversity. We also hypothesized that the presence of a parasitic nematode would influence an individual rodent's potential to contract other nematode parasites. To examine these hypotheses, we conducted a small mammal survey at Auburn University's Mary Olive Thomas Demonstration Forest in Lee County, Alabama. During summer 2019, we established 13 transects of Sherman traps. Transect length varied from 100-350 mm with a trap set every 10 meters. We trapped each transect for 2-11 nights. We collected fresh fecal samples from each individual captured to remove any possibility of environmental contamination. The fecal samples were transported to the lab where they were run by fecal flotation methods with the commercially available reagent, Fecasol. Parasitic nematode species were identified, and individual eggs were quantified for the entire slide. We captured 28 cotton rats (*Sigmodon hispidis*) and 35 cotton mice (*Peromyscus gossypinus*). A total of 313 nematode eggs were found in cotton rats, whereas in cotton mice the total was only 66. In female cotton mice, there were 20 nematode eggs identified versus 30 nematode eggs identified in males. In female cotton rats, there were 96 nematode eggs identified versus 149 nematode eggs identified in males. Overall, cotton rats had a higher presence of nematodes within juvenile and adult life stages versus cotton mice. Statistical tests are being done to examine our hypotheses. This work will serve as a foundation for further investigation of intestinal parasites and their role in small mammals of the Southeast.

Title: Parent and peer support as predictors of depression in the transition into and out of college
Primary Author: Dawson, Mary D. R.
Additional Authors: Samek, Diana R.
Department: Human Development and Family Studies
College/School: College of Human Sciences

Abstract:
Depression is common in the college student population. Recent national data shows 41.9% of college students felt so depressed that it was difficult to function any time within the last 12 months Parent and peer support have long been shown to be associated with greater well-being and less depressive symptoms, including a smoother transition to college. Less is known on how parent and peer support interact to predict the change in depressive symptoms in the transition into as well as out of college. We believe that greater peer support will offset the risk associated with low parent support in relation to change in depressive symptoms in the transition into and out of college. Hypotheses will be tested using the three-wave College Experiences Study (N=209, 61.7% female, 90.4% white). At each wave, a comprehensive survey was used to measure multiple aspects of overall health, including a measure of depressive symptoms (20 items, CES-D) and parent and peer support (22 items each) Data were collected from a randomly-selected, representative sample of first-year students in the 2015-2016 academic year. Follow up data collection took place approximately one year later (85% retention), and three years after that (70% retention currently, data collection is on-going). The results will be analyzed and ready by the time of the presentation. Results will demonstrate the overall prevalence and pattern of change in depression symptoms in the transition into and out of college. Further, they will demonstrate whether the trajectory of depression symptoms (baseline level and growth) varies as a function of parent and peer support. Such findings will provide implications as to how and when to strengthen close relationships to offset risk depression.

Title: Daycare and speech in noise perception
Primary Author: DeCarlo, Emma K.
Additional Authors: Farrar, T'Kaye
Department: Communication Disorders
College/School: College of Liberal Arts

Abstract:
It is unclear if exposure to speech and noise provided at daycares would facilitate speech perception in developing children. The purpose of this study was to compare the speech-in-noise (SIN) perception of children to the age-related normative values for auditory-figure ground perception. Twenty-nine children (ages 4-to-6) attending a local daycare facility full time (more than 32 hours a week) participated in this study for the last 12 consecutive months. Participants completed the Primary Test of Nonverbal Intelligence (PTONI), memory measures (forward and reverse digit spans), a frequency discrimination task, and list 1a/b and 2a/b of the Bamford-Kowal-Bench speech-in-noise (BKB-SIN; auditory-figure ground task). Norms for children ages 5-6 age range were compared to the current sample to determine if the enrollment in daycares significantly lowered signal-to-noise ratios required for SIN perception. Results indicate that age in months yields a strong inverse correlation with the speech in noise performance. Additionally, it was found that short-term memory capacity (STMC) had moderate inverse relationships to speech in noise performance. The BKB-SIN scores for children ages 5-6 (N = 12) were significantly lower than the test normative data. On the other hand, results from 17 children age 4 were determined not to be significantly different from the normative data provided when compared to the 5-6 age range. These results suggest that daycare settings provide exposure to speech when children are placed in demanding listening environments. It also facilitates the processing involved during SIN perception for young children, potentially advancing the child's development. Future work is needed to clarify the attributes of beneficial noise exposure during development due to the pilot study's small sample size.

Title: Communal egg-laying behavior and the consequences of egg-aggregation in the brown anole (*Anolis sagrei*)
Primary Author: Dees, Allison G.
Additional Authors: Wilson, Kayla; Reali, Chanel; Pruett, Jenna; Hall, Josh; Brandt, Renata; Warner, Daniel
Department: Biological Sciences
College/School: School of Forestry and Wildlife Sciences

Abstract:
Communal nesting is a behavior that involves multiple females laying eggs in the same nest or nesting site. This behavior may be a consequence of a shortage of preferable nest sites (constraint hypothesis) or an adaptation generated by fitness benefits associated with egg-aggregation (adaptive hypothesis). Experimental tests of these hypotheses require information about maternal nest-site choice and its fitness consequences. To address these, we studied a lizard (brown anole; *Anolis sagrei*) that produces single-egg clutches, but often aggregates eggs in nest sites. In a lab study, females were given the option of nesting in (1) soil previously used as nest substrate vs fresh soil and (2) soil with eggshells vs without eggshells. We also experimentally examined the effects of egg aggregation by incubating eggs singly, in groups of four, and groups of nine. We recorded egg surface temperature, water uptake, and hatchling morphology. Females were more likely to nest in pots with used soil and with eggshells than in pots with fresh soil or without eggshells. We observed no effects of egg aggregation on egg survival, egg temperature, or most measures of hatchling morphology. However, singly-incubated eggs absorbed more water than eggs incubated in the four and nine egg aggregations and this resulted in offspring with greater body condition (i.e. heavier for their length) at hatching. The behavioral experiment demonstrates that females actively choose nest sites that have been used previously (as expected under the adaptive hypothesis), but the egg-aggregation experiment shows no benefits to offspring based on the variables measured. Thus, the results of the behavior study support the adaptive hypothesis; however, results from our egg-incubation study do not. Likely, the adaptive and constraint hypotheses are not mutually exclusive, and a diversity of factors influence the evolution of communal nesting behavior.

Title: Towards microkinetic model generation: a theoretical study on protein deamidation network mapping
Primary Author: Dekle, Joseph K.
Additional Authors: Lawson, Katherine E.; Adamczyk, Andrew J.
Department: Chemical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Monoclonal antibodies (Mabs) are one of the most lucrative pharmacologics currently on the market. In addition to their primary use as vaccines for diseases such as the flu and HIV, Mabs are also used to treat cancer and autoimmune diseases. However, the diversity of these therapeutics is often limited by the degradation mechanisms experienced both in the formulation process and on the shelf after production. Due to size constraints, molecular models are crucial for studying these degradation mechanisms. One such mechanism of interest is deamidation, also known as peptide fragmentation through ammonia generation. In this study, we mapped out the deamidation of Asparagine and Glutamine into Aspartic Acid and Glutamic Acid, respectively. Full network mapping will enable us to determine the selectivity of the different possible deamidation mechanisms. To meet this goal, we studied a total of 10 dipeptides through which previous studies had determined were likely to promote deamidation. Modeled at a neutral pH, key parameters were computed using quantum chemical and statistical thermodynamic methods. From this, we were able to calculate the following values: Enthalpy of Reaction (ΔHR), Entropy (ΔS), Gibbs Free Energy of Reaction (ΔGR), Activation Energy (EA), and the Arrhenius pre-exponential factor (log(A)) for each dipeptide. From this, we predicted the most likely route of deamidation for each dipeptide reaction.

Title: The origin and formation of oxygen inclusions in austenitic stainless steels manufactured by laser powder bed fusion
Primary Author: Deng, Pu
Additional Authors: Karadge, Mallikarjun; Rebak, Raul; Gupta, Vipul; Prorok, Bart; Lou, Xiaoyuan
Department: Materials Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
The origins of nano-scale oxide inclusions in 316L austenitic stainless steel (SS) manufactured by laser powder bed fusion (L-PBF) was investigated by quantifying the possible intrusion pathways of oxygen contained in the precursor powder, extraneous oxygen from the process environment during laser processing, and moisture contamination during powder handling and storage. When processing the fresh, as-received powder in a well-controlled environment, the oxide inclusions contained in the precursor powder were the primary contributors to the formation of nano-scale oxides in the final additive manufactured (AM) product. These oxide inclusions were found to be enriched with oxygen getter elements like Si and Mn. By controlling the extraneous oxygen level in the process environment, the oxygen level in AM produced parts was found to increase with the extraneous oxygen level. The intrusion pathway of this extra oxygen was found to be dominated by the incorporation of spatter particles into the build during processing. Moisture induced oxidation during powder storage was also found to result in a higher oxide density in the AM produced parts. SS 316L powder free of Si and Mn oxygen getters was processed in a well-controlled environment and resulted in a similar level of oxygen intrusion. Microhardness testing indicated that the oxide volume fraction increase from extraneous oxygen did not influence hardness values. However, a marked decrease in hardness was found for the humidified and Si-Mn free AM processed parts.

Title: Cogswell Avenue redevelopment corridor: Pell City, Alabama
Primary Author: Deokar, Nishigandha P.
Additional Authors: Bajracharya, Shristi; Wylam, Brad; Esco, Taylor; Bhalerao, Rajas
Department: Community Planning
College/School: College of Liberal Arts

Abstract:
Pell City, Alabama is a small town and is in a region of the United States that is expected to grow due to its location between Birmingham, Atlanta, and Chattanooga. To fully understand Pell City, an in-depth analysis was conducted before any proposals were put together. The analysis focused on economics, demographics, connectivity, housing availability, zoning, and city ordinances of Pell City. Pell City does not lack access to strong infrastructure or major hubs, which can be used to improve the continuous development. Due to its strategic location, we believe Pell City can continue to grow if certain policies and plans are put into place to help the redevelopment of strategic parcels in the city and ultimately making the city more competitive and attractive to future economic investment. The goal of our project was to provide Pell City with a plan that outlines policies and strategies that will improve land use as well as spark economic development in the city. The proposal seeks to take advantage of its small-town feel and redevelop the city's underutilized core. The expected outcomes based on the plan were to promote connectivity, improve the streetscape, establish historical preservation, provide affordable housing, and generate equitable investments.

Title: Comparisons of phosphorus release characteristics from poultry litter using selective acidic and basic extractants
Primary Author: Dey, Poulomi
Additional Authors: Chakraborty, Debolina; Prasad, Rishi
Department: Crop, Soil, and Environmental Sciences
College/School: College of Agriculture

Abstract:
Poultry litter (PL) is a rich source of nutrients, especially phosphorus (P). As PL is bulky, its long-distance transportation is uneconomical. Poultry litter when applied repeatedly to crop and pasture fields over time causes the soil P levels to rise beyond the environmental threshold level and increases the risk of P loss to waterways via runoff during storm events. The development of methods to extract phosphorus from litter could be an important step towards reducing the P transport into the environment and the extracted P can be safely reused for agricultural purposes. The objectives of this research were 1) to quantify the P dissolution efficiency of extractants such as deionized water (H2O), 0.5 M NaHCO3, 1 M citric acid, and 1M HCl to extract P from PL 2) quantify proportions of organic versus inorganic P forms during the extraction process. Poultry litter was collected from eight poultry houses across Alabama. Poultry litter to extractant ratio of 1:100 and 1 hour shaking time was used repeatedly till the molybdate reactive P fall below the method detection limit. The extracted solution was analyzed for molybdate reactive P, organic P, and total P after each wash cycle. Results showed P dissolution efficiency in following order: 1 M HCl = 1 M citric acid > 0.5 M NaHCO3> deionized water. 1M HCl and 1 M citric acid extracted an average of 97% (±1%) of the total P from PL followed by 0.5M NaHCO3 and deionized water that extracted 61% (±9.7%) and 40% (±11.7) of the total P from PL respectively. Ninety-seven percentage of P recovery was achieved within four extraction cycles with HCl, whereas H2O took 7 cycles to recover 40 % dissolved P.

Title: A qualitative study of medicare plan selection decisions: rationality or bounded rationality?
Primary Author: Diggs, Kavon D. R.
Additional Authors: Chen, Zhenxing; Zhao, Yi; Westrick, Salisa C.
Department: Pharmacy
College/School: Harrison School of Pharmacy

Abstract:
Medicare beneficiaries can choose among various options including the Original Medicare, Medicare Advantage plans, etc. Because plan coverage and their needs may change from year to year, beneficiaries need to evaluate their choices annually. Given limited literature regarding how Medicare beneficiaries select their plan, this qualitative study's objectives are to identify factors influencing how beneficiaries select a plan and describe their decision-making process. Semi-structured in-person or telephone interviews with Alabama residents who have Medicare as their sole insurance provider was conducted in the Summer of 2019. Interview questions elicited participants' perceptions of factors they considered when selecting a plan, their priorities, and trade-offs. Transcripts were analyzed using thematic analysis with a process of qualitative inductive coding using Atlas.ti software. After several rounds of coding, 27 codes were identified and categorized into 6 themes including plan characteristics, decision-making process, knowledge, personal characteristics, environment, and experience. When making a plan selection decision, participants assessed plan characteristics including cost, coverage, and doctor access. Predisposing factors including participants' knowledge, experience, and characteristics including health status all influenced the plan selection decisions. Lastly, participants utilized the real world practical decision-making process to simplify their choices such as using only one attribute as the criteria when selecting the plan, staying with the status quo, and conducting satisficing (limited) search for alternatives. This study generates a better understanding of key factors influencing Medicare beneficiaries' decisions and the shortcuts they used to simplify their decision-making process. These findings will help researchers and community agencies create tools to help Medicare beneficiaries make rational decisions when selecting a plan.

Title: Multiple component transport through PEGDA membranes of varied fractional free volume

Primary Author: Dobyns, Breanna M.
Additional Authors: Kim, Jung Min; Beckingham, Bryan
Department: Chemical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Polymeric membranes are utilized for a wide variety of applications, such as biomedical, electrical, and purification purposes, due to their low carbon footprints, low energy requirements, and specificity for transporting certain molecules over others. One emerging energy application is the conversion of CO2 to liquid fuels or chemicals through electrochemical reduction. Such technologies are greatly needed today, due to the rising atmospheric CO2 concentration and eventual depletion of fossil-fuels resources. The technology for artificial photosynthetic fuel cell converts CO2 to high-value products via sunlight and water and utilizes an ion-containing polymer membrane to facilitate the transport of requisite ions. To prevent loss of device efficiency, the transport of methanol and sodium acetate, two common CO2 reduction products, must be well understood and preferably mitigated in these ion-containing polymer membranes. The most promising artificial photosynthesis cells today are inefficient due to high product transport through the polymer electrolyte membrane. Unfortunately, the cotransport of multiple solutes through polymer membranes is poorly understood. Herein, we utilize in situ attenuated total reflectance Fourier-transform infrared (ATR FTIR) spectroscopy to characterize multiple component transport through membranes. We synthesize poly(ethylene glycol) diacrylate (PEGDA)-based membranes of varying fractional free volume via UV-photopolymerization in the presence of varied water content and leverage these membranes to investigate differences between a single component and multicomponent transport behavior. We find the permselectivity of methanol over acetate varied by as much as 47% when comparing single to multicomponent diffusion experiments for membranes with the largest amount of fractional free volume. Critically, this work finds fractional free volume itself can impact the relative permeability of dense, hydrated membranes for solute mixtures.

Title: Investigating the role of LEC-specific P301L tau pathology in Alzheimer's disease
Primary Author: Dogan, Marissa H.
Additional Authors: Setti, Sharay, E.; Bloemer, Jenna, B.; Pinky, Priyanka D.; Pfitzer, Jeremiah, C.; Suppiramaniam, Vishnu., Reed, Miranda N.
Department: Biomedical Sciences
College/School: Harrison School of Pharmacy

Abstract:
Alzheimer's Disease (AD) is a fatal neurodegenerative disease that disrupts and destroys normal neuronal function via the formation of beta-amyloid plaques and neurofibrillary tangles made of hyperphosphorylated tau protein. One of the first brain regions to exhibit tau pathology in the lateral entorhinal cortex (LEC), with pathology "spreading" or "propagating" to connected regions, such as the hippocampus, as the disease progresses. To better understand the mechanisms underlying tau propagation, in experiment 1 we first injected an adeno-associated viral (AAV) vector encoding human tau with the P301L mutation into the LEC of healthy mice. After four weeks of LEC-P301L tau expression, we assessed for learning and memory impairments using memory tasks (object recognition and trace fear conditioning) designed to be LEC-dependent. After memory testing, we assessed for the presence of tau pathology using immunohistochemical staining of brain slices. Our results indicate that compared to controls, LEC-P301L mice exhibit subtle deficits in learning and memory that are associated with tau pathology in the LEC. LEC-P301L also mice exhibit impaired synaptic plasticity as indicated by a reduction in long-term potentiation, a cellular correlate of learning and memory. Because evidence from the literature suggests that neuronal activity may mediate the release of pathological tau from neurons, thereby underlying the spread of tau pathology from the LEC to the hippocampus, in experiment 2 we delivered bilateral injections of an AAV vector encoding human tau with the P301L mutant to the LEC. Then, we used optogenetics to stimulate neuronal activity in one hemisphere. Tau pathology spread further from the site of injection in the stimulated versus non-stimulated hemisphere, as indicated by the presence of tau pathology within the hippocampus. Preventing tau spread may ultimately prove to be a promising therapeutic target for the treatment of Alzheimer's disease.

Title: Mental and physical health of high school students from rural, low-income families
Primary Author: Dolinger, Sarah B.
Additional Authors: Feiss, Robyn; Pangelinan, Melissa
Department: Kinesiology
College/School: College of Education

Abstract:
Adolescence is a critical period for physical and mental health as the prevalence of obesity, anxiety, depression, and stress increases during this developmental stage. Participation in sports and physical activity may combat physical and mental health burdens during adolescence, but few have been conducted in rural and/or low-income populations, who may be disproportionately affected by health disparities. To investigate this knowledge gap, we conducted Wellness Fairs with 10th and 11th-grade students at rural Alabama high schools. Wellness Fairs were hosted at four Title I Alabama high schools and a total of 253 adolescents (104 males, 134 females, 15 sex not reported) participated in the study. Students completed the PROMIS Psychological Stress Experiences, PROMIS Pediatric Depressive Symptoms, PROMIS Pediatric Anxiety, and PROMIS Physical Activity questionnaires. Students also completed the FITNESSGRAM® physical fitness testing (body composition, BMI, resting heart rate, blood pressure, muscular strength and endurance (push-ups, curl-ups), and aerobic capacity (PACER)). Of our participants, 17.9% are overweight and 26.4% are obese. Further, 39.3% reported moderate or severe anxiety symptoms, 39.0% reported high or very high psychological stress symptoms, and 38.7% reported moderate or severe depressive symptoms. Sport participation was found to be positively associated with physical health measures (e.g., body fat percentage, blood pressure, resting heart rate, curl-ups, push-ups, and PACER test) but was not associated with mental health measures. Rather, physical activity was associated with mental health measures. These results indicate that the impact of sports participation and physical activity on physical and mental health in adolescents may differ in this population, compared to those in previous studies. The implications of these findings will be discussed with respect to changes in school policy to address these mental and physical health disparities.

Title: The curious construct of active learning in biology education research
Primary Author: Driessen, Emily P.
Additional Authors: Knight, Jennifer K.; Smith, Michelle K.; Ballen, Cissy J.; Woodruff, Brittany
Department: Biological Sciences
College/School: College of Sciences and Mathematics

Abstract:
Given that the term active learning (AL) often elicits interest and excitement among biology instructors, we explored what this term means to the community through the investigation of two research questions: (1) How is the term AL defined in the context of undergraduate biology classrooms?; (2) What AL strategies do instructors use in the context of undergraduate biology classrooms? To answer these questions we combed three biology education journals and surveyed members of the Society for the Advancement of Biology Education Research (SABER). The literature searched articles (N=148) and the listserv responses (N=105) were then analyzed for AL definitions and strategies, and these were then categorized. Most commonly, the reviewed articles did not define AL but did provide examples of specific AL strategies. Second, most commonly among the reviewed articles, there was no provided definition of AL or list of relevant strategies. Of the articles that did define AL, (N=27), the most popular theme that emerged from the definitions was related to "students interacting or engaging with the material," followed by definitions that emphasized what AL is not: "not a traditional lecture." These definitions were echoed by the survey respondents. Concerning AL strategies, we found that 38% of research articles related to AL did not mention any specific classroom strategies. The most frequently represented strategy categories from the literature and surveys were discussion (25% and 34%, respectively), group work (19% and 29%, respectively), and metacognition (19% and 45%, respectively). We conclude that AL means different things to different biology educators, and we highlight the importance of elaboration when using the term to characterize teaching.

Title: Efficient conversion of paper mill sludge to cellulose nanofibrils and their application as building blocks for constructing conductive nanopapers
Primary Author: Du, Haishun
Additional Authors: Parit, Mahesh; Jiang, Zhihua; Zhang, Xinyu
Department: Polymer and Fiber Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
In this work, we first tried to prepare cellulose nanofibrils (CNFs) from paper mill sludge (PMS) by a sustainable process of formic acid (FA) hydrolysis pretreatment combined with microfluidization. It was found that the mild FA hydrolysis (at 95 ºC for 3-6 h) pretreatment could hydrolyze most of the hemicellulose, swell and break down the cellulose fibers, and the cellulosic solid residue (CSR) with a high yield (over 75%) could be obtained. The resultant CSR could be further converted to CNFs with relatively low-intensity microfluidization (only two passes). In addition, FA could be readily recovered and reused with the recovery rate higher than 90%. Intriguingly, the resultant CNFs showed good dispersibility in DMSO, DMF, and DMAC because of the introduction of ester groups on the surface of the products during FA hydrolysis. Furthermore, cellulose nanopapers (CNP) were prepared from the above obtained CNFs dispersion by a vacuum filtration approach. A thin layer of chitosan (CS) could be further introduced on top of the CNP surface to introduce antibacterial ability. Finally, polypyrrole (PPy) was polymerized into the chitosan-coated CNP, resulting in the final multi-functional nanopaper (PPy-CS/CNP). Results showed that the obtained PPy-CS/CNP had high tensile strength (over 90 MPa), good antibacterial performance, high conductivity (2 S/cm), and excellent water-resistance (could remain the shape in water over 100 days), which showed great promise for the development of flexible and multi-functional electronic devices and high-end packaging materials.

Title: Evaluation of temperature and precipitation trends and long-term persistence in the CMIP6 climate models
Primary Author: Duan, Yanan
Additional Authors: Kumar; Sanjiv
Department: Interdisciplinary - Earth System Science
College/School: School of Forestry and Wildlife Sciences

Abstract:
Climate models are essential tools to understand the changing climate system. Coupled Model Intercomparison Project Phase 6 (CMIP6) provides outputs from state-of-the-art climate models. Climate modeling centers around the world have participated in CMIP6, which is sponsored by the World Climate Research Program. We evaluate 221 historical climate realizations (ensembles) from 23 CMIP6 climate models for their ability to capture observed temperature and precipitation trends. We employ a non-parametric trend detection technique with long-term persistence (LTP) consideration to account for decadal to multi-decadal climate variability in trend significance calculation (Kumar et al., 2013;2009). We also assess spatial variability in temperature and precipitation trends over the global land area (60N to 85N). Hence, we present a rigorous and comprehensive assessment of CMIP6 climate models. Results from this study can be useful for climate variability and change and water cycle studies.

Title: Studying the relationship between water use efficiency and yield in elite soybean lines in Alabama
Primary Author: Durstock, Mary K.; Koebernick, Jenny
Additional Authors: Buchaillot, Ma. Luisa; Sanz-Saez, Alvaro
Department: Crop, Soil, and Environmental Sciences
College/School: College of Agriculture

Abstract:
To meet the future food demands of an estimated 9 billion world population in 2050 and a changing climate crop yields will need to greatly increase. With Global Climate Climate change, the environments in which major crops are expected to suffer through more periods of unpredictable droughts. Though soybean (*Glycine max*.) cultivars with high water use efficiency (WUE) are well known and can sustain through early or late season drought, it is less understood whether these cultivars will meet future yield demands, as high WUE has been related with lower yield under well-watered conditions. By understanding the genetic and environmental factors underlying yield, yield components and WUE can help better predict routes for crop improvement. Within this study, 14 commercial cultivars adapted to different regions of the Midwest and Southeast were grown in two locations in Alabama. WUE was inferred using carbon isotope discrimination as this relationship has been well studied in soybean. During the growing season, physiological measurements were taken such as photosynthesis and leaf area index and at the end, harvest index and yield were taken. Between locations, photosynthesis, conductance WUEi varied suggesting environmental factors in WUE and yield variations. Carbon isotope discrimination varied among cultivars revealing an underlying genetic difference. With genetic and environmental differences and continued studies, breeding programs incorporating WUE characteristics can achieve higher-yielding cultivars in varying drought stresses.

Title: A species of Neopolystoma (*Monogenoidea: Polystomatidae*) infecting urinary bladder of alligator snapping turtles, *Macrochelys temminckii* (*Cryptodira: Chelydridae*) from the Pascagoula River, Mississippi
Primary Author: Dutton, Haley R.
Additional Authors: Bullard, Stephen, A.
Department: Fisheries
College/School: College of Agriculture

Abstract:
Polystomatidae (*Platyhelminthes: Monogenoidea*) includes 3 of 25 genera having species that infect freshwater turtles. These genera are diagnosed by the presence/absence and number of haptoral hamuli: Polystomoides (2 pairs of hamuli), Polystomoidella (1 pair of hamuli), and Neopolystoma (hamuli absent). Herein, we describe several specimens representing a species of Neopolystoma infecting the urinary bladder of the alligator snapping turtle, *Macrochelys temminckii*, in the Pascagoula River, Mississippi, USA. Our specimens differ from those of all other named and accepted species of Neopolystoma by having intestinal ceca that are diverticular and that terminate dorsal to the haptor, distinctive hooklets each having a shank and a thumb of approximately equal length and having a much longer and curved shaft, 16 genital coronet spines that each possess 1–2 flanges per spine, pre-testicular vaginal pores, and vaginal ducts that are anterior to the junction of the oviduct and genito-intestinal canal. Among the 24 accepted species of Neopolystoma, only 7 (3 from the urinary bladder, 3 from the conjunctival sac, and 1 reported from nostrils) are reported from 13 turtle host species in the US. This the first record of Neopolystoma from Mississippi and the alligator snapping turtle.

Title: Classification of intermediate-range missiles after launch
Primary Author: Eckert, Jordan P.
Additional Authors: Carpenter, Mark; Hartfield, Roy; Cervantes, Noel
Department: Mathematics - Concentration in Statistics
College/School: College of Sciences and Mathematics

Abstract:
We looked at a way to describe a deep learning neural network approach to intermediate-range missile system classifications during engagement. This paper is an update from a similar idea that if a known set of missile classes is to be fired, the measured telemetry of a missile from the given class can be used to rapidly determine the missile's class. The ultimate goal of this work is to rapidly identify characteristics of unknown missiles during flight in the shortest amount of time possible. These initial steps rely on characterizations derived from large numbers of flight histories or simulated trajectories identified by class. Deep learning neural networks were applied which yielded extremely accurate class predictions on both cleanly simulated and additional simulated radar "noisy" fly-outs data.

Title: Gas-phase formation of 2D GaSe quantum dot ensembles in a nonequilibrium laser ablation process
Primary Author: Elafandi, Salah G.
Additional Authors: Ahmadi, Zabihollah; Azam, Nurul; Mahjouri-Samani, Masoud
Department: Electrical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Interest in layered two-dimensional (2D) materials has been escalating rapidly over the past few decades due to their promising optoelectronic and photonic properties emerging from their atomically-thin 2D structural confinements. When these 2D materials are further confined in lateral dimensions toward zero-dimensional (0D) structures, 2D quantum dots with new properties can be formed. Here, we report a novel nonequilibrium gas-phase method for the stoichiometric formation and deposition of gallium selenide (GaSe) nanoparticles that can serve as quantum dot ensembles. We show that the laser ablation of a target in an argon background gas condenses the laser-generated plume resulting in the formation of aggregates and metastable nanoparticles in the gas phase. The deposition of these nanoparticles onto the substrates results in the formation of nanoparticle ensembles, which are then post-processed to further crystalize or sinter these nanoparticles. The effects of different background gas pressures, in addition to crystallization/sintering temperatures, were systematically studied. Scanning electron microscopy (SEM), photoluminescence (PL) spectroscopy, and time-correlated single-photon counting (TCSPC) measurement were used to study the correlations between growth parameters, morphology, and optical properties of fabricated structures.

Title: Use of acoustic tags to track movement of red swamp crayfish in response to elevated CO2

Primary Author: Elliott, Gabrella J.
Additional Authors: Cupp, Aaron; Allert, Annie; Stoeckel, James
Department: Fisheries, Aquaculture, and Aquatic Sciences
College/School: College of Agriculture

Abstract:
Procambarus clarkii is a highly invasive crayfish species that is native to the southern United States but has invaded many water bodies in North America and other continents. Recent work in our lab has demonstrated the potential of CO2 as a tool to drive crayfish out of invaded ponds or to push them towards low CO2 refuge areas for enhanced capture. The ability to track the movement of individual crayfish in ponds subjected to CO2 control measures would greatly enhance our ability to further evaluate and refine this control strategy. In this study, we first tested whether attachment of HTI telemetry tags to crayfish carapaces affected movement in relation to CO2. For a given run, eighteen tagged and eighteen untagged crayfish 40-55 mm carapace length was initially confined at one end of a 3.2 m trough equipped with a partial baffle. Carbon dioxide was diffused into water on one side of the baffle, but not the other. After a 15 minute acclimation period, crayfish were released to move freely in the trough for 30 minutes. Barriers were then used to divide the trough into five sections. Crayfish were removed and CO2 was measured in each section. Two sizes of tags were tested, with five runs per tag size. Preliminary results show little to no effect of either 15 mm or 20mm size tags on crayfish movement, with the greatest crayfish movement into areas of relatively low CO2 concentrations. Upcoming studies will track the movement of tagged crayfish in 0.02 ha earthen ponds to test whether the application of CO2 can be used to efficiently “push” crayfish into one end of infested ponds to enhance collection and eradication. The results of these studies will be used by the state of Michigan to design and conduct field trials in infested retention ponds.

Title: Cultural intelligence and study abroad: does length of time abroad impact student cultural intelligence?
Primary Author: Elliott, Megan M.
Additional Authors:
Department: Hospitality Management
College/School: College of Human Sciences

Abstract:
In a global society, it is no longer the exception to interact with people from different cultures, it is inevitable. The capacity to interact effectively on multi-cultural teams, during travel related to work, and to "operate within culturally novel and complex environments" (MacNab, 2012, p. 67) is becoming an invaluable asset. The capacity to function well in such settings is known as Cultural Intelligence (CQ). Exposure to different cultures, the length of exposure, and the motivation to engage with different cultures are key elements in predicting increased CQ. Study abroad allows students to refine their CQ in a structured and intentional environment, which leads to a greater global perspective as well as a higher willingness to work internationally post-graduation (Crowne, 2008). The purpose of this study is to determine the relationship between the length of time on a study abroad program and the impact on student CQ. The Cultural Intelligence Scale (CQS) is a proprietary assessment of the Cultural Intelligence Center ("Cultural Intelligence Center," n.d.). Few studies use the CQS to gauge the impact of study abroad on student CQ. For this study, students took the CQS before participating in their chosen study abroad program in an on-campus pre-travel meeting (T1), and then again after the completion of the program in an on-campus post-travel meeting (T2). The T1 and T2 tests were administered as part of the study abroad program curriculum. A regression analysis using the length of time and CQ shows the length of time predicts CQ with a moderate effect size. This study found that the length of time abroad does predict increased student CQ.

Title: A design tool for cost-benefit analysis and optimized design of green infrastructure for stormwater management
Primary Author: Ellis, Jackson R.
Additional Authors: O'Donnell, Frances C.; Vasconcelos, Jose G.
Department: Civil Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
The design of contemporary stormwater best management practices (BMPs) is primarily concerned with reducing the amount of runoff occurring for post-development site conditions. The proportion of rainfall that becomes runoff can be decreased by increasing the proportion of rainfall that is infiltrated into the soil layer, evaporated, transpired by plants, or captured for storage or reuse. Devices that are engineered to perform these functions are commonly referred to as green infrastructure practices (GIPs). There is a variety of GIPs that may be used by a stormwater manager, each with different design standards and associated construction and ownership costs. A tool was developed to make it easier for decision-makers to plan, design, and estimate the costs of incorporating green infrastructure into stormwater management plans. The tool employed a methodology for selecting the minimum-cost green infrastructure design based on water quality hydrologic objectives, as well as a simulation-optimization approach for the design of a conventional detention basin for peak flow attenuation and flood control for larger rain events. These methodologies were applied to an example catchment and the tool was used to design and estimate the cost of the optimized stormwater infrastructure. The results indicated that scale is an influential factor in the hydrologic and economic impact of using green infrastructure. The use of green infrastructure to drain 6.5 percent of the total catchment area resulted in a 0.1 percent reduction in required detention basin storage volume and associated costs, however, the total cost of the stormwater infrastructure increased by 7.6 percent when green infrastructure was used. These results illustrated the economic trade-off associated with green infrastructure and were influential in the ongoing development of cost-optimization methods for stormwater management.

Title: Inhibitory control in unimanual and bimanual force tasks
Primary Author: Erwin, Michael H.
Additional Authors: Matthews, Adefunke Dade; Neely, Kristina A.
Department: Kinesiology
College/School: College of Education

Abstract:
Inhibitory control allows an individual to prevent inappropriate behavior in favor of an ongoing goal-directed task. An example of inhibitory control is the ability to ignore your phone during an important conversation. Previous research (Neely et al., 2017) reports that force output serves as a measure of inhibitory control. Specifically, force output in a Go/No-Go task is scaled to symptom severity in adults with and without Attention-Deficit/Hyperactivity Disorder. However, participants only completed the task with their right hand, and patterns of brain activity differ for unimanual and bimanual tasks. The goal of the current project is to evaluate force output in unimanual and bimanual conditions in our Go/No-Go task to determine whether inhibitory control is hand-specific. To this end, healthy young adults will complete our Go/No-Go force task as well as tasks measuring hand strength and coordination. This poster will present pilot data from this study. This work is important because it will determine whether the inhibitory control of force output is affected by patterns of brain activation underlying unimanual and bimanual performance.

Title: Changing land use and land cover of Big Creek Lake Watershed, Mobile County, Alabama
Primary Author: Eva, Eshita A.
Additional Authors: Marzen, Luke
Department: Geosciences
College/School: College of Sciences and Mathematics

Abstract:
Land use and land cover (LULC) is a prime factor for any watershed to determine hydrology characteristics such as run-off, flow-rate, nutrient leaching, metal, and other organic pollution levels, etc. Our study area is Big Creek Lake which is 3,600 acres in area and is a tributary-storage reservoir in Mobile County located in southwest Alabama. Although the lake itself is only 3,600 acres, the watershed draining into it covers approximately 65,920 acres or 103 square miles. For this study, Landsat images were obtained from the USGS and chosen based on the observation of minimum cloud cover to have the lowest atmospheric and seasonal effects. Land use classification was performed using a hybrid unsupervised and supervised approach. The resulting classification was then recoded into water, forest, urban, agriculture, and grassland as each of these LULC areas have different impacts on water quality and quantity of the reservoir. The change detection approach involved the comparison of two dates of LULC classifications. Overall, all land uses experienced changes, where forest and grassland were found to be reduced urban built-up was significantly increased. During the period between 2004 and 2019, an area of 7473 acres of forest decreased. Similarly, the percentage coverage of grassland was found to be 33.4% in 2004 which gradually decreased to approximately 26.5% in 2019. In contrast, other land-use types showed considerable increases where the expansion of urban areas was most prominent. Urban built-up areas increased from 3698 acres (5.5%) to 5610 acres (8.34%) for 15 years (2004-2019). Agriculture was increased from 1.5% to 17% from 2004 to 2019. Forested areas revealed the largest land-use type that underwent a conversion process during 2004-2019. The forested areas were converted to urban built-up (261 acres), agriculture (305 acres), and grassland (5161 acres).

Title: Coordinated power balance scheme for a wind-to-hydrogen set in standalone power systems
Primary Author: Ezeodili, Echezona U.
Additional Authors: Kim, Jinho; Muljadi, Eduard
Department: Electrical and Computer Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
According to the American Wind Energy Association, U.S. wind power capacity increased 8 percent in 2018, more than double the capacity the U.S. had in 2010. Conventional energy resources are not only limited but also prone to cause environmental pollution. Therefore, there is a growing demand for renewable energy sources as a viable solution to the inadequacies of conventional energy resources. However, these renewable energy resources are intermittent and produce varying power outputs that affect the stability of the power system. For continuous and stable supply of electricity from these resources, energy storage technologies are required to support renewable energy systems. Hydrogen is gaining momentum as a potential future energy storage medium to supplement a variety of renewable energy sources. It can be regarded as an environmentally-friendly fuel with higher energy density making it advantageous over other storage technologies. Hydrogen energy storage is a process wherein the surplus of energy created by renewables sources during low energy demand periods is used to power electrolysis, a process in which an electrical current is passed through a chemical solution to separate hydrogen. Once hydrogen is created through electrolysis it is stored and can be used in stationary fuel cells to supply energy during high energy demand periods. This research presents a dynamic modeling and power control approach for a wind-to-hydrogen set, which consists of a type-4 wind turbine generator (WTG), a proton exchange membrane (PEM) electrolyzer, and a fuel cell system. The proposed power control approach aims to improve/optimize the efficiency of a wind-to-hydrogen set by producing hydrogen from surplus wind power and converting it back to electricity for peak-demand. This control scheme is tested under various scenarios to confirm the efficiency of the system

Title: A novel quaternary FPGA architecture using floating gate memories
Primary Author: Fadamiro, Ayokunle O.
Additional Authors: Rezaie, Pouyan; Harris, Christopher; Millican, Spencer
Department: Electrical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
A new quaternary FPGA (QFPGA) architecture based on floating-gate memory elements is presented and analyzed in this study. While technology scaling has delivered substantial FPGA performance, consumer demands go beyond what binary circuits can deliver. FPGAs implementing multiple valued logic (MVL) have been explored, but previously proposed architectures rely on non-standard fabrication techniques and optimistic performance analysis. Results show the proposed QFPGA implementation has a competitive delay and power density performance compared to equivalent binary implementations and previous QFPGA architectures from literature made in standard FinFET technology.

Title: Associations between antidiabetic medications use and breast cancer survival outcomes among medicare beneficiaries

Primary Author: Fahim, Md Shahariar
Additional Authors: McDaniel, Cassidi C.; Qian, Jingjing; Lin, Fang-Ju; Hsu, Chiu-Hsieh; Chou, Chiahung
Department: Health Outcomes Research and Policy
College/School: Harrison School of Pharmacy

Abstract:
Diabetes is responsible for high mortality among women with breast cancer. However, the variability of poor prognosis between different patient subgroups using anti-diabetic medications is still unknown. This study examined the associations between mortality (all-cause and breast cancer-specific) and different antidiabetic medication use before the breast cancer diagnosis. This study used a longitudinal, retrospective cohort design. Settings Linked Surveillance, Epidemiology, and End Results (SEER)-Medicare databases from 2007 to 2013 were used. Female beneficiaries were included if they had continuous Medicare enrollment and a new breast cancer diagnosis between 2008 and 2013 (n=49,151). Exposure Different classes of antidiabetic medications during one year before their breast cancer diagnosis. Outcome All-cause mortality (ACM) and breast cancer-specific mortality (BCSM, ICD-10 code: C50). Cox proportional hazard models were used to estimate adjusted hazard ratios (HR) and 95% confidence intervals for risks of survival outcomes, controlling for severity of diabetes and covariates. A total of 1,719 women with breast cancer used antidiabetic medications one year before their breast cancer diagnosis. Compared to metformin, patients using insulin, sulfonylurea, and combination drugs had a higher likelihood for ACM (adjusted Hazard Ratio, HR: 1.62, 95% CI 1.25 to 2.04; HR: 1.42, 95% CI 1.01 to 1.84; and HR: 1.45, 95% CI 1.14 to 1.83, respectively). In addition, patients with high scores (≥5) for diabetes severity index had a higher likelihood of having ACM compared to their counterparts (HR: 1.82, 95% CI 1.28 to 2.58). Except for the combination drug group (HR: 1.54, 95% CI 1.07 to 2.22), none other categories had a higher likelihood of getting BCSM. Among women with breast cancer, different antidiabetic medication use before cancer diagnosis likely affects ACM but not BCSM.

Title: Mental health issues and mobile healthcare: the effects of chatting app to increase accessibility and engagement of health resources on college campus
Primary Author: Falconer, Elling G.
Additional Authors: Kim, Yoonha; Hong, Jungpyo
Department: Communication
College/School: College of Liberal Arts

Abstract:
The mental health of college students is a growing concern (Auerbach et al., 2018). Depression and anxiety are commonly identified in college students (Kirsch, Doerfler, & Truong, 2015). Despite the importance of addressing the mental health issues, previous research lacks in understanding factors of motivating students to become engaged with health resources to solve mental health issues of students (Pedrelli, 2008). Mobile healthcare (mHealth) has become increasingly prevalent as a solution to providing health services worldwide (WHO, 2011). Benefits of adopting digitized healthcare solutions include the ability to integrate mHealth with current health services, increasing the ease of access as well as the engagement of health resources. Therefore, the purpose of this study is to examine the role of the mobile application to increase accessibility and engagement of health resources. Authors developed mobile health applications (i.e., chat systems) to enhance the accessibility of students and promote active engagement in personal healthcare management. In particular, the Solian (Solve + ian) – named by authors – is designed to share student's concerns with their counselor. This app is composed of three functions and the main function is chatting. The students can choose a counselor according to their needs and the selected professional counselors communicate with users. During the consultation, the counselors update the user's status. If students want extra-help about the problem, the consultant can connect health resources to the users. The sub-function of the app is exposing the local health resources, such as Auburn's health care center. The last function is a self-diagnosis test. The users can checkup their situation, also counselors can analyze a user's condition effectively. mHealth would provide a resource to many students, allowing services to be provided while students are on the waiting list to see a counselor.

Title: In-pond raceway system (IPRS) production trials growing stocker and food size hybrid catfish plus tilapia
Primary Author: Fantini, Leticia E.
Additional Authors: Chappell, Jesse; Hanson, Terry
Department: Fisheries, Aquaculture, and Aquatic Science
College/School: College of Agriculture

Abstract:
The performance and profitability of hybrid catfish (channel catfish, *Ictalurus punctatus*, ♀ x blue catfish, *I. furcatus*, ♂) raised in IPRS and Tilapia (*Oreochromis niloticus*) grown in cages were evaluated. Four ponds of 0.4 ha had a large raceway ("grow out") and a smaller raceway ("stocker generator"). Once grow-out units were harvested, the stockers would be harvested and placed into the vacated, adjacentgrow outt unit for growth tofood sizee fish. Additionally, a tilapia cage was placed into 2 of the 4 pounds and was used to reduce blue-green algae populations and large daily dissolved oxygen variations. Hybrid catfish were fed a 32% CP commercial diet twice daily. Each pond had a total of 5 HP of aeration keeping the dissolved oxygen above 3 mg L-1. Hybrid catfish (stocker + grow out) had yields ranging from 14,600 to 17,382 kg/ha with FCR averaging 1.59 and 1.70 for stocker and grow out, respectively. Total production equaled or surpassed production yields from conventional catfish pond production systems. Tilapia increased total production by 11%, with no additional feeding. Enterprise budget fixed and variable costs were developed using actual investment and production data. Economic profit was calculated using the monetary value of all inputs, including opportunity costs for non-cash items and risk premiums; additionally, accounting profit (net return calculated without the value of non-cash inputs) was calculated. The latter may be closer to what adopters of this technology would encounter. Costs of production varied among raceways and were influenced by survival and FCR. Economic enterprise budgets indicated negative net returns for combined catfish + tilapia and catfish only production, but tilapia only production had a positive net return. Accounting enterprise budgets showed positive net returns above variable cost and above all costs for catfish + tilapia combined and for catfish and tilapia separately.

Title: “Connecting the corridors”- rethinking Parkerson Mill Creek, AU Campus
Primary Author: Farjana, Riffat
Additional Authors:
Department: Landscape Architecture
College/School: College of Architecture, Design & Construction

Abstract:
Parkerson Mill Creek, an integral part of the local environment, is providing a green corridor with valuable native ecologies. The biodiversity has changed due to rapid urbanization, extra loads of surface runoff, climate change, and pollution. Between 1965-1973 the part of Parkerson mill creek near RBD library culverted which made a huge change in the flow of headwaters. The area is creating a straight edge between AU green space and the green walkways of the city of Auburn. Moreover, the city itself has negligible green spaces left in comparison with the green space of Auburn University. Both spaces co-exist without creating any connection. The site in the front of the RBD library has the potentiality to modify by bringing back the past and by reconnecting all green fabric of the city. My research goals focus on creating a transitional space of interaction. I emphasize the green connection of Auburn University and the city of Auburn to insure transitional ecological spaces as well. My research also proposes education, participation, stormwater collection and purification areas, the use of more permeable surfaces, reuse existing structure, and harvest rainwater. I engage my design research by examining sketches, scale models, section,s and repeated drawing investigation of the site. I accomplish my goals by creating an experiential social space of interaction in front of the RBD, daylighting Parkerson Mill creek, making Roosevelt Avenue a concourse; connect it with neighborhood street to Pine hill cemeter,y and extend it to Town creek, thus creating a connection of Parkersopn mill creek with Town creek in the urban fabric. The results of my design are the reflection of a new resilient social space that provides green connecting ecosystems and water quality. My final design amplifies the native ecosystem by connecting green corridors, water movemen,t and provides community space at the same time creates awareness by slowing down people to rethink Parkerson Mill creek.

Title: Laser-assisted selective and localized surface transformation of titanium to anatase, rutile, and mixed-phase nanostructures
Primary Author: Fathihafshejani, Parvin
Additional Authors: Mahjouri-Samani, Masoud
Department: Electrical engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Titanium has been the material of interest in biological implant applications due to their unique mechanical and biological properties. These implants interface with different biological parts in the body (e.g., bones, tissues) and could cause serious problems if pathogenic bacteria accumulate on the implant surfaces. Titanium dioxides (TiO2) have been very attractive in coating the surface of titanium parts for enhanced osteointegration and antibacterial behavior. However, the antibacterial activities vary for different TiO2 phases (e.g., anatase, rutile) and morphologies.i n this work, Titanium dioxide nanostructures with anatase, rutile, and mixed phases were successfully synthesized by a controlled pulsed laser-assisted transformation approach. A tunable nanosecond fiber laser with pulse-width duration ranging from 5 to 2000 ns and laser energy in the range of 0.05 to 1.57 mJ was employed for this transformation process. This versatile method is based on the controlled irradiation of titanium surface with a nanosecond fiber laser in the presence of oxygen gas flow. The influence of processing conditions such as laser power, scanning speed, laser pulse duration, frequency, and gas flow on the selective formation of anatase, rutile, and mixed phases was studied. The morphological and structural evolutions were investigated using various characterization techniques including scanning electron microscopy (SEM), X-ray diffraction (XRD), and Raman spectroscopy methods. The main advantage of this laser-assisted process was its ability to create localized and selective transformation with any desired patterns and shapes.

Title: Investigation into the halophilic, thermotolerant microalga *Picochlorum renovo* for greenhouse gas remediation and its potential applications
Primary Author: Ferrero, Marjorie A.
Additional Authors: Wang, Jin
Department: Chemical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Microalgae have long been recognized as a potentially significant biocatalyst due to their many prospective applications including a feedstock for biodiesel production, a source of nutraceuticals, an alternative food source, and for their role in greenhouse gas mitigation. Microalgae are capable of growing year-round, do not require arable land, can be cultivated in saline water, have higher biofuel potential compared to terrestrial crops, and can utilize carbon dioxide (CO_2) as a sole carbon source, further distinguishing them as ideal candidates for sustainable production of fuel and food. However, despite the considerable advantages of microalgae cultivation, there has been limited implementation of microalgae on an industrial scale. This is largely a result of low biomass productivity, high cost of media, and seasonal variations in cultivation conditions (e.g., temperature and light availability) leading to diminished biomass growth. For microalgae as a biocatalyst to become economically feasible each of these limitations must be addressed. *Picochlorum renovo* is a microalga that has exhibited superior biomass productivity compared to other microalgae species, is halophilic (likes high salt conditions) eliminating the need for freshwater, and can grow at high temperatures expanding the geographic regions it can be cultivated. In this work, we investigate the growth behavior of *P. renovo* under a range of cultivation conditions including varying carbon dioxide concentrations, varying light conditions, and varying temperatures. Equipped with this knowledge, we discuss potential applications of *P. renovo* including wastewater treatment which can overcome the hurdle of high medium costs.

Title: Selective adsorption of carbon monoxide using Cu+ ion: effect of CuCl morphology
Primary Author: Feyzbar, Farshad
Additional Authors: Oh, Tae-Sik
Department: Chemical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Cu+ ion has been used for CO adsorption in many adsorbent materials. In this work, CuCl with different morphologies has been synthesized to investigate the effect of different crystalline planes such as 111 (triangular morphology), and 100 (cubic morphology) on CO adsorption capacity, selectivity, and kinetics. The prepared samples were synthesized on the surface of copper support to form the different morphologies of CuCl and to effectively increase CO adsorption. X-CuCl/Cu were characterized using XRD, Rietveld analysis, N2 adsorption, and SEM. It was confirmed that Cu+ selectively adsorbed CO through π- complexation and CuCl with triangular and granule morphology has the highest CO adsorption capacity while the cubic morphology of CuCl provides the highest selectivity towards adsorption of CO.

Title: Field and laboratory investigations of groundwater arsenic sequestration in biogenic pyrite at an industrial site in Florida
Primary Author: Fischer, Alicia B.
Additional Authors: Lee, Ming-kuo; Saunders, James; Gilley, Sara; Marks, Justin; Redwine, Jim
Department: Geology
College/School: College of Sciences and Mathematics

Abstract:
Pumping groundwater from arsenic-contaminated aquifers has exposed millions of people to high and potentially deadly doses of the contaminant. Previous studies have investigated cost-effective techniques to remove groundwater arsenic (As) by stimulating sulfate-reducing bacteria (SRB) to form As-sequestering pyrite. This study intends to improve upon these past methods to demonstrate the effectiveness of SRB As remediation at an industrial site in Florida. The study has devised a new injection scheme to sequester As for nine months: A ferrous sulfate and molasses mixture was injected into eleven wells located upgradient of the plume, allowing the injectate to travel downgradient for full-scale remediation. The injectate was designed to stimulate SRB reduction and engender the precipitation of arsenian pyrite. Groundwater samples and newly precipitated solids were collected from June 2018 to March 2019. X-ray diffraction (XRD) and X-ray fluorescence (XRF) analyses, electron microprobe (EMP) measurements, scanning electron microscope (SEM) imaging, and geochemical calculations of arsenic speciation and mineral saturation have determined that As has been sequestered mainly in the form of arsenian pyrite. These analyses show the rapid precipitation of biogenic pyrite two weeks after injection, with the pyrite forming as euhedral crystals and spherical aggregates (framboids). EMP results indicate the sequestration of 0.01-1.21 wt% As in the precipitated pyrite. Additionally, geospatial and time-series data demonstrate that As concentrations have decreased throughout the site over nine months. From these analyses, the study has reduced As concentrations to below the site's regulatory standard of 0.05 mg/L throughout the nine months with the formation and stabilization of arsenian pyrite. Given these promising results, this study is within reach to optimize an affordable As-remediating procedure for industry and developing communities to reduce As to safe standards.

Title: Effect of light intensity and reduction of dietary energy and digestible lysine density on broiler chicken growth performance, breast meat yield, and meat quality defects
Primary Author: Flees, Joshua J.
Additional Authors: Keel, Andrew J.; Starkey, Charles W.; Starkey, Jessica D.
Department: Poultry Science
College/School: College of Agriculture

Abstract:
The objective of this randomized complete block design experiment with a 2 × 2 factorial treatment arrangement was to assess the effects of light intensity (LI) and starter phase dietary nutrient restriction (SDNR) on broiler growth, breast yield, and incidence and severity of Wooden Breast (WB) and White Striping (WS). On the day of hatch, Ross 708 × Yield Plus broilers (n = 384; 16 birds per pen; 3 replicate blocks) were randomly allotted to floor pens in the same facility that received either 2 (LOWLI) or 30 (HIGHLI) lux of light at litter level from d 0 to 35. Birds were fed either: 1) a commercial starter diet (CON) or 2) the CON diet with a targeted 10% reduction in both ME and digestible lysine (dLys) density (RES) in crumble form from d 0 to 14. All birds consumed a common grower diet from d 15 to 35. Means were separated using SAS (V9.4) PROC GLIMMIX and PDIFF at P < 0.05. No interaction among LI or SDNR was observed (P > 0.05). Broilers reared with HIGHLI were heavier on d 35, had increased feed intake (FI) in all feed phases compared with those reared in LOWLI ($P \leq 0.0096$). Broilers reared with LOWLI had lower BW gain from d 15 to 35 and d 0 to 35 compared with those reared with HIGHLI (P = 0.0073). Broilers fed the RES starter diet had similar BW and BWG ($P \geq 0.1902$) from d 0 to 14, but increased FI and FCR than those fed CTL ($P \leq 0.0012$). Neither LI nor starter diet altered breast weight, breast meat yield, and WB and WS incidence and severity ($P \geq 0.2050$). In conclusion, reductions in LI and dietary ME and dLys density reductions during the starter period did not produce the expected reductions in breast yield and incidence and severity of WB or WS. Further reductions in the starter diet ME and dLys density should be studied to better understand their impact on broiler performance, yield, and the incidence and severity of meat quality defects.

Title: Evaluation of carbon dioxide as a control technique for invasive red swamp crayfish (*Procambarus clarkii*)
Primary Author: Fogelman, Kaelyn J.
Additional Authors: Abdelrahman, Hisham; Jordan, Patrick; Allert, Annie; Cupp, Aaron; Stoeckel, Jim
Department: Fisheries, Aquaculture, and Aquatic Science
College/School: College of Agriculture

Abstract:
Red Swamp Crayfish (*Procambarus clarkii)* is native and economically important to the southeastern United States but have become an invasive pest elsewhere. There is a great need to develop and evaluate methods to control non-native populations and limit further expansions. Carbon dioxide is receiving increasing interest as a lethal and sublethal control tool for invasive species. We investigated the potential of CO2 to facilitate capture by inducing crayfish to migrate to the water edge or emerge from infested ponds. Objectives were to determine whether 1) emergence was greater in ponds treated with CO2 than non-treated ponds, 2) hourly collections were more effective than a single, final collection, and 3) freshwater inflows (refuges) into CO2 treated ponds reduced captures. Crayfish were stocked into 0.02 ha earthen ponds at densities of 100/pond. Treatments consisted of 1) no CO2, no freshwater inflow, 2) CO2, no freshwater inflow, and 3) CO2 plus freshwater inflow. CO2 was bubbled intermittently into ponds for a target concentration of ≥200 mg/L. Emerged crayfish and submerged crayfish at the water edge were collected on either an hourly basis or at the end of the experiment only. Water quality was collected hourly. Results showed significantly more crayfish were collected from CO2-only ponds. The temperature had a significant, positive effect on crayfish capture rates in CO2-only ponds. Under optimal conditions, as many as 57% of crayfish emerged from ponds within 5 hrs. Capture rates during suboptimal conditions were enhanced by collecting submerged crayfish at the water's edge. CO2 shows promise as a tool to enhance the capture of invasive crayfish. Findings highlight the importance of conducting evaluations of control methods under varying environmental conditions. If the goal is to increase capture efficiency via emergence from the water, the use of CO2 is likely to be most effective during warmer months and in the absence of inflow refuges within infested systems.

Title: Synthesis and testing of selective ‘pyrrophen’ systems for visual uranyl (UO22+) detection
Primary Author: Forbes, Madeleine G.
Additional Authors: Niklas, Julie; Mayhugh, Jacob; Gorden, Anne; Gorden, John
Department: Chemistry
College/School: College of Sciences and Mathematics

Abstract:
The development and characterization of uranium and other actinide elements provide valuable information about their behavior and remediation from the environment. Demands for nuclear waste storage and remediation warrant exploration for systems with the ability to selectively bind uranyl (UO22+), while excluding potentially competing for transition metal ions (Co2+,Cu2+, Zn2+, Ni2+, etc). Mixed-donor ligands such as salophens incorporate hard donors and have been studied extensively in this regard, yet soft-donor systems are less familiar. One exception is macrocyclic expanded porphyrins, but synthesis is challenging as they are costly and synthetically challenging to prepare. Coupling features from both expanded porphyrin-type and salen-type systems form a new category of hexadentate ligand that not only favors binding with uranyl over other cations but is also more easily synthesized. The modularity of the benzyl bis(pyrrol-2-yle)phenylenediamine ligand (or ‘pyrrophen’) offers opportunities for tuning steric and electronic features to maximize differentiation among metal complexes. With further exploration of steric and electronic contributions, a broader comparison of these pyrrophen derivatives can be made to determine which facets create the most effective and selective colorimetric sensor for uranyl detection.

Title: The relationship between the copy number of 11q11 gene and childhood obesity
Primary Author: Fouty, Anna D.
Additional Authors: Blocker, Alana; Phillips, Megan; Selvaraju, Vaithinathan; Jeganathan, Ramesh Babu; Sandey, Maninder; Thangiah, Geetha
Department: Biomedical Science and Nutrition Science
College/School: College of Human Sciences

Abstract:
Copy number variants (CNV) provide genetic modifications between individuals and human populations and are linked with multiple human diseases. Obesity is one of the highly heritable complex disorders, and obesity is associated with CNVs between individuals. A recent report shows that the 11q11 gene, a novel olfactory receptor, and its copy number variants play a role in the early onset of obesity. In the current study, we analyzed the relationship between 11q11 gene CNV and obesity measures in children. One hundred and twenty-seven participants between the ages of 6-10 years old were involved in this study. As per WHO guidelines, anthropometric measurements were recorded, and salivary samples were collected. DNA was extracted from saliva, and the copy number variants for the 11q11 gene were measured using digital PCR. The descriptive analysis of 11q11 copy numbers showed a significant increased CNV in girls compared to boys. African American participants had significantly increased CNV compared to European Americans. The percentage of overweight/obese participants with high copy number variants was significantly lower in boys compared to girls only in the European American population. Overall, these results suggest that difference in the 11q11 CNV in gender is mainly in European American overweight/obese participants.

Title: Using NASA earth observations to assess coastline replenishment initiatives and shoreline risk along Delaware's coasts
Primary Author: Gagliano, Nicholas J.
Additional Authors: Tessier, Rachel; Matevosian, Ani; Paris, Greta
Department: Environmental Science
College/School: College of Agriculture

Abstract:
Delaware's coastline is a vibrant tourist destination and a unique habitat for many vulnerable species. Yet, with the lowest mean elevation of any state, this indispensable stretch of land is threatened by numerous geological and climatic forces, including erosion, sea-level rise, storm surge, and subsidence. The state's Department of Natural Resources and Environmental Control (DEDNREC) has, therefore, served as a diligent combatant of coastal land loss since the 1950s. In partnership with the DEDNREC, the team utilized Landsat 8 Operational Land Imager (OLI), Landsat 7 Enhanced Thematic Mapper Plus (ETM+), Landsat 5 Thematic Mapper (TM), and the Terra Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) in combination with ancillary datasets to create a suite of time-series maps that identified shoreline extent changes in response to management projects and to generate a coastal land loss susceptibility map. Analyses of coastline change across time were performed using quantifiable measures derived from the time-series maps. The team found that there was a statistically significant, dampening shift of land to water between 1988 and 2018. Bombay Hook Wildlife Refuge, Prime Hook Wildlife Refuge, Rehoboth Beach, Slaughter Beach, and Assawoman Bay are the most susceptible areas to land loss along Delaware's coast. Areas that experienced the greatest land loss within the thirty-one-year range were Prime Hook and Bombay Hook Wildlife Refuges. Conversely, Cape Henlopen exhibited a notable accretion of land. These maps and analyses can be used by the DEDNREC to support the development of future coastal protection and replenishment strategies through the evaluation of restoration technique effectiveness and identification of at-risk areas.

Title: The association between Cajal bodies (CBs) and KSHV life cycles
Primary Author: Gan, Huachen
Additional Authors: Crawford, Bonnie.; Toomer, Gabriela; Sztuba-Solinska, Joanna
Department: Biological Sciences
College/School: College of Sciences and Mathematics

Abstract:
Kaposi's sarcoma-associated herpesvirus (KSHV) is the causative agent of several human malignancies arising in immunocompromised patients, and leading global cancer burden in people living with HIV/AIDS. KSHV replication consists of two phases, latent, with restricted expression of viral genes, and lytic, during which the expression of viral genes occurs in a defined order. The latent-to-lytic switch is marked by expression of polyadenylated nuclear (PAN) long non-coding (lnc) RNA, that governs the viral reactivation and modulates cellular processes. Our studies show that PAN undergoes installation of pseudouridine (Ψ) - a posttranscriptional modification, that when guided by small Cajal-body associated RNAs (scaRNAs), occurs within CBs. The formation of CBs involves two proteins, coilin, and survival of motor neuron protein (SMN), with scaffold and regulate their integrity. Our immunofluorescence analysis shows that KSHV reactivation induces CBs formation. The fraction of PAN seems to accumulate within it, likely to undergo pseudouridylation. The affinity capture of PAN followed by mass spectrometry (RAP-MS) analysis identified SMN, dyskerin - pseudouridine synthase guided by scaRNAs, and scaRNAs associated core proteins, as the PAN interacting molecules. We found coilin protein expression decreased in the lytic cycles. These results are suggestive of the subnuclear reorganization of coilin that occurs during KSHV lytic reactivation. Our further research will focus on discerning the role of CBs and their functional components in the KSHV lifecycle and pathogenesis. We will address the association of coilin with KSHV-encoded proteins and RNAs, and delineate the influence of coilin knockdown over KSHV latent and lytic gene expression programs. Viruses are known to induce profound changes to the overall nuclear architecture. Our project is, however, the first one linking CB formation, viral lncRNA epitranscriptomic modification, and herpesvirus replication.

Title: The first three-dimensional petrographic, geochronological, and geochemical characterization of the DeLamar epithermal Au-Ag deposit, Silver City, ID
Primary Author: Garcia, Raeann D.
Additional Authors: Bilenker, Laura; Hames, Willis; Barefoot, Marisa; Glidewell, Carly
Department: Geology
College/School: College of Sciences and Mathematics

Abstract:
Epithermal deposits are concentrations of metals formed from hydrothermal activity in shallow crust and provide a large amount of the world's gold (Au) and silver (Ag). Within this deposit type, low-sulfidation (LS) epithermal systems are dominated by surface fluids with limited to no magmatic input. DeLamar Mountain is a high-grade LS epithermal deposit located within the Northern Great Basin (NGB) in Idaho. Although it has been mined sporadically for over 150 years, little research has focused on this area. This study illuminates the formation of DeLamar from a three-dimensional perspective and improves our current understanding of the genesis of LS epithermal deposits worldwide. Complementary microscopic observations, geochronological data, and geochemical analyses shed light on the timing of the formation of DeLamar and nearby deposits as well as the potential role of the Yellowstone hotspot in their genesis. Spatially constrained samples were collected from drill core at DeLamar during the summer of 2019. Microscopy was used to identify and characterize minerals and their textures. Additionally, sulfur isotopes were measured in pyrite, a mineral associated with the ore, to fingerprint the source of the fluids that transported the Au and Ag. Six preliminary 40Ar/39Ar ages from single adularia crystals from neighboring Florida Mountain range from 15.95 ±0.06 to 15.35 ±0.07 million years, varying with size, depth, and within individual samples. These results overlap with previous studies, which reported ages for NGB deposits ranging from 16.6 to 15.2 million years and confirm that hydrothermal activity and mineralization were synchronous with the young Yellowstone hotspot, now located to the east. The observed age variations may reflect ore-forming events and record the thermal history of DeLamar and Florida Mountain. Together these data help construct a refined genetic model for DeLamar and the NGB by constraining the timing and source of mineralization.

Title: Damping effects of a particle damper on a torsional pendulum
Primary Author: Garton, Maximilian
Additional Authors: Koza, Tanner; Marghitu, Dan; Geng, Ying; Perkins, Edmon
Department: Mechanical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
A particle damper is a form of passive damping, which can dampen nearly all types of vibratory systems. Particle dampers function by energy dissipation, through an exchange of momentum and friction between the particles and the enclosure in which the particles have been placed. Particle dampers are useful in harsh environments where fluid or elastic dampers may not be able to function, such as in a vacuum or where temperatures would break down fluids and seals. Harsh conditions would ultimately fail a traditional damper. Research has previously been conducted for the use of a particle damper on translational systems and rotating systems, but the use of a particle damper on a torsional system has not yet been investigated. This case is intriguing as the particles within the torsional damper do not behave traditionally as particles would in a rotating system. The exchange of momentum due to the twisting of a torsional spring creates new conditions for the particles within. To recreate a torsional vibratory system, an experimental test was designed to withhold torsion springs and a particle damper placed on top. The system could be excited by an external source at any required frequencies. The purpose of this study is to determine whether or not a particle damper is effective or not when applied to a torsional system.

Title: Exploring changes in beliefs and attitudes towards CC health behaviors in adults with high risk: the meat and three greens feasibility trial
Primary Author: Gautreaux, Corinne E.
Additional Authors: Smith K. S.; Arthur, A.E.; Murrah, W.M.; Morrow, C.D.; Arnold R.D.; Braxton-Lloyd K.; Frugé A.D.
Department: Nutrition
College/School: College of Sciences and Mathematics

Abstract:
High red meat intake is associated with an increased risk of colon cancer (CC), while green leafy vegetables (GLV) may attenuate the cytotoxic damage from RM. We sought to explore changes in attitudes and beliefs towards CC health behaviors following a high GLV dietary intervention in adults with an increased risk of CC (NCT03582306). A 12-week randomized controlled crossover trial was conducted in adults with high RM and low GLV intake with body mass index (BMI) >30 kg/m2. Participants were stratified by gender and randomized to either the immediate or delayed intervention group and completed the Dietary Habits and Colon Cancer Beliefs Survey (DHCCBS) at the beginning and end of the study. During the 4-week intervention period, participants were provided with frozen GLV and counseled to consume 1 cooked-cup equivalent daily. Adherence was assessed twice weekly via 3-day recall. Participants consumed their normal diet for the remaining 8 weeks. Participants were dichotomized as low (LA, n=22) versus high (HA, n=25) adherence. Partial correlations, paired t-tests, and independent samples t-tests were conducted to investigate relationships between survey responses and intervention adherence. Overall, DHCCBS perceived risk scores increased significantly from pre to post (2.9 ± 1.1, 3.4 ± 0.90, p=0.007). Perceived benefits from GLV consumption significantly increased pre to post (4.0 ± 0.6, 4.2 ± 0.7, p=0.038). In LA, raw adherence data correlated with baseline GLV intake, as well as change in knowledge about risk (ρ=0.399, p=0.048; ρ=0.416, p=0.039, respectively). However, adherence in HA was correlated with change in the perceived benefits of GLV (ρ=0.476, p=0.029). Participating in a high GLV intervention provided increased knowledge about perceived CC risk, which translated to increased adherence.

Title: The cycle of abuse: life outcomes for childhood sexual abuse survivors
Primary Author: George, Lidia M.
Additional Authors:
Department: Clinical Mental Health Counseling
College/School: College of Education

Abstract:
Research suggests that childhood sexual abuse (CSA) can be related to future revictimization and sexual aggression in survivors. CSA is also connected to risky sexual behaviors in adults. Research on this topic could lead to a reduction in these behaviors through resources and therapies given to CSA victims. In the mental health field, this population would be considered a vulnerable population. They are considered this because they require greater protection against potential risks when participating in research studies and therapy in general. There is limited effective research on the topics of CSA and revictimization due to incongruence in terminology in research and the mental health field. Victimization and perpetration can vary among literature and clients themselves. According to Walsh, et al., (2007), "Sexual assault has been associated with a host of adverse outcomes, including depression, posttraumatic stress disorder (PTSD), substance abuse, low self-esteem, and interpersonal problems; hence, examining risk factors for sexual assault is of great importance." This research could potentially aid in creating specific therapies that target CSA survivors to prevent adulthood revictimization and/or sexual aggression.

Title: Utilizing a methanotroph-microalgalco-culture for treating raw municipal anaerobic digestate
Primary Author: George, Natalie E.
Additional Authors: Roberts, Nathan
Department: Chemical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Wastewater treatment utilizing anaerobic digestion decreases the amount of nitrogen present in liquid waste streams, which is beneficial to the ongoing global waste epidemic. Biogas (methane (CH4) and carbon dioxide (CO2)) along with high concentrations of ammonia (NH3) and phosphate (PO43-) are by-products of the AD process. Biogas is not frequently utilized in industrial settings and is mainly flared or used for heating. Secondary treatment to remove eutrophication-causing nutrients (NH3 & PO43-) from AD effluent is not always effective at removing the nutrients. The release of this effluent into the environment may cause harmful algal bloom in bodies of water. We have developed a co-culture of methanotroph and microalgae that are capable of recovering both CH4 and CO2 in biogas while simultaneously recovering the nutrients in wastewater effluents. We have chosen Methylococcus capsulatus and Chlorella sorokiniana as the model co-culture pair in this study. Currently, large dilutions (10-20 times) of AD effluent is performed with fresh water as it is reported that high concentrations of toxins and nutrients in wastewater reduce microbial growth. Our established protocol utilizes clarifier water from the wastewater treatment plant for dilution; thereby reducing the cost and eliminating the need for already clean water. We have examined the co-culture performance on different raw AD effluent concentrations. Preliminary results indicate that the co-culture grows well when diluted between ~180 and ~360 mg/L NH3-N; however, smaller dilutions of AD effluent to ~530 mg/L NH3-N resulted in significant inhibition of both strains. Co-culture growth at the 360 mg/L NH3-N level also allowed better biogas and nutrient recovery. Co-culture technology is promising for nutrient recovery from wastewater while simultaneously capturing both CH4 and CO2 in biogas. The biomass produced can be utilized for value-added products such as chemicals or biofuels.

Title: Binary versus ternary metal oxide synthesis pathways: a study on copper oxide formation catalyzed by group 13 metals
Primary Author: Gibson, Noah J.
Additional Authors: Bredar, Alex; Farnum, Byron
Department: Chemistry
College/School: College of Sciences and Mathematics

Abstract:
The properties of metal oxides nanocrystals are highly dependent on size, morphology, or the introduction of defects in the form of dopants. A large variety of solution-phase syntheses exist to create stable, metal oxide nanocrystalline materials. Recent developments in the hot injection methodology have provided an efficient method for the controlled growth of metal oxide nanocrystals for the use in catalysis, sensing, and fuel production. One method in particular allows for the synthesis of metal oxide materials via a greener, esterification reaction using oleic acid and oleyl alcohol. However, the application of this method is limited by the formation of the appropriate metal monomers for late transition metals like copper or nickel. Here, we show that the addition of group 13 metals with known Lewis acid properties can effectively catalyze the formation of these reactive monomers for nanoparticle nucleation. Through the addition of a metal catalyst, we extend this synthesis to p-type cuprous oxide (Cu2O), being previously unobtainable under similar reaction conditions. In addition to this, the presence of a group 13 catalyst can effectively tune nanoparticle size by one order of magnitude by simply changing catalyst amount or identity. However, challenges still exist in the synthesis of homogenous ternary metal oxides using this method due to competing pathways for binary metal oxide formation.

Title: Longitudinal relations between family SES and adolescent adjustment: sleep and physical activity as moderators
Primary Author: Gillis, Brian T.
Additional Authors: El-Sheikh, Mona
Department: Human Development and Family Studies
College/School: College of Human Sciences

Abstract:
Symptoms of adolescent adjustment problems are common (Philipp et al., 2018) yet are not distributed evenly in the population (Cicchetti & Rogosch, 2002). Children from lower-income families seem to be especially vulnerable to maladjustment (Evans, 2004); however, such risk may be heightened for those with poorer sleep quality (El-Sheikh et al., 2010) or less physical activity (Sigfusdottir et al., 2011). Consistent with cumulative risk (Evans, 2003) and diathesis-stress (Sameroff, 1983) frameworks, sleep and physical activity was tested as moderators of the relationship between family socioeconomic status (SES) indexed by income and trajectories of adjustment outcomes from ages 16 to 18. Participants included a socioeconomically diverse community sample of 252 youth (53.17% female; 32.54% Black/African American; 67.46% White/European American). Family income was reported by parents, sleep measured objectively with actigraphy, and physical activity and adjustment (anxious/depressive symptoms and rule-breaking behavior) reported by youth utilizing widely used psychometrically sound measures. In latent growth models, the interaction of family SES, sleep duration, and physical activity was associated with the slopes of anxious/depressive symptoms (B = –0.004, SE = 0.002, p = .05) and rule-breaking behavior (B = –0.004, SE = 0.001, p < .01) while accounting for the effects of sex, race, and BMI. Interaction plots showed that lower-SES individuals with shorter sleep duration and less physical activity had increasing rule-breaking and that longer sleep had a protective role among lower-SES teens with less physical activity (anxious/depressive). By identifying youth most at risk for adjustment problems and by examining potential protective and vulnerability factors, the results of this study may inform interventions (Kieling et al., 2011) seeking to prevent or treat symptoms of maladjustment in adolescents from families of various socioeconomic backgrounds.

Title: The effect of load magnitude on muscle activation during unilateral suitcase dumbbell carries

Primary Author: Gober, Peyton N.
Additional Authors: Bordelon, Nicole M.; Cassidy, Molly M.; Stewart, Sydney N.; Oliver, Gretchen D.
Department: Exercice Science
College/School: College of Education

Abstract:
DESCRIPTION: Upper extremity overuse injuries in sport may result from instability of the lumbopelvic hip complex (LPHC) and scapular stabilizing muscles. Unilateral dumbbell carries to improve stability is common; however, the effect of load on muscle activation should be understood. The purpose of this study was to investigate the effect of load magnitude on muscle activation during unilateral dumbbell carries. Eighteen (22.5 ± 2.5yrs, 174.9 ± 8.7cm, 71.8 ± 27.8kg) injury-free and resistance-trained individuals completed 3 trials of 3 load conditions relative to body weight including light (30%), moderate (35%), and heavy (45%). A single dumbbell was carried across a 12m distance in a suitcase position on the dominant side. Electromyography was used to analyze muscle activation of the following: dominant upper and lower trapezius (UT, LT), latissimus dorsi (LD,) and serratus anterior (SA) as well as bilateral gluteus medius (GM) and external obliques (EO). All muscle activations were normalized to individual maximum voluntary isometric contractions (MVIC). A 3 (load) x 8 (muscle) repeated measures ANOVA compared muscle activation (% MVIC) between load conditions.The analysiss revealed a significant load by muscle interaction effect [F (4.564, 77.582)=2.454, p=0.045]. Post hoc analysis revealed greater activation in heavy loads compared to light in the UT (p=0.001), LD (p=0.005), non-dominant EO (p=0.008), and the non-dominant GM (p<0.001). Greater activation was also present in the moderate loads compared to light loads in the UT (p= 0.003), non-dominant EO (p=0.003) and non-dominant GM (p=0.001). The effect of load on LPHC and scapular activation was muscle specific. Greater differences in contralateral activation (non-dominant EO and GM) likely occurred from a greater demand on the core to resist lateral flexion and maintain vertical alignment. muscle-specificific effects of load during unilateral carries should be considered during resistance training programming.

Title: Effects of calcium in the tobacco-*Xylella fastidiosa* pathosystem
Primary Author: Gomez Arias, Laura Melissa
Additional Authors: De La Fuente, Leonardo
Department: Entomology and Plant Pathology
College/School: College of Agriculture

Abstract:
Xylella fastidiosa (*Xf*) is a Gram-negative plant pathogenic bacterium that lives in the xylem vessels of infected plants and the foregut of sharpshooter's insect vectors. *Xf* causes diseases in many economically important crops worldwide. Virulence mechanisms of *Xf* involve colonization of host plants through twitching movement and development of biofilm leading to vessel occlusion and water stress. Essential micro- and macronutrients including calcium (Ca) are required for a myriad of functions within cells and are under tight homeostatic control. Previous results from our group show that: 1) *Xf* uses Ca enhance virulence traits, and 2) *Xf* infection triggers a host response that leads to the accumulation of Ca in plant tissue. To further assess previous results, the PD0913 gene was functionally studied by performing site-directed mutagenesis. Compared to the wild type, the mutant had lower total and planktonic growth under different concentrations of Ca (2 mM and 4 mM). However, biofilm growth was significantly higher for both mutant and WT under 4 mM of Ca. The main difference between WT and mutant is found in their ability to move via twitching motility. High concentrations of Ca (2 mM) significantly increased the twitching motility of mutant cells in which the fringe width was 120 mm while it was 40 mm for the WT. 4 mM Ca concentration prevented movement in both WT and mutant. Overall, results suggest that the PD0913 gene indeed is involved in the regulation of virulent traits such as twitching motility, which is modulated by Ca in vitro. Virulence in planta expressed by AUDPC (Area Under Disease Progress Curve) at different concentrations of Ca showed that ΔPD0913 is slightly more virulent than Temecula1. These observations suggest that interactions between plant hosts and the bacterium are affected by Ca. This led us to hypothesize that *Xf* is hijacking the Ca-defense response of the plant host to increase its virulence.

Title: Design of Oriented β-cyclodextrin/chitosan copolymer and its adsorption on nanocellulose surfaces as an active coating for molecule capture
Primary Author: Gomez-Maldonado, Diego
Additional Authors: Vega Erramuspe, Iris Beatriz; Filpponen, Ilari; Johansson, Leena-Sisko; Waters, Matthew; Peresin, Maria Soledad
Department: Forestry
College/School: School of Forestry and Wildlife Sciences

Abstract:

The use of bio-based materials for replacing fossil-fuel based alternatives is in the rise, however, green strategies to improve their performance are needed. This is particularly important in the case of lignocellulosic Currently, modified cellulose is used in a wide variety of products such as food additives, films, cosmetics, fibers, and paints. Chitosan - the second most abundant biopolymer-is less utilized even though its amine functional group make it very appealing for a variety of application, especially in the biomedical industry. Furthermore, the irreversible adsorption between cellulose and chitosan without extra energetic inputs allows for the opportunity to build composite materials using the layer-by-layer approach, enabling the engineering of a wide variety of environmentally-friendly materials. In this project, chitosan was modified with TEMPO-oxidized β-cyclodextrin (Ch-TOCD), using different NH: COOH ratios. The resulting copolymer was then adsorbed onto nano-fibrillated cellulose surfaces and the material was used to capture microcystin-LR by physical adsorption. This molecule was selected as it is considered an emerging target water remediation. Microcystin-LR has been linked to liver cancer and in recent years, it has been found that concentrations rise to hundred-folds the concentration considered safe by The World Health Organization. The prepared co-polymer Ch-TOCD was characterized using Elemental Analysis (EA), X-Ray Photoelectron Spectroscopy (XPS), and Fourier Transform Infrared Spectroscopy (FT-IR). The ability of this material to adsorb onto cellulose surfaces and the capacity of the resulting system to capture microcystin-LR was studied with Quartz Crystal Microbalance with Dissipation monitoring (QCM-D) and by Surface Plasmon Resonance (SPR).

Title: Click chemistry towards allyl-polymer MRI contrast agents: solubility, kinetics, and magnetic responses
Primary Author: Gong, Mingrui
Additional Authors: Minkler, Michael; Beckingham, Byran
Department: Chemical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Magnetic resonance imaging (MRI) uses a strong external magnetic field to resolve the relaxation time that proton excitation and relaxation. Then a computer program utilizes this information to project detailed images of the organs and tissues for clinical analysis. MRI contrast agents are introduced to tune relaxation times of nuclei to improve the visibility of certain areas of interest by increasing contrast with the surrounding tissue. Current MRI contrast agents are commonly gadolinium-based, which can result in side-effects to patients, including severe kidney problems. Therefore, a low-toxicity and biocompatible MRI contrast agent is sought to investigate as a possible replacement for the gadolinium-based contrast agents. Here, we investigate poly(alley glycidyl ether) (PAGE) as a polymer of interest due to its biocompatible PEG backbone and pendant allyl which is amenable for the click chemistry to incorporate magneto-responsive groups. The experimental approach is to functionalize PAGE with varied content of a magneto-responsive substituent and examine the impact on relaxation time. First, a small molecule is synthesized by the reaction of histamine and γ-thiobutyrolactone. The resulting small molecule contains a thiol for reaction with the PAGE-pendant allyl groups and a histamine residue for quaternization. Once isolated, we functionalize PAGE with this small molecule through thiol-ene click chemistry and lastly quaternized with iron(III) chloride to introduce the magneto-responsive character to shortening relaxation times. 1H Nuclear Magnetic Resonance (NMR) is used to simulate general conditions in MRI and to determine the chemical and magnetic properties of the product in the laboratory. A 20 mol% of functionalized PAGE has been synthesized and the impact on relaxation time investigated in dimethyl sulfoxide (DMSO) at varied concentrations. One of the expectations of this biocompatible and low-toxicity product is the requisite water solubility for use in humans.

Title: A model to create hunger-free college campuses throughout Alabama
Primary Author: Goodman, Malerie E.
Additional Authors: Powers, Alicia; Rains, Sara
Department: Hunger Solutions Institute
College/School: College of Human Sciences

Abstract:
A large, nationwide survey of college students in 2019 revealed 45% of respondents experienced food insecurity within the last 30 days, and 27% of Auburn University's student body reported food insecurity in a 2018 survey. To address this need, the Alabama Campus Coalition for Basic Needs (ACCBN) was established in 2018 to unite and support Alabama universities addressing basic needs among college students. Ten 4-year ACCBN participant universities are using an evidence-based model to address student hunger, which includes creating campus coalitions of support (ENGAGE), assessing the prevalence and perception of food-insecurity on campus (ASSESS), creating an action plan to address identified needs (PLAN), executing planned strategies to address identified needs (IMPLEMENT), evaluating the success of implemented strategies (EVALUATE), and celebrating successes (CELEBRATE). Auburn University's Hunger Solutions Institute will use secondary data from surveys administered at each ACCBN participating university to identify the prevalence of food-insecurity on each campus and key demographics of students experiencing food insecurity. Results will be used to build awareness of the prevalence of food insecurity among college students at universities across the state of Alabama, identify target populations of college students throughout the state in need of support to meet basic needs, and provide practical recommendations to four-year universities to assist their students who experience food insecurity.

Title: Structural Determination of BVDV IRES RNA for development of RNA-specific small molecule therapeutics
Primary Author: Gosavi, Devadatta A.
Additional Authors: Wower, Iwona; Wower, Jacek; Sztuba-Solinska, Joanna
Department: Biological Sciences
College/School: College of Sciences and Mathematics

Abstract:
Bovine Viral Diarrhea Virus (BVDV) is a (+)-sense RNA virus, that poses a global threat to the cattle industry. BVDV associates with respiratory, gastrointestinal, and reproductive diseases and accounts for $2.5 billion per year in economic losses worldwide. The initiation of BVDV translation occurs via an RNA regulatory domain referred to as an internal ribosome entry site (IRES). It can be found in other pathogenic viruses like HCV, as well as in cellular mRNAs controlling cell proliferation. Wower et al. (2011) using comparative structural analysis have shown that BVDV IRES comprises specific motifs, that govern both viral translation and replication, processes relevant to viral pathogenesis. I am investigating the structural conformation of BVDV IRES to develop RNA-specific therapeutics. Small molecule antivirals can target RNA by specific molecular recognition events unique to particular RNA structure rather than intercalation or sequence complementarity thus representing a novel and promising therapeutic modalities. I have established a bovine kidney cell system that stably expresses pIW-IRES(R17)-EGFP reporter plasmid including BVDV IRES. I am using SHAPE-MaP analysis, a high-throughput biochemical probing methodology to investigate the IRES structure inside the living cells, in association, and without actively translating ribosomes. The information derived from that system will guide the selection of structurally and functionally defined IRES domains that will be used to screen for RNA-specific chemotypes using the small molecule microarrays (SMM) strategy. It is used for evaluating large libraries of compounds for their ability to bind biomolecules. The “hit” molecules will be tested in BVDV infected MDBK cells to assess their influence over the virus replication. Further studies will also aim at using Cryo-EM for determining the 3D structure of BVDV IRES and discerning the specificity of chemotypes binding to IRES using SHAPE-MaP analysis.

Title: Aerodynamic comparison of a flapping-wing drone to a red-tailed hawk
Primary Author: Gosdin, Levi R.
Additional Authors: Swiney, Paul; Raghav, Vrishank
Department: Aerospace Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
With an increasing demand for unmanned aerial vehicles (UAVs) for civilian and military applications comes the limitations of gusty environments. Technology must be developed to effectively overcome the challenges of flying in harsh conditions. This project continues the search for appropriate countermeasures by comparing the natural response of a red-tailed hawk to vertical gusts to that of a flapping-wing drone. In preliminary experiments with the Southeastern Raptor Center, a red-tailed hawk maintained steady flight after experiencing the vertical force of four industrial fans blowing vertically across the span of the hawk's wings. It was observed that the hawk performed a maneuver to successfully mitigate the gust. A scaled-down test with a flapping-wing drone resulted in an unstable pitch forward causing the drone to crash. To successfully apply the hawk's response to UAVs, the response of the hawk was first quantified using a digitizing environment in MATLAB called DLTdv. Several points on the bird such as the beak, tail root, and tail tip were tracked in 2D, and the tail angle was computed as a function of time. It was calculated that the hawk actively responded to the gust by deflecting the tail downward at a maximum angle of 30 degrees as the beak and body entered the gust region. To ensure accurate tracking of the drone, white markers were placed on the body, wings, and tail to allow the DLTdv software to automatically track the flight dynamics. A 3D reconstruction of the drone flight was obtained by using calibration coefficients. The drone will be subjected to a scaled-down vertical gust, and the response will be accurately captured using four high-resolution Phantom cameras. Similarly, the hawk will again be subjected to the vertical gust, and the response will be reconstructed in 3D using the proven tracking techniques with the drone. A new UAV design will be developed by implementing the successful maneuvers of the red-tailed hawk.

Title: Selective PPAR-γ agonism attenuates neuroinflammation and improves brain energy dysregulation in a model of Alzheimer's disease
Primary Author: Govindarajulu, Manoj Y.
Additional Authors: Govindarajulu, Manoj; Ghanei, Nila; Yoo, Sieun; Steinke, Ian; Schaedig, Taylor; Suppiramaniam, Vishnu; Amin, Rajesh
Department: Pharmacology
College/School: Harrison School of Pharmacy

Abstract:
Neuroinflammation and brain metabolic dysfunction are a well-established feature of AD, that can be observed potentially decades before the development of AD symptoms. Thiazolidinediones (TZDs) are insulin-sensitizing peroxisomal proliferator activating receptor-gamma (PPARγ) agonists and are promising agents for improving pathologies of AD. However, they display poor blood-brain barrier (BBB) permeability, thus requiring high dosing and are associated with several adverse side effects. We have developed a novel PPARγ (AU-9) in-silico that avoids the unwanted side effects of current PPARγ agonist, including edema and effects on the heart. Furthermore, AU-9 displays enhanced BBB permeability, thus requiring lower concentrations to promote protection against AD. We hypothesize that our lead compound (AU-9), a selective dual Peroxisome proliferator-activated receptor γ/δ modulator improves neuroinflammation and energy dysregulation associated with AD in a mouse AD model. Six months old triple-transgenic AD (3xTg-AD) and C57BL/6J control mice were treated with AU-9 for one month. Hippocampal gene expression analysis for neuroinflammation and energy regulation was performed by Nanostring gene array. Hippocampal lysates were analyzed to determine the effect of AU-9 on various inflammatory and insulin signaling pathways; Immunohistochemistry to determine markers of inflammation and In vitro studies utilizing murine BV2 microglial cells to study the signaling mechanisms involved improving neuroinflammation and insulin signaling pathway. Gene expression analysis indicated decreased mRNA expression of various inflammatory genes and upregulation of genes involved in energy regulation with AU-9. Biochemical assays showed AU-9 attenuated p38 MAPK signaling, decreased microglial activation, and improved PI3K-Akt pathway both in murine BV2 microglial cells and in 3xTgAD mice. Our results indicate that AU-9 offers potential therapeutic benefits for mitigating pathologies in AD.

Title: Effect of administration route and AAV serotype for treatment of feline GM1 gangliosidosis

Primary Author: Gross, Amanda L.
Additional Authors: Gray-Edwards, Heather; Sena-Esteves, Miguel; Martin, Douglas R.
Department: Biomedical Science
College/School: College of Veterinary Medicine

Abstract:
GM1 gangliosidosis is a fatal neurodegenerative disease caused by a deficiency of lysosomal β-galactosidase (βgal). Cerebrospinal fluid (CSF) administration of adeno-associated viral (AAV) therapy is hypothesized to be an effective method for treating neurodegenerative diseases. In this study, we evaluated two serotypes (AAV9 and AAVrh10) using CSF delivery via the cisterna magna (CM). Additionally, we compared these results to the intravenous administration of AAV9. All treatment cohorts received 1.5e13 vector genomes/kg body weight at 1.8 ± 0.5 months of age. Untreated GM1 animals survived 8.0 ± 0.6 months while treated animals lived significantly longer. Clinical assessments included neurological exams, CSF biomarkers, and 7T magnetic resonance imaging (MRI) and spectroscopy (MRS). Postmortem analysis included βgal and virus distribution. Neurological abnormalities, which progress rapidly in untreated GM1 animals, were delayed but not halted in both CM treated cohorts. The IV treated cohort had mild neurological symptoms, similar to those seen early in disease stages, but no further impairments. MRI revealed delayed progression of neurodegeneration in both CM cohorts and preservation of brain architecture in the GM1+AAV9 IV cohort. Glycerophosphocholine and phosphoscholine, an MRS biomarker that increases with loss of myelin integrity, showed no correction in the GM1+AAVrh10 cohort, correction only in the cerebellum of the GM1+AAV9 CM cohort, and correction in several brain locations of the IV cohort. In the CM cohorts, βgal activity was restored in the cerebellum and spinal cord but did not penetrate deep brain structures (such as thalamus). The GM1+AAV9 IV cohorts had increased βgal activity throughout the CNS. All cohorts had some degree of βgal restoration in peripheral tissues. Using a similar vector backbone and the same total dose, this study demonstrates AAV efficacy in all treatment cohorts and suggests that IV gene therapy is most effective in the feline model.

Title: Investigation of selective binding of lanthanides to nitrogen and oxygen donor atom-based ligand systems
Primary Author: Grundhoefer, John P.
Additional Authors: Hardy, Emily E.; Gorden, Anne E. V.
Department: Biochemistry
College/School: College of Sciences and Mathematics

Abstract:
The lanthanide metals are known for their photophysical properties and medicinal applications as both magnetic resonance imaging (MRI) contrast agents as well as potential anti-cancer agents. Although they are used in a range of applications, their isolation and purification are very challenging because of their similar chemical properties to one another and the fact that they are most commonly found in nature co-deposited. The design and synthesis of new ligands, bound to lanthanide metals such as Europium and Dysprosium, is an interesting area of research directed at investigating what makes for selective coordination against the strong similarity of the lanthanide metals to one another, both in their common oxidation states as well as ionic radii to which coordination of metal to the ligand is somewhat dependent. With this research, we sought to design and characterize a new ligand system (1-[(1E)-({2-hydroxy-3[(E)-[(2-dhydroxy napthalen1yl)methylidene]amino]propyl}imino)methyl] napthalen-2ol) coordinated to several lanthanide metals as a way of investigating their coordination and chemical properties. These metal complexes were synthesized using relatively inexpensive starting materials in high percent yields. Spectroscopic data of the metal complexes have been obtained, though crystal structures have yet to be solved. Further research in this area will include the characterization of these lanthanide complexes by fluorescence spectroscopy, as well as investigating the effects that minor changes to the ligand system may have on the fluorescence of the metal center.

Title: Hostile attribution bias and aggression within adolescent males
Primary Author: Guajardo, Samantha E.
Additional Authors: Thompson, Kelli
Department: Psychology
College/School: College of Liberal Arts

Abstract:
The social information processing (SIP) model is the leading theory regarding the development of aggressive behavior and social maladjustment from early childhood to adolescence. According to this model, aggressive individuals display a strong tendency to attribute hostile intent to the behavior of others, even when the situation is benign, neutral, and/or ambiguous. This is called a hostile attribution bias (HAB). It further intensifies the misreading of social cues and elicits negative feedback from socially inappropriate responses, which becomes the filter that aggressive adolescents view and respond to the world. The purpose of the study was to extend the literature on adolescents' cognitions and beliefs about aggressive behavior. Archival data from a secure juvenile correctional facility was used to test the hypothesis that HAB would predict self-reported aggression. HAB was measured using vignettes in which the adolescent was read aloud a series of social interactions and asked to respond to the scenario. The adolescent is asked to guess the motive of the characters and choose a type of response. Participants (n = 239) were also given a self-report measure of aggression called the Peer Conflict Scale. Linear regression analyses were used to test which HAB scales predicted total self-reported aggression. The overall model was significant. Results indicated that individuals who rated the motive of the characters as highly reactive and threatening, indicating a high HAB, were associated with high rates of self-reported aggression. Likewise, those who rated the motives of the characters with benign motives had the lowest overall aggression rates. The results of this study further contribute to our understanding of how SIP and the misreading of social cues may contribute to the development of aggressive behavior in adolescence. More importantly, there are treatment options to help reduce HAB, which may also be beneficial to adolescents in juvenile detention programs.

Title: Tiered collaboration: addressing the impact of high poverty school culture on novice teachers
Primary Author (and presenter): Guilford, Bertha N.
Additional Authors: Tempero, Mashika
Department: Educational Foundations, Leadership, and Technology
College/School: College of Education

Abstract:
Teacher shortages and teacher turnover has been a continuous issue in education, especially in high poverty schools where most novice teachers find themselves working. The research examines the correlation between the characteristics of high poverty schools and teacher turnover within these schools. An analysis of two schools in Alabama highlights the poverty level of schools within the State. Finally, a look at best practices, and a conceptual framework is recommended to address the shortage of teachers in high poverty schools in Alabama.

Title: A newly isolated Bacillus amyloliquefaciens capable of high-level chirally pure D-2, 3-butanediol production: genomics analysis and genome engineering tool development
Primary Author: Guo, Na
Additional Authors: Yuechao, Ma; Jun, Feng; Yi, Wang
Department: Biosystems Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
2, 3-Butanediol (2, 3-BD) is a valuable platform compound with various applications in pharmaceutical, food, cosmetics, pesticides, and plastic industries. It exists as three stereoisomers, D-2,3-BD, L-2,3-BD, and meso-2,3-BD, possessing unique functions respectively. We have isolated a new strain, Bacillus amyloliquefaciens FJ-4, which can produce

highly enantiomerically pure D-2, 3-BD (> 99.9%) to high levels, as well as very high productivity and yield. Genomics analysis of FJ-4 showed the unique feature and metabolism of 2, 3-BD production, and provided information for the genome engineering purpose. Currently, we are developing the CRISPR-Cas9-based genome engineering tool for the strain, with promising preliminary results obtained. In the future, we aim to establish Bacillus amyloliquefaciens FJ-4 as a great workhorse for biofuel and biochemical production from low-value feedstocks through systematic genome engineering.

Title: Development of a novel rotating volumetric velocimetry technique for rotor flows
Primary Author: Gururaj, Abbishek
Additional Authors: Moaven, Mahyar; Tan, Puayen, Zu; Thurow, Brian; Raghav, Vrishank
Department: Aerospace Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
The aerodynamics over rotors is important in understanding the performance of wind turbines, helicopters, and most recently of small unmanned aerial vehicles. The flow over rotors strongly controls the performance of rotors and therefore the study of flow over the rotors is of primary importance. However, measurement of the flow over a rotor blade is very challenging especially using state-of-the-art optical laser-based flow diagnostic techniques such as Particle Image Velocimetry (PIV). Conventional PIV techniques are severely limited by their inability to measure the flow in the rotating frame of reference that is needed to comprehensively diagnose the flow over a rotor. Hence, the present work explores a novel rotating frame of reference flow measurement method to study the flow field evolving over the rotor. By employing a rotating mirror system on the rotor hub, imaging through a plenoptic camera mounted co-axially with the mirror, and using a volumetric field illumination instead of a planar field illumination, the challenges experienced by conventional PIV methods are overcome and a 3D time-resolved measurement over a wide range of azimuth angles is achieved. In the presentation, an overview of the methodology along with the challenges, details of the test facilit,y and some preliminary flow field measurement results will be discussed.

Title: Tumor-on-a-chip platform for in vitro recapitulation of the prostate tumor microenvironment and application in anti-cancer therapeutic evaluation
Primary Author: Habbit, Nicole L.
Additional Authors: Anbiah, Benjamin; Suresh, Joshita; Anderson, Luke; Hassani, Iman; Jasper, Shanese; Prabhakarpandian, Balabhaskar; Arnold, Robert; Lipke, Elizabeth
Department: Chemical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
The native tumor microenvironment is an intricate network characterized by spatial and temporal heterogeneities in cell populations, tissue microarchitecture, and angiogenic development, resulting in an induced molecular gradient across the tumor. Each of these characteristics directly contributes to the complex pathophysiology of cancer. Therefore, it is imperative to accurately recapitulate the full TME when engineering a biomimetic cancer model for use in clinically-translatable cancer drug development. This study reports the production of a microfluidic prostate tumor-on-a-chip platform that employs 3D tumor chambers, surrounded by a complex microvascular network derived from CT images of tumors in vivo. The microvasculature channels were seeded with endothelial cells and held under physiological flow conditions. PC-3 prostate cancer cells and BJ-5ta fibroblasts were encapsulated in poly(ethylene glycol)-fibrinogen within the primary tumor chamber, while ancillary tumor chambers remained empty to monitor for cell migration. Cell viability was assessed, and the drug diffusion profile was characterized via perfusion of a fluorescent probe molecule. Initial drug studies were performed on-chip using doxorubicin. To ensure the tissue maintained physiological relevancy, macrotissues were fabricated off-chip. In vivo tumors were generated for a novel in vivo – in vitro tissue microarchitecture comparison by subcutaneously injecting PC-3 cells into the flank of athymic mice. During long-term culture on-chip, PC-3 cells were found to intravasate from the primary tumor chamber, circulate through the microvasculature, and extravasate into the secondary and tertiary tumor chambers. Vascular geometry-dependent diffusion into the primary tumor chamber was achieved, thus mimicking the differential drug distribution observed in native tumors. Non-uniform cell death was observed post-doxorubicin exposure, thus confirming limited drug diffusion within the tissue.

Title: Quantifying veterinary care cost for indoor versus outdoor house cats (*Felis catus*) in the southeastern United States

Primary Author: Hagelskamp, Abby L.
Additional Authors: Gary, Allison, M. (other primary author); Christopher, A.
Department: Wildlife Science/Pre-Vet
College/School: School of Forestry and Wildlife Sciences

Abstract:
The United States has millions of pet owners, and as pet ownership steadily increases there is a growing economic market for pets. One of the most common pets in the US is the house cat (*Felis catus*), with recent estimates indicating 80-90 million owned cats. Cats are unique because they can live in a variety of circumstances that ultimately affects the variation in health care individual cats require. One common source of variation comes from whether cats are strictly housed outdoors or indoors. Basic veterinary care is different between these two groupings, as outdoor cats generally harbor greater parasite loads and are susceptible to more diseases and threats (e.g., predation, vehicle collision) due to their being exclusively outdoors. This observation leads to the question of whether differences in lifespan and healthcare are markedly different between outdoor cats and indoor cats. To address the question of vet care costs for indoor and outdoor cats we developed and administered an internet survey that asked about veterinary health care costs at veterinary clinics in Alabama, Florida, and Georgia. The anticipated results from the survey, which are currently being administered, may provide greater insight on both the economic and practical impacts of the veterinary field. Greater knowledge of how veterinarians choose to differentially treat their outdoor versus their indoor feline patients, coupled with greater knowledge on the health of individuals in each group and costs for these treatments may help to create better-informed pet owners who fully understand the cost of owning a feline. As such, our results may help to improve responsible pet ownership.

Title: Evaluating roller swabs for *Salmonella* spp. detection
Primary Author: Haiderer, Hannah E.
Additional Authors: Macklin, Kenneth; Talorico, Aidan
Department: Poultry Science
College/School: College of Agriculture

Abstract:
As a major foodborne pathogen, *Salmonella* detection and control in broiler houses is an important step to help minimize contamination of broiler meat. In this trial, different litter sampling methods for *Salmonella* detection were evaluated those being: drag swabs, boot covers, roller swabs, and grab collection samples. Drag and roller swabs sampling media were aseptically prepared in the lab. The drag swabs were aseptically prepared, then premoistened with a 2x solution of non-fat dried milk and placed in a 50ml tube. Boot covers were individually packaged and purchased pre-prepared. Roller swabs consisted of paint mini-roller heads, which were 10.2 cm long with semi-smooth and semi-rough surfaces, aseptically placed in a 50ml tube and pre-moistened as described for the drag swabs. Two studies were performed. The first study was initiated after the conclusion of a 35-day broiler experiment in which 40 pens containing 25 birds per pen that had been challenged with a nalidixic acid/novobiocin resistant strain of *Salmonella* Enteritidis was terminated. The subsequent study was performed at the termination of a 42-day experiment of broilers reared on the same litter as was used in the first study. For both the collection methods were as follows: Drag swabs samples were collected by pulling the drag swab across the top of the litter in an azig-zagg pattern trying to cover as much surface area of the pen as possible. Afterward, the drag swabs were placed back into the tube. Boot covers were placed over plastic shoe covers and then over 75% of the pen's surface area was walked on. After which the boot cover was then placed in a Whirlpak. Roller swabs were placed on a paint roller arm and rolled over 75% of the pen surface and then transferred to a Whirlpak. Grab collection samples were collected by taking enough litter to roughly weigh 10+ g from three locations in the pen. These were under the waterline, near the feeder, and a random spot from the middle of the pen. The three grabs per pen were then placed into a Whirlpak. Collected samples were then assessed on a +/- basis by enriching in tetrathionate broth with a 2% iodine solution for 48 hours and then streaking on xylose lysine tergitol 4 agar containing nalidixic acid (100μg/ ml) and novobiocin (15μg/ ml) (XLT4+). Litter samples were diluted 10-fold in phosphate-buffered saline and streaked onto XLT4+ plates. Collected data were analyzed using the General Linear Model and if significant ($P<0.05$) the means separated by Tukey's HSD. The results of study 1 showed that the roller swabs (83%) were significantly less effective ($P<0.05$) in recovering *Salmonella* than the other sampling collection methods drag swabs (95%), boot covers (98%), and litter grab samples (99%). The results of study 2 showed that the drag swabs were significantly ($P<0.05$) less effective in detecting *Salmonella* than the other methods. With drag swabs having a 6% *Salmonella* recovery, while litter grab samples (17%) and roller swabs (23%) were intermediate and boot covers (56%) the best at *Salmonella* recovery. Looking at the two studies, study 1 had a higher *Salmonella* prevalence compared to Study 2. When comparing all the methods to each other from the two studies, it was observed that boot covers could recover *Salmonella* significantly ($P<0.05$) better than the other methods tested in these studies.
Title: Investigation of the antibacterial activity against foodborne pathogens and chemical composition of extracts and partitions of *Psidium guajava*
Primary Author: Hall, Audrey M.; Nguyen, Chris N.

Additional Authors: Calderon, Angela; Monu, Emefa
Department: Drug Discovery and Development
College/School: Harrison School of Pharmacy

Abstract:
The CDC estimates that each year around 1 in 6 (or 48 million) people in the U.S. get sick of foodborne illnesses. Of the total number, 128,000 are hospitalized, and 3,000 died. *Escherichia coli, Salmonella enterica,* and *Staphylococcus aureus* are among the most common pathogens that contribute to this Public Health issue. *Psidium guajava*, commonly called guava, is traditionally used around the world as a natural antimicrobial remedy. Scientific investigations by Dr. Emefa Monu from Auburn University's Department of Poultry Science have shown that P. guajava (70% ethanol extract) at 2.5% decreased the levels of all three pathogens below the detection limit after 24 hours, confirming that *P. guajava* is a source of antibacterial agents against foodborne pathogens and spoilage organisms. The *P. guajava* leaves used for further biological and chemical investigation were collected from Ghana and extracted with 70% ethanol. The ethanolic extract was then dissolved in water and sequentially partitioned with n-hexane, dichloromethane, and ethyl acetate, resulting in four separate partitions. The four solvents were chosen based on density and polarity differences and are expected to separate different compounds from the extract according to their chemical affinity. The four partitions will soon be tested against a panel of selected bacteria, including E. *coli, S. enterica,* and *S. aureus*, at Dr. Monu laboratory. The partition showing the highest antibacterial activity will be further investigated using Liquid Chromatography-Mass Spectrometry, which will result in the structural elucidation of the bioactive compounds. The goal of the project is to formulate a substance composed of *P. guajava* antibacterial compounds that can be applied to fruits and vegetables after harvesting that will prevent the growth of foodborne pathogens, thereby reducing the consumer's chance of acquiring the foodborne illness.

Title: Role of prenatal synthetic cannabinoid exposure on the cerebellum of adolescent rat offspring
Primary Authors: Hall, Justin, A; Pinky, Priyanka, D
Additional Authors: Majrashi, Mohammed; Ayaka, Fujihashi; Bloemer, Jenna; Suppiramaniam, Vishnu; Dhanasekaran, Muralikrishnan
Department: Drug Discovery and Design
College/School: Harrison School of Pharmacy

Abstract:
Cannabinoids are an illicit recreational drug used by some women during pregnancy to attenuate morning sickness. However, prenatal cannabinoid exposure produces enduring cognitive, locomotor, and behavioral deficits in the offspring by affecting neural circuitry and various signaling mechanisms that are responsible for learning and memory. The effect of prenatal cannabinoid exposure on the cerebellum is still not well elucidated. The cerebellum plays an important role in balance, motor control, as well as some cognitive processes such as attention, language, emotional functions, and procedural memories. Therefore, the current study evaluated the effects of prenatal cannabinoid (synthetic cannabinoid agonist - WIN55, 212-2) exposure on the cerebellar markers of oxidative stress (reactive oxygen species-ROS, Nitrite-NO, lipid peroxide), mitochondrial function (Complex-I and IV activities), apoptosis (Caspase-1, Caspase-3, ERK, p-JNK, P38), and the cerebellar signaling molecules associated with cannabinoid (CB1 receptor), glutamatergic (GluA1, GluN2A receptor), and dopaminergic neurotransmission (monoamine oxidase (MAO) & tyrosine hydroxylase activities), and synaptic plasticity (AKT, GSK3β, ILK). Administration of WIN55, 212-2 during pregnancy altered the markers of oxidative stress by significantly reducing nitrite content, without any alteration in ROS generation and lipid peroxide content. An anti-apoptotic effect has been observed by increased expression of P38 expression. On the other hand, pro-apoptotic factor caspase-3 activity, pERK, and pJNK expression were significantly decreased. CB1 and GluA1 receptor expression remained unchanged; however, the GluN2A receptor expression was significantly reduced. With regard to the dopaminergic neurotransmission, a significant decrease in the MAO activity with no change in tyrosine hydroxylase activity has been observed. Altogether, data from this study provides evidence for cerebellar alterations following prenatal synthetic cannabinoid exposure.

Title: Microstructure effects on the electrochemical performance of graphene/manganese oxide hybrid electrodes
Primary Author: Hamade, Fatima A.
Additional Authors: Davis, Virginia A.
Department: Chemical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
A hybrid material of manganese oxide (MnO2) nanowires as guests in ultra-large graphene oxide (GO) sheet hosts has been fabricated to investigate the effects of nanowire inclusion on electrochemical performance. Ultra-large graphene oxide sheets exhibit an order of magnitude larger length to diameter ratio compared to most studies with smaller GO sheets (~40,000 compared to ~2,000) and demonstrate potential for improved electrode design. The individual and multicomponent dispersions were analyzed by spectroscopy and microscopy techniques to characterize the materials and gain insight into their dispersion microstructures. The dispersions were then freeze-dried into aerogels with 3D porous architectures. UV-vis, FTIR, and Raman spectroscopy convey subtle differences in the reduction of graphene oxide throughout the hybrid synthesis. Furthermore, AFM and SEM images of the hybrid indicate a uniform distribution of MnO2 nanowires across the GO sheets. Tuning the initial dispersion parameters, including concentration and MnO2 content, results in different morphologies and physical properties of the aerogels. The electrochemical properties of MnO2 and hybrid were explored to determine the effects of GO/MnO2 interactions and porosity on electrode performance. Results from this work provide insight into developing structure-processing-property relationships and improving electrode design for potential applications of deionization, supercapacitors, and conductive films.

Title: A Comparison in cardiomyocyte production between microsphere-encapsulated and self-aggregated hiPSCs
Primary Author: Hammons, Hanna L.
Additional Authors: Finklea, Ferdous; Hashemi, Mohammadjafar; Lipke, Elizabeth A.
Department: Chemical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Cardiovascular disease is the leading cause of death in the United States due to the inability of the heart to regenerate after damage. Current treatments decrease the risk of future problems and minimize complications but do not restore function in the myocardium. Cardiomyocytes (CMs) cannot be cultured in vitro due to their specialized function and low turnover rate; therefore, stem cell differentiation is needed. Current advances in the biomanufacturing of CMs involve the utilization of self-aggregated embryoid bodies (EBs) in bioreactors. However, we have previously shown the successful formation of engineered cardiac tissues (ECTs) directly differentiated from encapsulated human induced pluripotent stem cells (hiPSCs) in a PEG-fibrinogen matrix in terms of differentiation efficiency (>70% CMs) and CM maturity, in micro islands and microspheres. The goal of this project is to compare the ECTs from microsphere encapsulated hiPSCS to EBs. Microspheres are produced using a custom microfluidic oil-in-water emulsion technique. Following encapsulation, the hiPSCs are maintained for 3 days before initiating differentiation. For EB formation, the hiPSCs are grown in a monolayer before being enzymatically detached and seeded into a flask. The cells self-aggregate and are maintained for 2-3 days before cardiac differentiation, which occurs in a 6 well-plate. The initiation of cardiac differentiation for microspheres and EBs are induced by inhibiting the Wnt pathway with 5 μM CHIR on day 0. On day 1, the Wnt pathway is activated by the addition of IWP2. Cell counts are performed days 0, 1, 3, and 10 for EBs and microspheres. On day 10, the efficiency of cardiac differentiation is quantified with flow cytometry. On day 0, EB cell counts were 1.12 ± 0.52 and 10.23 ± 1.92 million cells after maintaining the aggregates for 2 and 3 days, respectively. This project investigates the impact of encapsulating hiPSCs on the production of CMs compared to current advances with EBs.

Title: The impacts of wild pig (*Sus scrofa*) rooting on soil macroinvertebrate abundance in southeast Alabama
Primary Author: Hancock, Alexandria E.
Additional Authors: Bolds, Sara; Lockaby, B. Graeme; Ditchkoff, Stephen S.
Department: Wildlife Ecology and Management
College/School: School of Forestry and Wildlife Sciences

Abstract:
In the United States, wild pigs (*Sus scrofa*) are a widespread invasive species with populations continuing to grow. These animals can impact disease transmission, species and plant richness, and soil quality. Although there are many studies on wild pig removal, there are very few on how the damage caused by wild pigs influences soil macroinvertebrate distribution. We hypothesized that soil macroinvertebrate abundance in areas impacted by wild pig rooting would be less than in unrooted areas, and that soil moisture would also be less due to rooting activity. From June to December of 2019, we collected soil samples from rooted and non-rooted areas on private property in the Upper Coastal Plain of Alabama to assess differences in soil macroinvertebrate abundance and soil moisture. Preliminary results show that soil macroinvertebrate abundance in rooted plots was 5.1 times greater than in unrooted plots, which may be a result of organic material being mixed into the soil during rooting. Additionally, mean soil water content was greater in rooted samples than unrooted samples which may be due to the incorporation of the litter layer and subsequent greater retention of water near the soil surface. This research may help determine whether wild pigs are contributing to changes in soil macroinvertebrate abundance and could assist in the management of wild pigs by helping to fill the knowledge gap between rooting damage and their effects on soil quality.

Title: Lateral flexion and spinal extension influence on net normalized shoulder kinetics in baseball pitching
Primary Author: Hankes, Michael J.
Additional Authors: Giordano, Kevin A.; Oliver, Gretchen D.
Department: Kinesiology
College/School: College of Education

Abstract:
Energy must be funneled through the trunk and into the throwing arm in baseball pitching. Pitchers vary trunk positioning to alter arm slot for performance and deception to the hitter, but it is unknown how trunk positioning affects shoulder kinetics. Increased shoulder kinetics have been correlated with increased injury rates in baseball pitching. The purpose of this study was to examine the correlation between trunk flexion and shoulder kinetics in youth baseball pitching. 16 youth male baseball pitchers (14.1±1.2 years; 175.7±10.3 cm; 66.4±9.1 kg) each threw 3 fastball pitches while an electromagnetic motion capture system collected kinematic data. Linear regressions were used to determine if trunk kinematics were able to predict shoulder kinetics in a baseball pitch. Data were analyzed in the phases between foot contact (FC), maximum external rotation (MER), ball release (BR), maximum internal rotation (MIR), and follow-through (FT). Variables of trunk flexion (TF), lateral flexion (TLF), and rotation were regressed on mass normalized shoulder net force (NNF). Trunk kinematics were able to predict shoulder kinetics in the phases from FC to MER and MIR to FT. Specifically, TLF to the non-throwing side from FC to MER (β= -0.005) and spinal extension from MIR to FT (β=-0.003) correlates with increased NNF from BR to MIR (F=7.709, adj. r2= 0.472, p=0.006). Trunk kinematics in baseball pitching correlate to shoulder kinetics, potentially affecting pitcher's risk of injury. Our findings suggest that increased TLF to the non-throwing side in the phase from FC to MER and greater trunk extension in the phase from MIR to FT correlate increased shoulder kinetics. Altered trunk positioning may be suboptimal for energy transfer through the thorax, causing compensation distal in the kinetic chain, at the shoulder, to maintain performance.

Title: Evaluating the effects of hunting disturbance on waterfowl using drone technology
Primary Author: Hansey, Brittany R.
Additional Authors: Gulsby, William; Gitzen, Robert
Department: Wildlife Sciences
College/School: School of Forestry and Wildlife Sciences

Abstract:
The Tennessee River Valley (TRV) in north Alabama provides important winter habitat for non-breeding waterfowl, making it a prime location for waterfowl hunting. Although overall hunter numbers in the U.S. have decreased in recent years, waterfowl hunter numbers in Alabama have increased during the last decade, resulting in the potential for increased disturbance to waterfowl. Providing a quality waterfowl hunting experience is important for state wildlife agencies, like the Alabama Department of Conservation and Natural Resources, because hunting generates millions of dollars annually that fund wildlife conservation. Therefore, it is essential to regulate hunter opportunities (i.e., number of hunting days) to maintain both hunter satisfaction and sustainable waterfowl populations. To determine the relationship between hunting disturbance and relative abundance of waterfowl in the TRV, we will conduct aerial surveys before, during, and after the hunting season. Specifically, we will use an unmanned aircraft system (UAS) equipped with a thermal camera for night surveys and a red-green-blue (RGB) camera for day surveys to compare estimates of relative waterfowl abundance during these periods across areas with varying hunting regulations, and on refuges (areas closed to hunting). Managers will use this information to establish regulations that optimize hunter opportunity and satisfaction while maintaining sustainable waterfowl populations.

Title: Determination of anand parameters from creep tests of SAC305 solder joints
Primary Author: Haq, Mohammad Ashraful
Additional Authors: Hoque, Mohd Aminul; Hamasha, Sa'd; Suhling, Jeffrey C.; Lall, Pradeep
Department: Mechanical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Solder Joints are considered to be one of the most vulnerable components of electronic packages and their fatigue failure is regarded to be one of the major methods of electronic package failure. The prediction of solder joint reliability is thus of great importance and most finite element packages utilize the Anand Viscoplastic Model to model the solder joints. 3x3 arrays of SAC305 solder joints of roughly 750□m in diameter in between two FR-4 printed circuit boards were used to create a sandwiched structural sample. These samples were then subjected to creep tests at various temperatures (T = 25, 50, 75, 100 °C) by using a set of specially designed fixtures to grip these sandwiched joint specimens. The nine Anand model constants were then extracted from the creep data and compared with the Anand constants obtained from creep experiments conducted on bulk SAC305 samples. The effect of the different sets of Anand parameters on the calculated accumulated work was then investigated by inputting the constant values in a finite element model of an actual package. The accumulated work obtained from both simulations was then compared with the actual experimental data to verify the accuracy of the newly obtained Anand Parameters.

Title: Modelling frost nucleation on surface coatings with different wettabilities
Primary Author: Harges, Ellyn N.
Additional Authors: Cremaschi, Lorenzo
Department: Mechanical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Frost growth leads to inefficiencies or safety concerns for many different types of systems, including heat pumps, wind turbines, and aircraft. Several experimental studies have shown promise in using hydrophobic and hydrophilic coatings to mitigate or control frost growth on surfaces. Some analytical studies have also been performed to predict frost growth behavior on these types of surface coatings; most of the available models, however, consist of empirical correlations that do not take into account the earliest stages of frost growth, when surface wettability has the largest effect. To capture more completely the effects of surface wettability on early frost growth, a model was developed which incorporates all three primary stages of frost growth: droplet condensation and freezing, crystal growth, and frost layer growth. The primary frost characteristics that the model predicts are droplet size until freezing, the time it takes for droplets on a surface to freeze, and the frost thickness and density after freezing occurs. The model was validated using data available in the published literature as well as data gathered as part of this research project, and it was confirmed that the model was able to predict frost behavior for a wide range of surface contact angles and test conditions. Because of this, the model can be used to make recommendations as to how different surface coatings may be useful in frost mitigation or control for a variety of applications.

Title: Integrating poverty simulation into an educational program for pharmacists
Primary Author: Harris, Tinia D.
Additional Authors: Westrick, Salisa; Hastings, Tessa
Department: Pharmacy
College/School: Harrison School of Pharmacy

Abstract:
Poverty can lead to medication non-adherence and poor health outcomes. Quality patient-centered care requires empathy and awareness of the realities of living in poverty. Poverty simulations and interactive role-play activities have been used to increase health professional students' sensitivity to the needs of low-income patients. This is the first identifiable study that incorporated a poverty simulation into an educational program for practicing pharmacists. The educational program was delivered to 89 pharmacists in March and June 2019. During the educational program, pharmacists participated in a simulation and a didactic lecture. The newly-developed simulation had two scenarios representing the lives of different low-income Medicare patients and their families. Each participant was assigned a scenario and placed in a five-member group representing a family unit including the patient, the patient's grown child, son/daughter-in-law, and two grandchildren. Through the simulation, participants encountered day-to-day and unexpected events while working as a family to identify options to address financial difficulties. The exercise was immediately followed by a large group debrief, during which participants reflected on the experience, discussed insights, and considered the next steps. This study aimed to assess the impact poverty-focused used educational program on: participants' change in knowledge, intention to assist future low-income patients, and satisfaction of the educational program. Participants' mean knowledge increased from 2.76 (SD=0.97) to 3.61 (SD=1.21) (p<0.01) out of 5. The majority (88.3%) agreed they were interested in assisting patients with limited income in the future. Most participants (78% - 94.1%) strongly agreed that the program was satisfactory. These results provide a glimpse of the impact poverty-focused educational program can have on pharmacists. Future studies should investigate more long-term effects of the simulation.

Title: Hashtag architecture: how image-based social media is changing how we interact with physical space
Primary Author: Harrold, Aubrey L.
Additional Authors:
Department: Architecture and Interior Architecture
College/School: College of Architecture, Design & Construction

Abstract:
Smartphones have revolutionized how we receive news, travel, eat, but most importantly, how we communicate with each other and with the space around us. The discipline of architecture is heavily reliant on representation through photography; therefore, we cannot dismiss the idea that the new norm of possessing a high-quality camera phone at all times and communicating through image-sharing social networks has impacted how we view and interact with architecture. The desire to represent and distribute how we view our lives and the world around us is a basic human trait, however, this modern format is resulting in unique programs that designers should take note of. This project investigates the design strategies and characteristics of a space that draws people to taktakectures to be shared on social media, and how these types of spaces fit into a historical tradition of portraiture, specifically the portraits that can be found in Medieval Books of Hours. This project will also analyze various art exhibitions and architectural projects that have increased in popularity specifically due to their photogenic nature on social media and will examine the trend of the installation designs of "Instagram Experience Museums." The purpose of this project is to design spaces that control the aesthetic output of the user experience and develop a deeper architectural significance instead of acting as a mere backdrop.

Title: Evaluating acoustic design in adult education spaces for autism
Primary Author: Harvey, Mallory R.
Additional Authors: Gatlin, Anna Ruth
Department: Interior Design
College/School: College of Human Sciences

Abstract:
Autism Spectrum Disorder (ASD) is a neurodevelopmental condition that consists of a deficiency in social communication and interaction, as well as restrictive or repeated patterns of behavior and interests (Kuzminsk, 2019). Although architects and designers are responsible for accommodating the needs of all users, the needs of those with ASD are completely excluded from all building codes and design guidelines (Gaines, 2016, p.3). Sensory differences are common for individuals with ASD. An understanding of the impact of noise pollution for individuals with autism might lead to increased interest in methods of adapting the sound environment (Kanakri et al., 2017). A variety of physiological effects resulting from excess noise can interfere with task performance such as startle response, freezing, muscle tension, and an increased risk of aggressive behavior (Suter, 1989). The relationship between stress and elevated levels of noise can thus be significant Acoustical/auditory and visual privacy have the biggest impact on well-being. Comparing two standard classrooms on a mid-size PSE campus, there is a notable difference in acoustical values. To measure noise levels within a standard lecture style claclass lectureleandard active learning style classroom, I took readings from a decibel reader application. Results suggest that in and outside the standard style classroom, noise levels may be significantly higher than in and outside of the active learning style classrooms. Multiple coders analyzed the rooms using a visual coding schema to identify the percentage of hard and soft surfaces. Results suggest that the standard lecture classroom had 40% more hard surfaces. This poster analyzes universal and empatempathyc hecticn as they contribute to designing with acoustics for an autistic-friendly classroom. This poster further analyzes and compares two classrooms that are standard on a post-secondary education mid-sized campus through the lens of a person with ASD.

Title: Investigating the impact of pluripotent stem cell encapsulation on the differentiation of cardiomyocytes for production of 3D engineered cardiac tissue
Primary Author: Hashemi, Mohammadjafar
Additional Authors: Finklea, Ferdous; Hammons, Hanna; Tian, Yuan; Lipke, Elizabeth
Department: Chemical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Cardiovascular diseases are now recognized as the leading cause of mortality worldwide, due in part to the limited self-renewal capacity of adult cardiomyocytes (CMs). Human induced Human-ininduced statementsiPSCs) can be differentiated into CMs and have shown promise in restoring function to damaged myocardium. However, the utilization of cell therapy has been limited due to poor cell viability, retention of cells in the desired area, and engraftment between delivered cells and host tissue. Incorporation of a biomaterial scaffold can aid in overcoming these limitations; prior work from our lab has generated functional engineered cardiac tissues (ECTs) differentiated from PEG-fibrinogen encapsulated hiPSCs. In this study, we investigated the effect of hiPSC encapsulation within PF hydrogels on cardiac differentiation in comparison to 3D self-aggregated embryoid bodies (EBs), the current method for biomanufacturing of CMs in bioreactors. Here, we employed a novel microfluidic system for encapsulation that enabled us to rapidly producprodu ospheres that are uniform in size. The cell-laden PF precursor solution and mineral oil were injected in the inlets of the encapsulation device, a PDMS mold, and crosslinked using high-intensity visible light. To generate the EBs, a single cell suspension of hiPSCs was seeded in culture media on a shaker plate. The hiPSCs remained viable following encapsulation and during aggregate culture, assessed using a Live/Dead Viability Kit. The number of cells during differentiation in both platforms was quantified. Differentiation occurred successfully with greater than 90% CM content for both encapsulated hiPSCs and EBs, quantified using flow cytometry. In conclusion, the encapsulated hiPSCs remained viable, successfully differentiated, spontaneously contracted, and did not result in a cell loss following initiation of differentiation which demdemonstrates t potentialor use in bioreactor culture and foll therapy applications.

Title: Mechanical and chemical activation of calcium oxide-based sorbents for CO2 capture at high temperature
Primary Author: Hassani, Ehsan
Additional Authors: Oh, Tae-Sik
Department: Chemical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Anthropogenic carbon emission has a clear impact on the climate. As greenhouse gas emissions are at a historic high, unprecedented action is required to ensure the continuation of the planet's habitability. A potentially favorable option for CO2 capture is Calcium Looping (CaL). Despite all the advantages of calcium looping, CaL technology suffers from a decrease in efficiency of the reactivity of sorbents as the number of regeneration cycles increases. Considering synthesizing sorbent, scientists have been trying different chemically and mechanically methods of sorbent activation. In this work, mechanical and chemical activation were investigated in two separate studies. The first study has focused on the effect of ball milling, as a mechanical activation, on the performance of the sorbents. on the other hand, the second study has investigated the chemical activation (internal spacer by metals) for the sorbents. The effect of mechanical activation on commercial Ca(OH)2 was investigated regarding carbonation/decarbonation kinetics and sorbent cycle stability. The kinetics of solid-gthehe rethe actiowereas characterized by in situ X-ray diffraction. By increasing the speed of ball milling, we could reduce the particle size and crystallite size while increasing the pore volume in the sorbent as evidenced by XRD, dynamic light scattering, and nitrogen physisorption on the as-mechanically-activated sorbents. Mechanical activation was proven to be effective for the overall CO2 capture ability of the sorbent. The effect of chemical activation on CaO-based sorbents was also investigated. the stability performance of the sorbent increased significantly by introducing transitional metal spampacera carr the sorbent. / Memechanicaltivation increased the performance initially while the chemical activation made the sorbent more stable during the cycling.

Title: Generation of in vitro 3D engineered tumor tissues for the study of colorectal cancer
Primary Author: 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

Abstract:
To study tumor biology and investigate anti-cancer therapeutics, in vitro cancer models are needed in addition to low throughput and costly in vivo models. Traditionally, cancer cells were cultured on plastic substrates as 2D monolayer cell culture to create in vitro models. Although 2D cancer models have provided many insights into cancer cell biology and facilitated anti-cancer drug development, these models are intrinsically unable to mimic many pathophysiological cues of the native tumor milieu. To this end, 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 CRC PDX model. The long-term viability of the cells was assessed, and colony area and diameter of the CRC PDX cells, the mechanical stiffness of engineered tumor tissues, and gene expression using RT-qPCR were investigated and compared with in vivo culture. The change in cell subpopulations was investigated over 29 days by flow cytometry. The morphology of CRC cell colonies was examined by histology and immunostaining. In conclusion, our novel in vitro CRC model demonstrated high potential for implementation in the study of CRC disease progression and elucidation of tumorigenic mechanisms. The established platform can potentially be used in the future for drug-testing applications to mitigate the impact of CRC.

Title: Does parent socio-emotional support in the first two years of college predict cumulative GPA in the transition out of college?
Primary Author: Haymon, Cortney L.
Additional Authors: Samek, Diana
Department: Biomedical Sciences
College/School: College of Human Sciences

Abstract:
Parental socio-emotional support has been shown to predict academic achievement for students in adolescence, but it is unclear if this support is equally as beneficial through early adulthood and the college years. It is important to study whether the protective effect of parent socio-emotional support is developmentally-limited to the transition into college or whether it may also apply to the transition out to better understand and ideally help young adults at this critical turning point. We arcan addresshis gap using the longitudinal College Experiences Study (N=209). Data were collected when a random sample of students were in the wast and second years of college, as well as in their transition out of college (five years after the first assessment). Retention rates = 85% at the first follow-up and 70% at the second follow-up (data collection is still on-going). At each assessment, participants completed a comprehensive survey (1-2 hours to complete, on average) that covered a wide gamut of social experiences and health outcomes. The measure of parent socio-emotional support and cumulative GPA will be evaluated for this presentation. We hypothesize that students who report higher levels of socio-emotional support from parents during the first two years of college will also report higher cumulative GPA and academic achievement in the transition out of college. Results wilresults completedted by the time of the research symposium. If hypotheses are supported, results would suggest that universities shshould place higher portance on encouraging the involvement of parents during not only the transition into college, butaallso hroughout a student's college career.

Title: Diet cycling increases metabolic flexibility and decreases metabolic disease associated hepatic gene expression in rats
Primary Author: Haynes, William K.
Additional Authors: Kirby, Annie; Woodie, Lauren; Greene, Michael
Department: Nutrition
College/School: College of Human Sciences

Abstract:
Obesity is a major public health concern that results from western diets that are high in fat and sugar and has been correlated with the development of non-alcoholic fatty liver disease (NAFLD). One component of obesitobesityesassociatedtedisease is a lack of metabolic flexibility, resulting in an impairment of the body's ability to transition between lipid and carbohydrate utilization. In this study, we examined the effect of different diets in rats to determine whether metabolic flexibility and the development of NAFLD could be modulated. Rats were divided into five treatment groups: western diet (WD), high-fat (HF), high-carbohydrate (HC), cycling, and control. The WD group was given a diet high in both fat and carbohydrates, while the control group was fed a standard chow diet of moderate carbohydrate and fat. The HF group was given a diet high in fat but low in carbohydrates, while the HC group was given a diet high in carbohydrates but low in fat. The cycling group alternated between a high-fat and high-carb diet on a weekly bweekly metabolic cages to measure the respiratory exchange ratio at different time point across the study, pointsng that metabolic flexibility was greatest in the cycling group. After five weeks on the dietary intervention, rats were sacrificed, and RNA expression for hepatic genes regulating carbohydrate and fat oxidation and inflammation were assessed using RT-qPCR. We observed non-significant reductions in carbohydrate (G6pc) and fat oxidation (Fgf21 and Srebf1) and inflammation (Il1B) gene expression in the cycling group compared to the WD group. Our results suggest that cycling increases metabolic flexibility and potentially reduces expression of hepatic gthe enes associated with NAFLD.

Title: From peasant to farmer:the ttransformation of forest management in China
Primary Author: He, Mingtao
Additional Authors: Huang, Senwei; Zhang, Yaoqi; Rahman, Mohammad M.
Department: Applied Economics in Forestry
College/School: School of Forestry and Wildlife Sciences

Abstract:
In the past 40 years, China has experienced an unprecedented transformation of the rural society and liveliho,ods and self-subsistence forest management has transitioned to more business-oriented management identified as Forestry Cooperatives (FC), Family Forestry Farms (F,FF) and Forestry Specialized Households (FSH) in this study. We explored the factors contributing to this transformation using household survey data in seven provinces in 2016. The age and education of the household heads, income, the holding areas of cropland, ecological forest, forestland, leasing forestland, and legally contracted forestland and their located provinces were found to be statistically significant in transforming the household's forest management. The factors that drthe ive transformation to various ownership types show some variations as well. The findings can help us better understand not only the transformation of forest maagement, but also the rural economy and society in general. The results have implicationsication on how to further facilitate forest management transformation.

Title: Assessment of formulations of açaí botanical dietary supplements for hepatic CYP3A4 interference

Primary Author: Heck, Kabre L.
Additional Authors: McLachlan, Caleb; Calderón, Angela I
Department: Pharmaceutical Sciences
College/School: Harrison School of Pharmacy

Abstract:
Botanical dietary supplementarend to be consumed more so by cancer patients than by otherwise healthier patients in order tto side effects of chemotherapy drugs and/or increase quality of life; the enzyme responsible for the metabolism of most anticancer drugs is CYP3A4, an enzyme that is predominantly located in the liver. Our research team performed an examinexamined and found an indicated potential risk between CYP3A4 non-interactive cancer drugs and *Euterpe oleracea* Mart. (açaí) berries containing BDS. A parallel artificial membrane permeability assay (PAMPA) was utilized to filter intestinal passive diffusion of raw açaí berry constituents so that these compounds could be tested for inhibition or induction of liver CYP3A4. The study found that both passively and non-passively diffused compounds in methanol açaí extract displayed significant induction of liver CYP3A4 – suggesting that there is potential for interactions between in açaí BDS and drugs metabolized by CYP3A4 if used synchronously. Our current study looks at two açaí BDS formulations from major manufacturers from the U.S. market and assesses for the potential of the passively diffused compounds of these formulations to produce inhibition or induction of hepatic CYP3A4. The first formulation (ADSC-1) showed that passively diffused açaí constituents displays an IC50 of 21.62 mg/mL and ndisplayvely diffused constituents with an IC50 of 0.42 mg/mL in the intestinal volume. The maximum daily-recommended dose of this formulation by manufacturers yields an estimated concentration of 20.8 mg/mL in the intestinal volume. Our findings suggest that individuals may be consuming açaí BDS at a concentration that may inhibit CYP3A4. The evaluation of the second formulation (ADSC-2) are still underway as well as the assessment of the two formulations for hepatic CYP3A4 induction.

Title: The effects of long term climate trends on orbital vehicle launch delay events
Primary Author: Heilmann, Christopher M.
Additional Authors:
Department: Aerospace Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Increased average surface temperature is a known byproduct of modern climate change. This results in an increase in energy available to developing weather systems, resulting in an increase occurrence rate of adverse weather events. Of particular interest is if the rate of adverse weather events can be identified by metrics outside of standard meteorological observation. Within this study, the average surface temperature trends for the southeast continental United States from the beginning of the Space Shuttle Era, 1981, to modern day will be compared to the rate of weather related launch delays out of Cape Canaveral within the same time-frame. While correlation does not mean direct causation, identifying any relationship between temperature trends and weather delays may gleam avenues of study in effects of future climate change.

Title: Pharmacokinetics and relative bioavailability of pimobendan and o-desmethyl pimobendan in healthy dogs after rectal administration
Primary Author: Her, Jiwoong
Additional Authors: Bacek, Lenore; Boothe, Dawn M.; Winter, Randolph; Kuo, Kendon
Department: Veterinary Biomedical Sciences
College/School: College of Veterinary Medicine

Abstract:
Pimobendan is used as therapy for acute congestive heart failure (CHF) in dogs with advanced cardiac disease. In some patients with CHF, oral administration is difficult and increases patient stress. This study aimed to determine if administration per rectum (PR) would be an acceptable alternative to administration per os (PO). Pharmacokinetics of pimobendan and its active metabolite o-desmethyl pimobendan (ODMP) were prospectively characterized in healthy dogs (n=8) using a randomized, crossover design with a 24 hr washout after a single dose of pimobendan (0.5 mg/kg) administered either PR or PO. Plasma pimobendan and ODMP were quantitated using HPLC using an assay validated in dogs. Data were subjected to non-compartmental analysis (Phoenix Winnonlin®). Key parameters (mean ± SD) after PO and PR administration, were, respectively, for pimobendan, peak concentration (Cmax, ng/ml) 49 ± 30.9 vs 10 ± 1.95, time to reach Cmax (Tmax, hr) 2.07 ± 0.93 vs 1 ± 0.42, disappearance half-life (T1/2, hr) 1.83 ± 0.80 vs 2.20 ± 0.58, and area under the concentration-time curve (AUC0–∝ ng/ml/hr), 148 ± 71 vs 31 ± 12, with a relative bioavailability (F) of 0.24. For ODMP, PO vs PR, respectively, Cmax was 31 ± 10 vs 8.8 ± 4.76, Tmax of 3.2 ± 1.6 vs 1.65 ± 1.1, T1/2 was 4.96 ± 2.74 vs 8.34 ± 4.81, AUC0–∝ was 168 ± 36 vs 50 ± 19, F of 0.27. The F of ODMP vs pimobendan was 1.31 (PR) and 1.51 (PO). This study demonstrates pimobendan may achieve potentially therapeutic concentrations when administered PR at 0.5 mg/kg.

Title: Donor developmental stage and androgen profile impacts gametogonia production for creation of xenogenic catfish
Primary Author: Hettiarachchi, Darshika U.
Additional Authors: Alston, Veronica; Gurbatow, Jeremy; Vo, Khoi; Zadmajid, Vahid; Coogan, Mike; Xing, De; Husseini, Nour; Johnson, Andrew; Wang, Jinhai; Li, Shangji; Dunham, Rex; Butts, Ian
Department: Fisheries, Aquaculture and Aquatic Sciences
College/School: College of Agriculture

Abstract:
Xenogenesis is emerging as an innovative technology for hybrid catfish (♀ channel catfish, *Ictalurus punctatus* × ♂ blue catfish, *I. furcatus*) production, where primordial germ cells (PGC), spermatogonial stem cells (SSCs) or oogonial stem cells (OSCs) are transplanted to a sterilized host species to produce xenogens. Currently, donor cells are collected from randomly selected immature fish without having prior knowledge regarding the best donor stage. Therefore, the current study was carried out with the objective of determining the relationships between quantity of stem cells, total length (TL), total weight (TW) and the level of sex steroid hormones [testosterone (T) and 11-ketotestosterone (11-KT)] in blue catfish (donor fish). Positive quadratic relationships were observed between TL and the number of extracted live SSCs (r2 = 0.50; P < 0.0001) as well as TW and the number of live SSCs (r2 = 0.37; P < 0.0001), revealing that a TL of 38.1 cm and TW of 400.2 g, yield the highest number of extracted live SSCs. Similar to the findings from males, TL (r2 = 0.77; P < 0.0001) and TW (r2 = 0.65; P < 0.0001), also revealed positive quadratic relationships to the number of extracted live OSCs, where 31.2 cm and 410.1g females yielded the greatest number of extracted live cells. Positive quadratic relationships were also detected between levels of T (r2 = 0.59; P < 0.0001), 11-KT (r2 = 0.69; P < 0.0001) and number of extracted live SSCs in male catfish, where 50.9 pg/mL of T and 44.7 pg/ml of 11-KT, yielded the maximum number of live SSCs. These relationships between the quantity of stem cells and body size as well as the profile of sex steroid hormones reveal promising results as reliable biomarkers to enhance the efficiency of germ cell transplantation. These results can also be used to make precise predictions on number of stem cells at certain life stage without sacrificing precious fish housed in living genetic repositories.

Title: Can the use of art and active learning improve the retentions of anatomy and physiology of the auditory system?
Primary Author: Hill, Anna G.
Additional Authors: Leonard, Lindsey; Weaver, Aurora; Lawrence, Molt
Department: Communication Disorders
College/School: College of Liberal Arts

Abstract:
Research has revealed the use of art within medical education can improve understanding of disease and observational skills in clinical practice (Bell & Evans, 2014). Application and results of art assignments in a graduate Medical Aspects of Hearing Disorders course will be reported. A cohort of ten first-year AuD students enrolled in Medical Aspects of Hearing Disorders, completed various art assignments throughout the semester which were used to foster observation skills during otoscopy. In order to understand the role of the art assignments during the course, students provided pre and post assessments of their knowledge in the topic area and learning gains following the course material. The Student Assessment of their Learning Gains (SALG) was administered prior to and again following course completion. Results indicated that while only 20% of the cohort considered themselves artistic, 90% reported they strongly agreed that the art assignments improved your observational skills for otoscopy and indicated significant gains in confidence. When asked if students believe creative work can improve memory for material covered on a graduate level course, 50% agreed. The graduate students were then able to take the knowledge they had learned and apply it by teaching it to children in an elementary school class in Auburn, AL. Results from the SALG showed a strong correlation between hands-on classroom activities and in understanding the importance of performing otoscopy for appropriate assessment/management decisions. 100% of the students reported much-to-great amount of gain following the art assignments and student understanding of the subject area. Results from this study support the use of art in medical education, and specifically within the audiology field.

Title: Influence of preparatory arm swing on horizontal jump kinematics
Primary Author: Hill, Imani N.
Additional Authors: Kosek, Jerad J.; Brown, Taylor A.; Wilburn, Christopher M.; Weimar, Wendi H.
Department: Kinesiology
College/School: College of Education

Abstract:
Electromechanical delay (EMD) is the time required by the body after activation to take the slack out of the muscle, before the muscle can perform a motion. During most sports, lateral lower extremity movements are assisted by swinging of the arms. The latissimus dorsi (LD) attaches to the iliac crest of the sacrum and assists in stabilization of the pelvis. By reducing muscle slack in the LD before the motion occurs, the stabilization time decreases, which will allow the legs to pull on the pelvis harder and faster. We hypothesized that pre-activation of the latissimus dorsi by performing a preparatory arm swing would increase the stabilization of the pelvic muscles in preparation for horizontal jump takeoff. The purpose of this study was to evaluate how a preparatory arm swing (PAS) influences horizontal jump (HJ) peak force (PF) and time of propulsion (TOP) in healthy, physically active young adults. Kinetic data [AMTI (Watertown, MA, USA)] of 5 participants (n=5) were collected during 6 jumping trials, 3 with PAS and 3 without. Jumping conditions of HJ with PAS and HJ without PAS were completed in randomized order. Results revealed HJ peak force was an average of 194.8 N for the PAS condition and 191.73 N for the without PAS condition. HJ TOP was an average of 0.202 seconds for PAS condition and 0.197 seconds for the without PAS condition. A dependent sample paired t-test was run and there was no significance found ($p=0.842$) for propulsive time. A second dependent sample paired t-test was run and there was no significance found ($p=0.811$) for peak force. The results indicate that there was no significant difference in peak force nor time to propulsion between the two conditions. However, as this is a pilot project with a novel movement, the increase in force production is encouraging. Future research is required to further evaluate this trend.

Title: Integrating art-based therapy methods for elders with dementia
Primary Author: Hix, Sarah K.
Additional Authors: Odom, Kylee; Harvey, Mallory; Rivers, Natalie
Department: Interior Design
College/School: College of Human Sciences

Abstract:
As the rate of elders facing Alzheimer's and Dementia continues to rise, the knowledge of a cure remains obscure. Individuals living with such experience major cognitive decline and gradually lose their intellectual and social abilities, as well as memory, personality, movement and lingual functions. While potential solutions have been largely explored, including pharmaceutical, surgical, therapeutic, dietary, among others, alternative therapy methods are increasingly being practiced on older residents living with Alzheimer's and Dementia. Both art and music therapy have resulted in improvements in cognitive abilities among older participants, driving the study of alternative therapy according to the built environment. This human-centered approach seeks to reveal how the design of a space, mobility to function, color and lighting affect the success of specific alternative therapies like art and music. Ultimately, the environment where these participants engage in therapy can advance the effectiveness of treatment and improve ongoing degenerative skills by allowing individuals to connect to a sense of place and identity.

Title: Prevalence of *Plasmodium* and *Wolbachia* in mosquitoes and prospect of *Wolbachia* to block malaria transmission
Primary Author: Hoque, Md Monirul
Additional Authors: Barua, Subarna; Poudel, Anil; Kalalah, Anwar; Adekanmbi, Folasade; Wang, Chengming
Department: Biomedical Sciences
College/School: College of Veterinary Medicine

Abstract:
Mosquito surveillance is one of the critical functions of local health departments, particularly in the context of outbreaks of severe mosquito-borne infections. This study tested the hypothesis that mosquitoes from Alabama may be infected with *Plasmodium*, and *Wolbachia* as endosymbiont bacterium of the order *Rickettsiales*. A total of 560 adult mosquitoes were trapped from Auburn with miniature light traps in 2019. The mosquitoes were identified morphologically and with molecular detection method with a PCR targeting the mosquito mitochondrial COI. Mosquitoes were placed in one of 64 pools depending on species, sex, and number of trapped mosquitoes and site of collection. Nucleic acid was isolated from homogenized mosquito samples and FRET-qPCR was used to detect *Plasmodium* targeting the small subunit ribosomal RNA, and *Wolbachia* targeting the wsp gene. Among the pooled mosquito samples, *Culex* was predominant genera (73%), followed by *Anopheles* (13%), *Aedes* (9%) and *Uranotaenia* (5%). In total, 11% of the mosquito pools were positive for *Rickettsia* spp., including *Plasmodium relictum* in 4 *Culex* and *Plasmodium elongatum* in 2 *Culex* and 1 *Uranotaenia*. The prevalence of *Wolbachia* in the trapped mosquitoes were 67%, comprising *Wolbachia endosymbiont* of *Culex pipiens* (78%) and *Wolbachia endosymbiont* of *Culex quinquefasciatus* (22%). Our data suggest the baseline data for the diversity of mosquitoes and parasites. While only avian *Plasmodium* species were identified in this study, avian malaria has been identified as the primary cause of the drastic decline of Hawaiian honeycreepers (>90% mortality rate), and of the decline in the population of house sparrow in suburban London. Whether the prevalence of *Wolbachia* and its genetic diversity in mosquitoes affects the mosquitoes' susceptibility to different pathogens, requires further evaluation. Studies are ongoing in our laboratories to determine the epidemiology of avian malaria, *Wolbachia* and their possible effects.

Title: Developing novel disulfiram-based metal-organic nanoparticles for treating triple-negative breast cancer
Primary Author: Huang, Chunghui
Additional Authors: Chen, Wu; Wang, Qi; Wang, Junwei; Kang, Xuejia; Li, Feng
Department: Pharmaceutics
College/School: Harrison School of Pharmacy

Abstract:
There were about 10 million people who were died because of cancer in 2018 in the world. Among them, 6.4% died of breast cancer. 10-20% of breast cancers were triple-negative breast cancers which were negative for both hormone receptors and HER2 receptors. Triple-negative breast cancer is considered the most aggressive breast cancer and has a worse prognosis than other forms of breast cancers. Therefore, there is an urgent need for an effective treatment for triple-negative breast cancer. Disulfiram (DSF), an alcohol-aversion drug, has been repurposed for cancer treatment and overcome drug resistance. In our previous studies, we developed a Stabilized Metal Ion Ligand Complex (SMILE) technology to prepare Cu(DDC)2 nanoparticles (NPs) for disulfiram-based cancer therapy. The selection of stabilizers is critical for drug loading and stability of Cu(DDC)2 NPs. In the current study, we synthesized a mini-library of amphiphilic dendrimers and investigated their performance as the stabilizers of Cu(DDC)2 NPs. In addition, we also evaluated the anticancer potential of optimized Cu(DDC)2 NPs with 4T1 breast cancer cells. Our studies indicated Cu(DDC)2 NPs could effectively kill 4T1 cells and induce immunogenic cell death (ICD). In conclusion, we have synthesized novel amphiphilic stabilizers to prepare Cu(DDC)2 NPs with optimal physicochemical properties. This NP formulation demonstrated great potential for treating triple-negative breast cancer.

Title: Improving polymer-modified asphalt by modifying SBS using click chemistry
Primary Author: Huang, Tina
Additional Authors: Dobyns, Breanna M.; Leiva Villacorta, Fabricio; Beckingham, Bryan S.
Department: Chemical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
The increasing use of vehicles has shortened the lifespan of asphalt roads. The permanent strain in asphalt, including rutting and cracking, generally makes driving rough and dangerous. In addition, the cost of maintaining roads increases with increasing traffic load and distressed asphalt. There is now a high demand for polymer-modified asphalt due to its increased durability, higher stiffness, and stronger cracking resistance. However, the poor solubility of polymers and easy separation of the asphalt-polymer mixture are some of the current difficulties of polymer-modified asphalt. Polystyrene-block-polybutadiene-block-polystyrene (SBS) triblock copolymer is an useful polymer additive to asphalt binders as it has both glass-like and rubber-like properties. SBS has been used to modify asphalt resulting in improved heat resistance, better elasticity, and higher strength. However, the polarity difference between SBS and asphalt results in an inability for pre-mixing and long term storage. Therefore, SBS-modified asphalt binder must be produced on-demand for immediate use, thus drastically increasing costs and can lead to construction delays or the polymer-asphalt mixture became separated if a delay occurs. Here, we seek to improve the stability of these mixtures. A thiol functional group was added to SBS to achieve functionalization ranging from 20% to 100%. This was performed with a thiol-ene radical addition reaction, also known as click chemistry. This is a highly selective reaction that has high yield with very little to no by-products. The product was isolated and characterized with nuclear magnetic resonance (NMR) and gel permeation chromatography (GPC). Characterization of thermal behaviour will be performed with differential scanning calorimetry (DSC). Dynamic mechanical analysis (DMA) and thermogravimetric analysis (TGA) will be tested in collaboration with National Center of Asphalt Technology to determine its miscibility and stability with asphalt binder.

Title: Thermal tolerance of white-legged shrimp (*Litopenaeus vannamei*) in low salinity culture systems

Primary Author: Hussain, Aya S.
Additional Authors: Fogelman, Kaelyn; Abdelrahman, Hisham; Roy, Luke; Stoeckel, James
Department: Agriculture
College/School: College of Agriculture

Abstract:
Aquaculture of white-legged shrimp (*Litopenaeus vannamei*) in low-salinity ponds is a small but growing industry in the southeastern United States. High variability in survival among ponds has been linked to variation in thermal regimes. Water temperatures in July and August can periodically reach and/or exceed 36 ºC in commercial shrimp production ponds, which are typically two meters in depth and can heat up considerably by late afternoon. In this study, we examine the physiological basis of thermal tolerance in shrimp using the concept of aerobic scope – the difference between the metabolic rate required for basic maintenance of an organism (resting metabolic rate: RMR) and the maximum metabolic rate an organism is capable of (potential metabolic activity: PMA). As aerobic scope increases, organisms can potentially utilize more energy for growth and reproduction. We hypothesize that aerobic scope can be used to predict optimal and lethal temperatures for shrimp, with optimal growth occurring at temperature(s) where aerobic scope is maximized and morality occurring at temperatures where aerobic scope approaches zero. To test the concept of aerobic scope, we exposed shrimp to temperature changes at a rate of 1°C/hr across a range of 20 - 42°C. At each temperature, we used intermittent respirometry to estimate RMR and the electron transport system (ETS) assay to estimate PMA. Aerobic scope was calculated as the difference between RMR and PMA. Critical thermal maximum (CTM) was estimated as the temperature at which shrimp could be flipped over and were unable to right themselves for at least 30 seconds. Upcoming experiments will measure growth at multiple temperatures. Data is currently being analyzed to estimate aerobic scope of L. vannamei and to test whether aerobic scope assays can serve as a useful tool to estimate optimal and lethal temperatures for shrimp in aquaculture systems.

Title: Targeting human DNA damage inducible 1 homolog II (hDdi2) for the treatment of cancer
Primary Author: Ibtisam, Ibtisam
Additional Authors: Ann, Jennifer; Habbit, Nicole; Lipke, Elizabeth; Mitra, Amit K.; Maksimenko, A.; Fiering, Steven N.; Smith, Forrest T.; Kisselev, Alexei F.
Department: Medicinal Chemistry
College/School: Harrison School of Pharmacy

Abstract:
DNA-damage inducible 1 homolog 2 (Ddi2) is a novel aspartic protease, known for its function as protein shuttle that delivers the ubiquitinylated proteins to proteasome for degradation in the ubiquitin-proteasome system (UPS). Rapid growth and increased production of the damaged protein makes the cancer cell highly proteasome dependent. Unlike non-malignant cells, cancer cells undergo apoptosis upon partial proteasome inhibition. Despite of high cytotoxicity of proteasome inhibitors in solid tumor cells in-vitro, its clinical effectiveness is limited by the rapid recovery of proteasome activity, and lack of therapeutic approaches to block this recovery. Ddi2 was found to activate the transcription factor Nrf1 responsible for the restoration of proteasome activity. We found that knockout of Ddi2 sensitizes cells to proteasome inhibitors. Ddi2 knockout affects the colony-forming in the 2D and 3D in-vitro model. It is also dramatically reduced the growth of xenograft tumors in mice. RNA sequencing of tumors revealed that knockout of Ddi2 leads to down-regulation of several pathways that have been associated with tumorigenesis. To further elucidate the role of Ddi2 in proteasome recovery and cancer treatment, we designed an aspartic protease probe; an initial step in developing a Ddi2 inhibitor. Overall, our data suggest that Ddi2 is an oncoprotein and potential target for the treatment of cancer.

Title: Nanofibrillated cellulose (CNF): their effects at the wood-based matrix/resin interface on particleboards application
Primary Author: Iglesias, Maria Celeste
Additional Authors: McMichael, Philip S.; Asafu-Adjaye, Osei A.; Via, Brian K.; Peresin, Maria S.
Department: Forestry
College/School: School of Forestry and Wildlife Sciences

Abstract:
Wood-based panels are commonly utilized as building materials both for interior and exterior purposes. Their production and utilization has been increasing over the past few decades due to the varied and advantageous properties they present. Adhesive-bonded products make up nearly 80% of the wood products on the global market, and of that, urea-formaldehyde (UF) makes up more than 81% of the resins used. Formaldehyde-based resins are primarily used due to the combination of their effectiveness and relatively low cost, as well as their ease of application and lack of color. Nevertheless, their main disadvantages are the lack of tack and the emission of formaldehyde over time. In an attempt to improve UF performance, the utilization of microfibrillated cellulose as an alternative has been demonstrated to be effective. However, a better understanding of the mechanisms of the interactions at the interfaces, which allow a better performance of the adhesive, is of important relevance. In this work, we studied interfacial interactions between UF and melamine urea-formaldehyde (MUF) with bleached (BCNF) and unbleached (LCNF) cellulose nanofibrils. To this end, we used surface sensitive techniques such as Quartz Crystal Microbalance with dissipation monitoring (QCM-D) complemented with Surface Plasmon Resonance (SPR) to study system interactions on thin films. Additionally, morphology and surface free energies were investigated using Atomic Force Microscopy and Contact Angle Measurements (CAM). Finally, particleboards with different adhesive/CNF formulations were produced and tested in terms of thickness swelling (TS), water absorption (WA), modulus of elasticity (MOE), and modulus of rupture (MOR).

Title: Racial disparities in sleep among college students
Primary Author: Illiano, William C.
Additional Authors:
Department: Human Sciences
College/School: College of Human Sciences

Abstract:
Racial disparities in sleep are well-documented in adulthood. Yet, few studies have assessed race differences in sleep during the college years, and nearly all have relied on self-report measures. This study aims to evaluate racial disparities using both subjective and objective measures of sleep among first- and second-year college students. Data were collected from 263 undergraduate students (53% female; Mage = 19.21 years, SD = 1.01) from a large research university in the southeastern United States. Approximately half of the sample identified as African American/Black (N = 137, 58% female) and half as European American/White (N = 127, 48% female). Participants completed a laboratory visit during which several subjective assessments of sleep were completed including the Pittsburgh Sleep Quality Index (PSQI) and Epworth Sleepiness Scale (ESS). Objective measures of sleep were assessed through wrist actigraphy and include sleep time, sleep efficiency, and total minutes of awakenings after sleep onset (WASO). Significant racial disparities were observed in average sleep time, average sleep efficiency, and the ESS, but not in WASO or the PSQI. Black students averaged 5 hours and 56 minutes of sleep per night while white students averaged 6 hours and 35 minutes. In sleep efficiency, black students averaged 75.9% efficiency while white students averaged 80.0%. In the ESS (scored out of 24 with higher scores indicating higher daytime sleepiness), the average score of black students was 7.1 while the average score of white students was 5.7. Potential mediators for these disparities that were examined include adverse childhood experiences (ACEs), socioeconomic status, and perceived levels of discrimination. However, race remained a significant predictor in all models. Future research should investigate the discrepancies between sleep measures and the factors that may be giving rise to the observed race differences.

Title: Geochemical viability of CO2 as a working gas for compressed energy storage in porous formations
Primary Author: Iloejesi, Chidera O.
Additional Authors: Beckingham, Lauren
Department: Civil Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
This study evaluates the geochemical reactions that occur during the injection and extraction of CO2 into porous formations compressed energy storage using utilizing reactive transport simulations. Compressed energy storage is a promising means of abating the limitations of intermittent renewable energy production. In these systems, working fluids are injected into and extracted from the subsurface for energy storage or production based on energy demand. Using CO2 as a working fluid, the geochemical reactions at the cushion gas/formation fluid boundary are evaluated here for a series of injection-extraction cycles for storage in the Paluxy formation, Kemper County, MS for a four months study period. In addition, the effect of energy storage on reactions will be evaluated. Simulation results are compared to simulations considering flow during CO2 sequestration in the same formation consisting of injection only (uni-directional flow). Single-phase flow of CO2 acidified brine in a three-centimeter section at a temperature and pressure of 50oC and 100 bar respectively is considered for both simulations. Mineral dissolution with a corresponding increase of porosity from 24.8% to 33.6% throughout the simulation area dominates the simulation results for the uni-directional flow simulation. The bi-directional flow simulation results show that the injected CO2 initially resulted in mineral dissolution but the flow cycling decreases the driving force for dissolution and results in gradual mineralization. The associated change in porosity increases to 31.1% near the cushion gas boundary and 25.8% furthest from the CO2 plume a variation which depicts the varying extent of mineral dissolution throughout the simulation area. pH variations are also observed for the two systems where the initial brine pH of 8.82 reduces to 4.96 for the bi-directional flow simulation at the end of the study period while that pH of the uni-directional system drops to a more acidic pH of 3.43.

Title: Off campus students' participation gap linked to difficulties with transportation and parking

Primary Author: Isom, Jhayla
Additional Authors: Newsome, Caroline; Ocampo, Alex; Driskell, Sara
Department: Psychology
College/School: College of Liberal Arts

Abstract:
College campuses host many exciting and informative events for their students, and it is common to see colleges advertising for all the events and resources that they offer to their students in order to encourage more students to attend. Unfortunately, the number of students taking advantage of these opportunities is significantly impacted by a student's housing situation and limitations with available transportation options. Many commuting students complain about both the transportation system and parking on campus, with many of these commuting students seeing getting back on campus as a burden, which could negatively affect their campus involvement. In this research, a campus survey was given to current Auburn students (N=494) to see if Auburn students living off campus have similar difficulty with participating in campus events. Compared to students living on campus, those living off campus were significantly more likely to report avoiding going to social events and SI sessions that were after school hours specifically because of their difficulties getting to campus. Students living off campus were significantly less likely to report attending after hours events on campus that were for their personal enjoyment (as opposed to those required by a class or for extra credit). Lastly, students living off campus were significantly more likely to rate their experience getting back to campus after school hours as difficult. The current study concluded that compared to on campus students, off-campus students reported attending fewer on-campus events and using fewer on campus resourceson-campusa also showed that commuting students felt that they would spend more time on campus if commuting was easier. The information provides insight on how to close the participation gap between on campus and commug students.

Title: Cognitive impairment associated with the use of streptozotocin and chemotherapy in rodent models

Primary Author: Jackson, Caroline A.
Additional Authors: Jackson, Caroline; Pondugula, Satyanarayana; Majrashi, Mohammed; Almaghrabi, Mohammed; Abbott, Kodye; Govindarajulu, Manoj; Ramesh, Sindhu; Gill, Kristina; Fahoury, Eddie; Narayanan, Natasha; Desai, Darshini; Nadar, Rishi; McElroy, Trey; Moore, Timothy;
Department: Pharmacy
College/School: Harrison School of Pharmacy

Abstract:
Endogenous (hyperglycemia) and exogenous (therapeutic, prophylactic, street drugs) factors can considerably contribute to cognitive impairment (CI). Currently, few invasive and/or non-invasive markers correlate with CI, and those that do exist require expensive or invasive techniques to predict and accurately measure the cognitive decline. Therefore, we sought to determine hematological markers as predictors of CI in two different chemically induced valid rodent models of CI (streptozotocin-induced hyperglycemic model and chemotherapy [doxorubicin/cyclophosphamide] treated rodent model). Hematological markers were analyzed in the above rodent models of CICI and compared to their respective control groups. There was a significant increase in creatinine kinase, lactate dehydrogenase, and aspartate aminotransferase (AST) in the chemotherapy group. Blood urea nitrogen (BUN), alkaline phosphatase (ALP), bilirubin, creatinine, and glucose levels were significantly increased in the streptozotocin group. Interestingly, triglycerides were significantly elevated in both the streptozotocin and chemotherapy groups. Previous studies with human subjects have shown a potential link between the increase in triglyceride levels and CI. Likewise, our data indicate a notable correlation with an increase in triglycerides to cognitive impairment in the rodent models. This suggests elevated levels of triglycerides could prove to be a potential non-invasive hematological marker for the increased risk of CI. Further studies are warranted to determine the causal relationship between elevated triglyceride levels and CI.

Title: Peer-victimized children's behavior when witnessing bullying: how encouraging the bully or supporting the victim predicts future victimization
Primary Author: Jackson, Jennifer D.
Additional Authors: Troop-Gordon, Wendy
Department: Human Development and Family Studies
College/School: College of Human Sciences

Abstract:
Bullying is a group process that often includes bystanders who may engage in pro-bullying (e.g., laughing at the bullying) or defending behavior (e.g., standing up for the victim). Research has shown that bullying declines in classrooms in which pro-bullying bystander behavior is rare and defending is common. However, the implications of pro-bullying or defending behaviors for the bystanders are unknown. The consequences of bystander behavior may be particularly important for children who are peer victimized (i.e., the targets of bullying) and, therefore, at the greatest risk for social difficulties. The current study tested two propositions: (1) pro-bullying behavior reduces the risk for later peer victimization among children who have been experiencing a high level of peer victimization, and (2) defending behavior amplifies the risk for later peer victimization among children who have been experiencing high levels of peer victimization. Participants were 4th- and 5th-graders (N = 484; 239 girls; Mage = 10.25 years; 57.6% Black; 32.2% White) attending one of five public elementary schools. In the fall and spring, children completed self-reports of bystander behavior and self-reports and peer-reports of peer victimization. Regression analyses revealed that boys who experienced high levels of peer victimization in the fall experienced less victimization in the spring if they frequently engaged in pro-bullying bystander behavior. In contrast, children who experienced high levels of peer-reported victimization in the fall experienced greater peer victimization in the spring if they engaged in frequent pro-bullying bystander behavior and, for girls, frequent defending. These findings suggest that highly victimized children feel heightened peer victimization if they engage in either pro-bullying or defending bystander behavior. Such information has important implications for anti-bullying interventions aimed at reducing pro-bullying behaviors and increasing defending behaviors.

Title: TAAL: tampering attack on any key-based logic locked circuits
Primary Author: Jain, Ayush
Additional Authors: Zhou, Ziqi; Guin, Ujjwal
Department: Electrical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Due to the globalization of semiconductor manufacturing and test processes, the system-on-a-chip (SoC) designers no longer design the complete SoC and manufacture chips on their own. This outsourcing of the design and manufacturing of Integrated Circuits (ICs) has resulted in a number of threats, such as overproduction of ICs, sale of out-of-specification/rejected ICs, and piracy of Intellectual Properties (IPs). Logic locking has emerged as a promising defense strategy against the aforementioned threats. However, various attacks pertaining to the extraction of secret keys have undermined the security of logic locking techniques. Over the years, researchers have proposed different techniques to prevent existing attacks. In this paper, we propose a novel attack that can break any logic locking techniques that rely on a stored secret key. This proposed TAAL attack is based on implanting a hardware Trojan in the netlist, which leaks the secret key to an adversary once activated. As an untrusted foundry can extract the netlist of a design from the layout/mask information, it is feasible for a malicious foundry to implement such a hardware Trojan. All of the three types of TAAL attacks can be used for extracting secret keys. We have introduced the models for both the combinational and sequential hardware Trojans that evade manufacturing tests as well. An adversary only needs to choose one hardware Trojan out of a large set of all possible Trojans to launch the TAAL attack.

Title: Effects of iron and UV light exposure on the chemical stability of brilliant blue FCF in solution

Primary Author: James, Cierra A.
Additional Authors: Bell, Leonard N.
Department: Food Science
College/School: College of Agriculture

Abstract:
To understand food quality and shelf-life, it is crucial to optimize factors that affect food chemical stability. Previously, our lab determined that rebaudioside A degradation was enhanced in the presence of iron, citric acid, and ultraviolet (UV) light exposure. Other food ingredients may be affected similarly by the combination of iron and citric acid upon exposure to UV light. The objective of this project was to evaluate the effect of iron and UV light on the stability of another food ingredient, Brilliant Blue. Citrate buffer and water were prepared for pH 3. Both solutions were made without added iron and with 3.7 ppm iron. Brilliant Blue (FD&C Blue No. 1) was added to each solution. The four solutions were placed into twenty-two 2-mL glass vials; half were stored in darkness and the others under UV radiation (365 nm; 39-40 μW/cm2) at 30°C. Samples were removed regularly for up to 67 days. Brilliant Blue concentrations were analyzed using spectrophotometry at a wavelength of 630 nm. Pseudo-first-order rate constants with 95% confidence intervals were calculated. Colorant stability was adversely affected by iron, citrate, and UV light exposure. Solutions stored in darkness resulted in no measurable colorant loss. However, the degradation rate constants increased upon exposure to UV light. Brilliant Blue degradation was fastest in the presence of citrate, iron, and UV light. Enhanced colorant degradation is likely due to iron-citrate complexes forming destructive hydroxyl radicals upon light exposure. In the presence of iron and citrate buffer, photodegradation of food ingredients increases. To minimize chemical deterioration that may occur with UV light exposure, beverage producers should optimize product formulation and packaging.

Title: Additive manufacturing of fabric-like structures
Primary Author: Jayswal, Ajay
Additional Authors: Adanur, Sabit
Department: Mechanical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Unlike conventional manufacturing techniques, additive manufacturing (AM) is a modern technology that comprises the features of building a 3D object by adding the materials layer-by-layer. In this research, AM, which has the potential of creating a complex product following a Computer-Aided Design (CAD) model, has been employed. The Fused Deposition Modelling (FDM) process has been used in the 3D printing of yarns and fabrics that injects the thermoplastic material through the nozzle onto a platform layer upon layer. Polylactic Acid (PLA) was used to manufacture 2/1 twill weave designs of fabric-like structures using the 3D printer, Dremel 3D45. After completion of the printing process, each yarn of 1.00 mm in diameter was separated. Tensile tests were conducted using the ASTM standard test method D3822-01 to measure the tensile strength of warp and weft yarns that were produced. The mean tensile stress at maximum load was 29.54 MPa and 16.20 MPa for warp yarns and weft yarns, respectively. It was observed that the yarns are showing directional properties: the yarns in the printing direction were continuous yarns having higher strength and the yarns in cross-printing direction were staple-like yarns having lower strength.

Title: Regulation of gonadal androgen secretion in male rats by environmental chemicals
Primary Author: Jeminiwa, Bamidele O.
Additional Authors: Knight, Rachel C.; Abbott, Kodye L.; Pondugula, Satyanarayana R.; Akingbemi, Benson T.
Department: Biomedical Sciences
College/School: College of Veterinary Medicine

Abstract:
Bisphenol S (BPS) is an analog of bisphenol A (BPA) used in the manufacture of consumer products due to its superior thermal stability. Although it is assumed that BPS is a safe replacement for BPA, the safety profile alone or in the presence of other endocrine-disrupting compounds(EDCs) is unknown. 17α-Ethinyl estradiol (EE2) is a synthetic estrogen used in oral contraceptives for women. EE2 is known to accumulate and persist in the water at low concentrations. EE2's presence in water supplies assures that males are equally exposed to this agent. Most studies have focused on single EDC effects, but the more plausible reality is that humans are exposed to chemical combination dialysis. Hence, we investigated the singular effects of BPA, BPS and EE2 an,d their combinations in growing male rats. Prepubertal male rats were exposed to each of BPA, BPS, and EE2 at 5 µg/L of drinking water and their combinations at the same doses, i.e., BPA+EE2 or BPS+EE2 for 14 days. In a second experiment, pubertal male rats were fed BPA, BPS, and EE2 at 10 µg/L of drinking water and their combinations at 5 µg/L of each chemical for 14 days. At sacrifice, was were obtained to measure testosterone (T) concentrations. In addition, testicular explants were incubated in culture media for 3 hours without and without luteinizing hormone (LH). Serum and spent media were analyzed for T concentrations by RIA. In both experiments, exposure to BPA and BPA+EE2 decreased (p<0.05) serum T concentrations but this effect was absent with BPS and its combination with EE2. On the other hand, basal testicular T secretion was decreased (p<0.05) by all test chemicals and their combinations in both prepubertal and pubertal rats. Immunoblot of testes from prepubertal animals showed decreased (p<0.05) Mullerian Inhibiting substance in BPS, EE2, and BPS+EE2 animals. Findings imply that exposures of the population to combinations of environmental chemicals disrupt reproductive development and function.

Title: What does it mean to live with asthma as a young adult?
Primary Author: Jeminiwa, Ruth N.
Additional Authors: Bidur Banjara; Md Motiur Rahman; Kimberly Garza; C. Edward Chou; Ana Franco-Watkins; Brent I. Fox
Department: Health Outcomes Research and Policy
College/School: Harrison School of Pharmacy

Abstract:
Young adults have unique challenges in asthma management because of their developmental phase. Programs directed at this population must consider the challenges faced by this demographic. Yet, little is known about the experience of living with asthma as a young adult. Our objective was to uncover what it means to live with asthma as a young adult using a systematic literature review and qualitative meta-synthesis. PubMed, CINAHL, and PsycINFO were searched from database creation to March 2019 by two researchers independently. Additional articles were identified through a high sensitivity search of Google scholar. Qualitative and mixed methods studies describing the experience of living with asthma as a young adult (ages 18-29) were included. Preferred reporting items for systematic reviews and meta-analysis guidelines were followed. The rigor of the included studies was assessed using the MMAT Tool. Study findings were coded by two researchers independently. A grounded theory approach was used for data analysis and synthesis. Seven studies were identified and were of high quality with scores ranging from 75% to 100%. Five concepts related to "living with asthma as a young adult" emerged: 1)Needs (e.g., weather information), 2)Barriers (e.g., decreased parental support), 3)Enablers (e.g., knowledge of asthma management), 4)Behaviors (positive e.g., taking medication as prescribed; negative behaviors e.g., stopping medications when better), and 5) Outcomes (disease, interpersonal, and personal outcomes). When needs are met, enablers are present, and barriers are removed, young adults are more likely to exhibit positive behaviors with good outcomes. Young adults have several needs, barriers, enablers, behaviors, and outcomes as a result of living with asthma. Our findings may be leveraged to develop programs targeting young adults.

Title: Immunoproteasome inhibitors for the treatment of all
Primary Author: Jenkins, Tyler W.
Additional Authors: Downey-Kopyscinski, Sondra; Kisselev, Alexei F.
Department: Pharmacology
College/School: Harrison School of Pharmacy

Abstract:
A build-up of misfolded proteins in cancer cells can lead to cell death, and they heavily rely on the proteasome to break down damaged polypeptides. Proteasome inhibitors are approved by the FDA for the treatment of multiple myeloma and mantle cell lymphoma. There are two types of proteasomes, constitutive and immunoproteasomes. Constitutive proteasomes are found in all tissues while immunoproteasomes are expressed predominantly in the lymphoid tissues including hematologic malignancies and FDA-approved Inhibitors block both types of proteasomes. B-ALL leukemia with the MLL-AF4 translocation has been the primary focus of this project. This leukemia is a product of a fusion between chromosomes 4 and 11. The MLL-AF4 in infant leukemia with a poor prognosis and no current targeted treatment. However, it is highly sensitive to bortezomib, an FDA-approved inhibitor of constitutive and immunoproteasomes. We found that the overwhelming majority of proteasomes in this subtype of ALL are immunoproteasomes. We asked the question of ether bortezomib can be replaced with immunoproteasome inhibitors for the treatment of this leukemia. Immunoproteasome inhibitors should also reduce off-target toxicity of proteasome inhibitors caused by the inhibition of the constitutive proteasome in non-lymphoid tissue, i.e. cardiac and gut toxicities. We found that MLL-AF4 cell lines are highly sensitive to a 1-hour pulse treatment with pharmacologically relevant concentrations of immunoproteasomes inhibitor ONX-0914. However, the activity of the immunoproteasome recovers thereafter providing a potential escape route. The recovery of immunoproteasome occurs by a novel mechanism, distinct from the recovery of constitutive proteasomes, and can thus be potentially targeted to further enhance nce efficacy of immunoproteasome inhibitors. In summary, these studies demonstrate that immunoproteasomes are therapeutic targets in ALL.

Title: Sirt3 agonism alters lipid accumulation in lipid-mediatedpatic steatosis
Primary Author: Jiminez, Victoria S.
Additional Authors: Ghanei, Nila; Sheadig, Taylor; Smith, Forrest; Boncher, Tracey; Amin, Rajesh
Department: Drug Discovery and Development
College/School: Harrison School of Pharmacy

Abstract:
Non-alcoholic steatohepatitis (NASH), the most severe form of non-alcoholic fatty liver disease (NAFLD), is emerging as the most significant form of chronic liver disease in the world today. Therefore there exists a critical need to develop novel therapies to help mitigate the development of NAFLD and its progression towards NASH. Recently it has been observed that SIRT3 is significantly altered in function and reduced in expression in the heart and liver from models of obesity and diabetes. SIRT3 regulates mitochondrial protein activity involved with metabolic homeostasis, oxidative stress, and cell survival. In the current study, we predict that activation of SIRT3 promotes protection against fatty acid-induced panic steatosis. Novel SIRT3 agonists were computationally developed in the Amin lab. Hepatic steatosis was developed using BSA-conjugated palmitic acid. SIRT 3 agonists were evaluated for activity using afla fluorescencesbasedreening assay. Direct SIRT3 effector expression levels including AMPK, SOD,d SREBP were evaluated by western analysis. We have observed that honokiol, a magnolia bark extract reduced lipid accumulation our fatty acid steatotic model by 20%, whereas lead compounds reduced lipid accuaccumulation30-45%. In addition, we, also observed reduced lipid vesicle diameters in hepatocytes were reduced by approximately 20% by honokiol and 40-50% by our lead compounds. To explain the mechanism for lipid accumulation studies we observed by western analysis reduced mimitochondrialcetylation, increased pAMPK, PGC-1□ , d mitmitochondrialspiration. Our data is currently preliminary and further evaluation will determine the significance of selective amino acid activation in the allosteric binding pockets for developing novel SIRT3 agoagonistsecond w,e are currently investigating the impact of our compounds on diabetic animal models and the relative role of SIRT3 knock out on liver inflammation.

Title: Inventory and characterization of Gulf Coast salt marsh soil resources
Primary Author: Johnson, Brooke M.
Additional Authors: Shaw, Joey
Department: Environmental Science
College/School: College of Agriculture

Abstract:
Tidal marsh systems and their soils on the Alabama and Mississippi Gulf Coast are a critical natural resource that has not been intensively investigated. This research project is working with the USDA-NRCS – Coastal Zone Soil Survey to improve our understanding of these soil resources. Seven soil pedons have been collected along the Gulf Coast and described, sampled, and analyzed in the laboratory. The upper horizons of six pedons are moderately saline (EC ranges from 8.0-16.0 mScm-1) due to tidal influences, while the lower parts are slightly saline (EC 4.0-8.0 mScm-1). EC is significantly higher in organic vs. mineral horizons (8.28 mS·cm-1 vs 5.36 mScm-1, p<0.001). Soil Salinity is related to marsh vegetation and tracking marsh salinity dynamics can reflect sea-level rise. Organic horizons [soil organic carbon (SOC) & gt; 12%] are present in four pedons, but the soils are largely mineral. Estimates of SOC based on loss-on-ignition-measurements (LOIC) were correlated to SOC measured by dry combustion (r=0.92), suggesting this simple technique could facilitate carbon measurements in these environments. Marsh soils are a significant terrestrial carbon stock and are a component in the emerging blue carbon and carbon sequestration area. Changes in pH following 16 weeks of incubated oxidation (ΔpH) ARE higher for organic vs. mineral horizons (3.66 vs 2.53, p<0.05). Percent sulfur, clay content, and SOC content account for 30% of the variance in ΔpH (sulfur=15%, clay=7%, SOC=7%). In addition, sulfur contents are higher in organic vs. mineral horizons (1.61% vs 0.77%, p<0.01). Six of the soils classified as Sulfaquents – illustrating the prominence of biochemically reducing conditions and sulfidic materials within tidal marsh soils. The seventh soil is classified as a Sulfasaprist, a soil with significant sulfidic and organic materials. Our research is providing a greater understanding of tidal marsh environments and will facilitate restoration projects in target areas.

Title: Studying the relevance of stomatal characteristics on drought tolerance in peanut
Primary Author: Johnston, Seth R.
Additional Authors: Sanz-Saez, Alvaro
Department: Crop, Soil, and Environmental Sciences
College/School: College of Agriculture

Abstract:
Approximately 65% of peanuts in the U.S. are produced without irrigation due to their tolerance to short-term drought. However, the American Peanut Council has identified drought damage as the most serious challenge facing peanut sustainability in the U.S. Improved resistance to abiotic stress is crucial for the long-term viability of the U.S. peanut production. A general model for crop production under limited water environments can be defined as Y = T x TE x HI, where Y is yield, T is the total water transpired by plants, TE transpiration efficiency, and HI is the harvest index. We hypothesize that one of the causes of drought tolerance is increased transpiration efficiency due to differences in stomatal conductance and photosynthetic rates. Therefore, we expect to find smaller and less dense stomata on more dry drought-tolerantltivars that would allow the plant to preserve more water during drought stress. Lack of existing methods to evaluate these traits on peanuts drove us to develop a consistent and efficient process that would result in clear stomatal prints with the fastest and most accurate way to count and size the stomata. This process was developed over the previous year and compiled into a single report. We then used the process to assess the relationship between stomatal size and density on adaxial and abaxial leaf surfaces in drought-tolerant and drought resistance peanut cultivars to evaluate our original hypothesis. Our first assessment showed little to no correlation between these traits and general drought tolerance in peanut, but we believe this process can be used in quickly phenotyping and screening for other desired traits in peanut lines in the future.

Title: Ability of sport dog owners to correctly estimate their dog's body condition
Primary Author: Jones, Rebecca L.
Additional Authors: Kluess, Heidi; Lee-Fowler, Tekla; Wadsworth, Danielle
Department: Kinesiology
College/School: College of Education

Abstract:
Participation in dog sports is growing with over 3 million entries in dog sports for 22,000+ events last year. However, the impact of dog sports participation on owner's and dog's fitness is unknown. The goal of this study was to investigate body condition in owners and dogs that participate in dog sports and the factors that contribute to dog obesity. Sport dogs and their owners were recruited at local dog sport events. Owners answered a questionnaire about their opinion of the dog's body condition, feeding and exercise behaviors, and feeding and exercise intentions. The dog's body condition was assigned a score using the Purina 9-point body condition scale (BCS) and anthropometric measurements were taken to calculate dog body mass index and fat percentage. Sport dogs (n=101) and their owners participated in this ongoing study. The owners were 86% women and 54±16yrs old (range: 21-76 years) with self-reported BMI=26±7kg/m2. The dogs (52% female; 36% intact) were 4.7±2.3yrs old, participated in 4±3 sports, and had earned titles in 3±2 sports. Fifty-one of those dogs (50.5%) had a BCS of 4 or 5, which is ideal body condition on the Purina BCS scale. Five dogs had a BCS of 3, which is classified on the scale as too thin. The rest of the dogs (45%) had a BCS of 6 or above which is too heavy. The body fat percentage for the dogs was 14±5% and the BMI was 25±11kg/cm2. Nearly all the owners (92%) reported their dogs as "optimal" body condition. When comparing the Purina BCS score and the owners' view of the dog's body condition, only 57% of owners correctly identified their dog's body condition. There was a significant correlation between the Purina BCS and the calculated body fat percentage of the dogs (R=0.48, p<0.001), but not with the owner's BMI or the dog's BMI. Almost half of the dogs in this study were too heavy and 38% of owners underestimated their dog's body condition, indicating that better education about dog body condition is necessary for all dog owners.

Title: Friends of Baptist Hill Cemetery: preserving the past, promoting the current, and protecting the future
Primary Author: Jones, Alexis M.
Additional Authors: Jordan, Emmalee
Department: Human Development and Family Studies
College/School: College of Human Sciences

Abstract:
Baptist Hill Cemetery is the main African American cemetery in Auburn established in the1870ss. The cemetery contains the lost stories of early African Americans in Auburn. Many of the plots at the southern end and along Dean Road, both marked and unmarked, hold formerly enslaved persons and early members of Ebenezer Baptist Church. "Friends of Baptist Hill Cemetery" is a project established to preserve and promote the cemetery and the African American history of Auburn that it represents through research and photography. To better document the lives of those buried in the cemetery, extensive research was conducted through online history databases, tombstone inscriptions, oral histories from relatives, and courthouse, census, and cemetery records. The authors will present efforts made by the group to bring visibility in highlighting the Baptist Hill narrative. By providing this visual documentation, we can bring awareness to our community's history.

Title: Synthesis of novel bio-ink for SLA 3D printing of hydrogels for biomedical applications
Primary Author: Joshi, Prutha
Additional Authors: Auad, Maria L.
Department: Polymer and Fiber Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Hydrogels are evolving in the arena of tissue engineering as matrices for repairing or regenerating tissues and organs. 3D printing of tissue/organ structures has numerous benefits such as design flexibility and use of specific cell lines; however, it needs further enhancements in different areas such as the development of new bio-inks and the commercialization of the 3D printed products. Hydrogels, due to their porous structural similarity to soft tissue, are considered as potential candidates for tissue-engineered scaffolds. The cellular structure of hydrogels can mimic the tissue structure present in the human body. In this study, we developed bio-inks based on poly(ethylene glycol) dimethacrylate hydrogels to obtain a cellular structure by stereolithography 3D manufacturing. These new biomaterials allow the fabrication of porous structure and define the cellular macroscopic shape of the hydrogel for tissue engineering.

Title: The spatiotemporal expression of ROR and RYK during early sea urchin embryonic development
Primary Author: Ka, Che
Additional Authors: Range, Ryan
Department: Biological Sciences - Developmental Biology
College/School: College of Sciences and Mathematics

Abstract:
Wnt signaling unifies all metazoans and is important in development, adult tissue homeostasis, and disease. Receptor tyrosine kinases ROR (Tyrosine-protein Kinase Transmembrane Receptor) and RYK (Receptor-like Tyrosine Kinase) contain Wnt binding domains and can transduce both canonical and non-canonical Wnt signals. ROR and RYK have been implicated in the development of organisms from nematodes to vertebrates. However, the precise developmental functions of these two proteins are unclear in any adult or embryonic model system. Here, we used a combination of whole-mount in situ hybridization (WMISH) and qPCR to detail the spatiotemporal expression patterns of ror and ryk in the deuterostome sea urchin embryo. qPCR data shows that both ror and ryk are expressed in similar amounts throughout sea urchin development, with both genes reaching peak zygotic expression at the start of gastrulation. Our WMISH data indicate that both these genes are expressed ubiquitously during early cleavage stages. Later, during gastrula stages, ror is expressed in posterior endodermal cells as well as ventral and apical ectodermal cells. Similarly, ryk expression during gastrula stages is localized to the endoderm but is downregulated from the equatorial ectoderm while remaining in the anterior neuroectoderm. Interestingly, these results indicate ror and ryk are expressed within the same territories in which the sea urchin Wnt signaling network is actively specifying and patterning the early germ layer GRNs along the AP axis. Together, these data suggest that ROR and RYK may be involved in AP specification and patterning as well as the molecular mechanisms governing gastrulation in sea urchin embryos.

Title: Role of flies in dissemination of antimicrobial resistance
Primary Author: Kalalah, Anwar A.
Additional Authors: Poudel, Anil; Adekanmbi, Folasade; Hathcock, Terri; Wang, Chengming
Department: Biomedical Sciences
College/School: College of Veterinary Medicine

Abstract:
Antimicrobial resistance remains a serious public health threat globally despite decades of efforts to curb the selection and transfer of resistance through judicious use of antimicrobials. The environment plays an essential role in the transmission of antimicrobial resistance. However, studies on the environmental link to antimicrobial resistance spread are lacking. Flies are well-known vectors of bacterial pathogens but there is little data on their role in spreading microbial community and antimicrobial resistance. In this study, from 276 flies that were trapped in Auburn, AL, we isolated 84 *E. coli* including 16 multidrug-resistant isolates and 129 Staphylococcus species with two being multidrug-resistant. To evaluate the role of flies in antimicrobial resistance dissemination, we compared microbiota, antimicrobial resistance genes (ARGs), and mobile genetic elements (MGEs) in flies with those in feces of sympatric animals. A 16S rRNA-based metagenomic analysis identified 25 phyla in flies and 23 in feces while all phyla in feces were found in flies. At a genus level, flies harbored 886 genera while feces contained 596. Furthermore, 9 out of the 10 significantly abundant genera related to potential pathogens in feces were also found in flies. Bray-Curtis dissimilarity analysis showed that the microbiota of flies was more similar to the microbiota of feces of their sympatric animals than those of the feces from the other animal species. The qPCR array amplified 276 ARGs/MGEs in fecal samples and 216 ARGs/MGEs in the flies with 91% of genes in flies were also detected in feces. These similarities suggest that flies might play a role in the epidemiology and dissemination of antimicrobial resistance. However, long-term studies with larger sample numbers from more geospatially distinct populations and infection trials are indicated to further evaluate the role of flies in the dissemination of antimicrobial resistance.

Title: Biomimetic CuS Nanoparticles for photochemotherapy (PTT) of Cancer
Primary Author: Kang, Xuejia
Additional Authors: Chen, Wu; Huang, ChungHui; Wang, Qi; Wang, Junwei; Suryawanshi, Amol; Li, Feng
Department: Drug Discovery and Development
College/School: Harrison School of Pharmacy

Abstract:
Near-infrared (NIR) laser-induced photochemotherapy (PTT) has received increasing attention in fighting cancers. The design of novel photothermal agents and delivery carriers is critical for the success of PTT. In our study, we developed an innovative delivery system that combined the nanoparticles (BSA) with the photothermal agents (CuS nanoparticles NPs can refrain from the reticular endothelial system (RES) capture and accumulate in tumor regions through passive tumor targeting. CuS-NPs (CNs) are featured with prominent heat effect, which could efficiently induce 4T1 and B16F10 cell death when treated with NIR laser. Previous reports indicated that PTT was capable of triggering immunogenic cell death (ICD) in tumor cells. Tumor cells undergoing ICD can expose calreticulin (CRT) on the cell surface and lead to the maturation of dendritic cells. The activated dendritic cells will promote the presentation of tumor antigens and thus increase the recruitment of cytotoxic T lymphocytes (CTLs) in the tumor sites. We are currently optimizing the treatment protocol by investigating the effects of different doses of CNs as well as different laser intensity and irritation time on cancer cell viability and induction of IDC. In the future, we will further explore the impact of CuS/PTT treatment on the modulation of the tumor microenvironment and its potential for cancer immunotherapy.

Title: Synthesis and characterization of a more stable and more responsive MRI contrast agent sensor for hydrogen peroxide
Primary Author: Karbalaei, Sana
Additional Authors: Beyers, Ronald J.; Goldsmith, Christian R.
Department: Chemistry
College/School: College of Sciences and Mathematics

Abstract:
Reactive oxygen species (ROS), including hydroxyl radicals (·OH), superoxide anions (O2-), and hydrogen peroxide (H2O2), are produced within the mitochondria and various other electron transfer regions within cells. The overproduction of ROS has been linked to a wide range of health disorders such as cancer, heart disease, inflammatory disorders, neurological disorders, and aging. Reliable sensors for non-invasive in vivo imaging of ROS not only provide an opportunity to monitor oxidative stress in vivo but can also facilitate the development of better treatment options. MRI is commonly used to non-invasively visualize internal tissues and organs. Biochemical processes can be monitored by MRI when a chemically responsive contrast agent is administered. Here, we have prepared an Mn(II) complex with the redox-active ligand 1,8-bis(2,5dihydroxy bebenzoyl1,4,8,11-tetraazacyclotetradecane (H4qp4) and characterized it as a redox-responsive MRI contrast agent. The Mn(II) compound reacts directly with H2O2 to yield aanMn(II) species with a 60% greater T1-related relaxivity (r1). The inclusion of a macrocycle in the ligand framework stabilizes the complex in both its reduced and oxidized forms.

Title: Investigating the effect of substrate topographical and chemical characteristics on attached cultivation of green algae *Stigeoclonium*
Primary Author: Karimi, Zahra
Additional Authors: Blersch, David M; Davis, Virginia A.
Department: Chemical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
The objective of this research is to investigate the effect of substrate surface energy and macroscopic topographical features on attachment and growth of filamentous green algae *Stigeoclonium*. Algae are a valuable source of bio-compounds. Algae-based products are used in a variety of industries, including environmental remediation, nutraceuticals, personal care products, and biofuels. Yet, low efficiency and lack of consistency remain to be among the major challenges in scaling up algal systems. Attached algal cultivation has gained interest in the past few years due to its potentials for overcoming cost and energy efficiency issues of algal cultivation systems as an alternative method to suspended cultivation. However, limited fundamental scientific understanding of the algal attachment process hurdles the ability to optimize algal attachment and growth. In this research, substrates with different surface energies were used for the cultivation of filamentous algae *Stigeoclonium* in a flow reactor, and the amount of attached biomass was measured. Furthermore, 3D printed polylactic acid substrates with macroscopic spherical topographical features were investigated for attachment favourability. The results demonstrate the correlation of the attached biomass and substrate surface energy and topographic feature size. This work helps to evaluate the effectiveness of substrate chemical and topographical characteristics as engineering design parameters in attached algal systems for improving the yield and achieving species selectivity.

Title: An analysis of potential mechanisms underlying the increased suicidality in rural areas
Primary Author: Kasperek, Steven R.
Additional Authors: Puder MD, David
Department: Biological Sciences
College/School: College of Sciences and Mathematics

Abstract:
Between the years 2000 and 2016, the age-adjusted suicide rate increased by 30%. Analysis of CDC and US Census data indicate suicide rates steadily increased as counties have become more rural. Separately, the literature has shown strongly inverse connections between meaning in life – the set of values and beliefs guiding a person's life – and the rate of suicide. A life with a sense of meaning is a life the individual feels is worth living. Mental pain and locus of control, two additional factors, have been consistently related to suicidality. Specifically, mental pain occurs through emotions such as grief, despair, frustration, or anger. It is the sense one's self has been compromised, damaged, or otherwise disrupted away from its equilibrium. Locus of control refers to the level of responsibility one feels for the outcomes in their life. A person with an external locus believes outcomes in life are outside his or her control. Alternatively, one with an internal locus feels a sense of autonomy and responsibility for their life's outcomes. This presentation analyzes rurality, along with the previously described risk factors, and suggests directions for future research. Based on Alabama's proud tradition in agriculture and a rural lifestyle, there is substantial relevance to our community here in Auburn.

Title: Establishment of a model to evaluate the effects of antibiotic-free programs on intestinal development and local immune response in the small intestine of broiler chickens
Primary Author: Keel, Andrew J.
Additional Authors: Calderon, Allan; Tejeda, Oscar; Starkey, Jessica; Starkey, Charles
Department: Poultry Science
College/School: College of Agriculture

Abstract:
As the broiler industry shifts to antibiotic-free (ABF) broiler production, it has become important to develop a better understanding of the immune system and health of the small intestine (SI) to minimize reductions in growth performance of broilers not fed antibiotic growth promoters. Mitotically active cells (MAC) help maintains epithelial barrier and nutrient absorptive functions, while macrophages (MP) assist in preventing pathogen invasion of the host. The objective of this experiment was to evaluate commonly used production practices in an ABF environment on intestinal cell mitotic activity and local intestinal immunological response. A randomized complete block design experiment with a 3 × 2 factorial treatment structure was conducted. The 3 dietary protein sources were: soybean meal (SBM), a mix of 50% poultry by-product meal and 50% feather meal (PFM), and porcine meat and bone meal (MBM). Broilers were also reared on either new litter (NL) or used litter (UL). On d 3, 8, 11, 15, and 21, 6 birds per treatment from 6 different blocks (total n = 36 per d) were randomly selected for sampling. Broilers were injected intraperitoneally with 5'-bromo-2'-deoxyuridine 1 h before sampling to label MAC. Samples were analyzed using cryohistology, immunofluorescence staining, and digital fluorescence microscopy to determine the density of MAC and MP. Data were analyzed using SAS V9.4 PROC GLIMMIX, and treatment means were separated using PDIFF at $P \leq 0.05$. Neither dietary protein source nor litter condition affected MAC or MP densities on d 11. However, on d 3 ($P = 0.0126$) and d 15 ($P = 0.0292$) in the duodenum and d 21 ($P = 0.0009$) in the ileum, broilers reared on UL had a greater MAC density. On d 8 in the duodenum, broilers fed MBM had an increased MP density ($P = 0.0401$). These results indicate that dietary protein source and litter condition affect the physiology of the SI, though additional work will be necessary to better understand the underlying mechanisms.

Title: Consuming technology - purchasing electronic devices
Primary Author: Keller, Elizabeth C.
Additional Authors: Layon, Sam; Kelsey, Margaret
Department: Industrial Design
College/School: College of Architecture, Design & Construction

Abstract:
The ever-changing nature of modern-day technologies and markets necessitate continual research and updated product design. Electronic devices, in particular, are advancing rapidly. For example, every 12 to 18 months computers double in their capabilities and will be the centerpiece of this research. Electronic devices have a significant impact on users' day-to-day lives, across demographics. There needs to be further research on designing and marketing electronic devices. In this study, data are gathered from surveys involving over one hundred people. Their interests will assist in best predicting market demand and design. Consumer research will take place to assist in design and marketing strategies for electronic devices.

Title: Differential sensitivity to novel stimuli and d-amphetamine following adolescent methylmercury exposure
Primary Author: Kendricks, Dalisa R.
Additional Authors: Newland, M. Chris
Department: Psychology, Cognitive and Behavioral
College/School: College of Liberal Arts

Abstract:
Methylmercury (MeHg) is an environmental neurotoxicant known to induce alterations in dopamine-mediated behavior such as motor activity, reinforcement sensitivity, behavioral flexibility, response inhibition, and choice. The development of dopamine systems plays a key role in the manifestation of behavior related to attention-deficit/hyperactivity disorder (ADHD), including alterations in sustained attention and short-term memory. Alterations in attention and memory systems have been observed in children exposed to MeHg in utero following maternal seafood consumption. Because adolescence is also a key time for the development of dopamine systems, the current study modeled potential changes in sustained attention and memory following exposure to MeHg throughout adolescence using a mouse model. Mice were exposed to 0, 0.3, or 3 ppm MeHg in drinking water throughout adolescence and trained in a visual signal detection task in adulthood. Sustained attention and memory were probed with novel tactile and visual stimuli. The behavior for all animals, across MeHg exposure groups, was impaired significantly by the tactile stimulus. However, animals exposed to 3 ppm were less impaired by the visual stimulus than the 0 and 0.3 ppm animaTor to determine the characteristics of the visual stimulus, animals were injected with 0.3 mg/kg d-amphetamine and probed with the visual stimulus. Acute d-amphetamine improved memory in the presence of the visual distractor for the 3 ppm group but not for the 0 or 0.3 ppm groups. This differential sensitivity supports alteration in dopamine neurotransmission following developmental MeHg exposure and is in line with observations of behavioral inflexibility following developmental MeHg exposure.

Title: Solvated electrons around metal complexes: precursors to liquid metals
Primary Author: Khan, Shahriar
Additional Authors: Miliordos, Evangelos
Department: Chemistry and Biochemistry
College/School: College of Sciences and Mathematics

Abstract:
The search for high electrical and thermal conductivity materials have plachasliquid metals' in the foratront of cutting-edge scientific investigation. The focus of this project is molecular systems with solvated electrons, which are the building blocks of liquid metals. Solvated electrons are loosely bound electrons to a molecular arrangement, where they are not loyal to any specific atom. After a series of theoretical explorations in our lab, we have found that metal-ammonia complexes (including alkali, alkaline earth ,and transition metals) preferably accommodate some metallic valence electrons at the periphery of the complexes in diffuse hydrogenic-type orbitals. The number of diffuse electrons depends on the metal identity and the number of coordinated ligands. Moreover, these loosely bound electrons belong to the entire metal-ammonia complex as if the whole complex behaves as a plain nucleus. Transition metal-ammonia complexes are even more interesting because of the simultaneous presence of protected inner d orbitals, which are reluctant to be diffused. Further investigation revealed that not only ammonia but also other ligands such as methylamine, water, and alcohol can initiate this process of electron solvation. These findings indicate that the formation of such species is natural for all metals and various ligands.

Title: Characterization and modification of jet issuing from a cyclone vortex combustion chamber
Primary Author: Khan, Omer
Additional Authors: Anwar, Ahmed
Department: Aerospace Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Jet emanating from a cyclone chamber was experimentally investigated using dye flow visualization and Particle Image Velocimetry (PIV). Tangential injection at the top of a cyclone chamber results in a highly turbulent flow that laminarizes under the influence of favorable pressure gradient as it accelerates towards the center of the chamber where the vorticity generated at the walls gets concentrated in the form of amalgamated vortex filamentbeforeto exiting the chamber as a swirl dominated jet. Unlike the classical axisymmetric jet, the presence of streamwise vortex filaments originating inside the cyclone chamber superimpose swirl on the jet and compromise the axial momentum that leads to causing a rapid decay. A passive momentum recovery device in the form of an axial tube was utilized to surround the core of the primary vortex before its exit. Experimental results show its effectiveness in reducing the swirl and improvements in axial characteristics of the exiting jet. Topological features of the flow, mean a,nd turbulence measurements are presented and discussed.

Title: Land management influences on shrink-swell behavior of expansive clayey soils
Primary Author: Kharel, Geeta
Additional Authors: Knappenberger, Thorsten
Department: Crop, Soil, and Environmental Sciences
College/School: College of Agriculture

Abstract:
Vertisols are soils with high clay content and a distinct shrink and swell behavior. In Alabama, they are found in the Black Prairie Region, expand well into Mississippi ,and are also found in Texas. The shrink and swell behavior of these soils aaffectthe soil hydrology and they are generally challenging for agricultural use. Soil carbon content is an important indicator of soil health and could be also related to their shrink and swell behavior. Conservation tillage has become very popular over the last decades and in general, it increases soil health and soil carbon content. We hypothesize, that soils under conservation tillage have reduced shrink and swell behavior in comparison to conventional tillage. Soil samples were taken at four soil depths from 0 to 50 cm from around the Auburn University Blackbelt Research & Extension Center which were under conventional tillage, pasture, hayfield, and forest land management systems and had Sumter and Vaiden soil series. Soil samples were analyzed for the coefficient of linear extensibility (COLE), soil texture, Atterberg limits, permanganate oxidizable carbon (POXC), and total carbon (TC). The COLE values were highest in forests and lowest in hayfields (15 and 9 %), while POXC values were highest for forest and lowest for conventional tillage (621 and 373 mg per Kg of soil). The COLE values were significantly different for land managements, soil types, and soil depths (P < .0001, P < .0001, and P = .038 respectively) while only land management and soil depth were significantly different for POXC (P < .04, P < .0001). The first results confirm our hypotheses that land management affects soil health indicators and shrink and swell behavior. We will expand our research area into other soil and land management systems across the Black Prairie Region.

Title: Greenspace integration to reduce college student's study abroad anxiety in Palazzo Chigi, Italy
Primary Author: Killen, Margaret (Maggie) E.
Additional Authors:
Department: Interior Design
College/School: College of Human Sciences

Abstract:
Study abroad offers fundamental experiences to prepare students to prosper in today's dynamic global economy. The College of Human Sciences at Auburn University hosts over ten distinct study abroad experiences for students in its majors. Every semester at least twenty-one students from the College of Human Sciences participate in one of the study abroad opportunities in efforts to expand their personal experiences for their future. Research has shown that studying abroad increases student confidence while expanding a student's ability to easily adjust to various environments. Although highly valuable, study abroad can also be challenging and stressful to college students who are asked to make decisions and engage in unfamiliar experiences all while immersed in a new culture and a foreign place, far from their support system. Students studying abroad must quickly adapt and create a new network of support in to successful. One of the resources available anywhere around the world can be found in our connection to nature. Nature can reduce or even reverse the negative effects of travel anxiety while promoting wellness. The goal of this research project is to examine opportunities to intentionally integrate on-site natural green spaces within an existing study abroad campus to reduce anxiety and serve as a place of connection for students. The research design focuses on a case study of the J. S. Bruno Study Abroad in Italy campus for Auburn University, where students typically spend a full semester studying abroad through the College of Human Sciences. Members from the research team travelledtraveledzo Chigi, Italy – home of the J. S. Bruno Study Abroad in Italy campus for Auburn University – to photograph the existing campus. These photos were combined with geospatial data sourced from Google Earth to develop a campus matrix. The images were then analyzed by an independent coder to map hardscapes, softscapes, and natural green spaces on the campus matrix.

Title: Multi-solute transport of Methanol and Acetate in crosslinked PEGDA-AMPS cation exchange membranes
Primary Author: Kim, Jung Min
Additional Authors: Beckingham, Bryan
Department: Chemical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Ion exchange membranes are a crucial component for several applications from water treatment to energy devices. Photoelectrochemical CO2 reduction cells are one of those applications, which aim to utilize solar energy to reduce CO2 to valuable chemicals, such as methanol and acetate. One of the most imminent concerns with these applications is the absence of a suitable ion exchange membrane, which promotes the transport of counterions while limiting the crossover of CO2 reduction products to prevent them from oxidizing back to CO2. Here, we investigate the multicomponent transport behavior of two CO2 reduction products, methanol, and acetate, in a series of polyether-based cation exchange membranes of varied charge density. Model membranes are synthesized by varying poly(ethylene glycol) diacrylate to 2-acrylamide-2-methyl propane sulfonic acid content. Diffusive permeabilities of these membranes to methanol, acetate, and the mixture of two were measured by a diffusion cell coupled with in situ attenuated total reflectance Fourier transform infrared spectroscopy to monitor the time-resolved concentration of each permeant. Interestingly, acetate permeates through the membranes more rapidly in the presence of methanol compared to permeating by itself. This behavior is attributed to the screening of electrostatic interaction (Donnan exclusion interactions), in which methanol interferes with the electrostatic repulsion between membrane-bound sulfonate anions and transporting acetate anions.

Title: Novel approaches to *Salmonella* environmental surveillance data from a veterinary teaching hospital
Primary Author: Kitchens, Steven R.
Additional Authors: Wang, Zheran (Rachel); Wright, James C.; Price, Stuart B.
Department: Biomedical Sciences
College/School: College of Veterinary Medicine

Abstract:
Environmental *Salmonella* contamination can pose a risk to livestock. Biosecurity and risk factor analysis of *Salmonella* prevalence in environmental samples can help the development of interventions to control *Salmonella* spread. Veterinary teaching hospitals are good locations for collecting environmental and animal samples for *Salmonella* contamination analysis, due to the presence of multiple animal species. A surveillance study of a veterinary teaching hospital was conducted to better understand the dynamics of *Salmonella* in the environment within a multi-species animal facility. We analyzethe d prevalence of *Salmonella* to identify sources or areas of environmental contamination and evaluated different statistical methods to more accurately prthe edict presence of *Salmonella*. The ultimate goal was to use the results of these analyses to develop future interventions for preventing *Salmonella* spread. The total number of samples collectthree yearsear span was 887. Of 887 samples, 351 (39.57%) were culture positive for *Salmonella*. Datwereas aanalyzedwith three statistical methods: logistic regression with random effects, random forest statistical method, and Markov chain Monte Carlo (MCMC). The results from the three models differed slightly from each other, but overall each indicated seven factors or areas that contributed significantly to Salmonella contamination: bovine species, summer season, water samples, drain samples, fecal samples, food animal barns, and the dairy barns/pastures. The random forest model was the most accurate and most sensitive of the three models, butdoes not give information on sources of contamination if an existing outbreak of widespread contamination is occurring. The MCMC model provided more specific information that could be beneficial in ithe dentification of potential sources of contamination.

Title: Blind navigation using two cameras
Primary Author: Kopp, Leann H.
Additional Authors: Oeding, Luke
Department: Mathematics
College/School: College of Sciences and Mathematics

Abstract:
Navigating an unfamiliar area, or even leaving a building from a new exit, can be disorienting, especially when GPS is unreliable. We implement mathematical solutions to this problem, transferring a known pose from a fixed camera to a personal device like a phone. Visual odometry includes pose transfer, whose goal is to obtain a translation and rotation between two cameras, typically using only visual cues. We transfer pose from one image to the next using only visual information, in the form of feature correspondences, from the two cameras. We provide experimental data from real image sequences to illustrate hto ow pose transfer works and to highlight the accuracy achieved from these methods, using images taken around Auburn.

Title: Computational study of expiratory airflow in healthy and diseased patient-specific trachea
Primary Author: Kore, Tarun E.
Additional Authors: Tiwari, Bipin; Bodduluri, Sandeep; Bhatt, Surya; Raghav, Vrishank
Department: Chemical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Chronic Obstructive Pulmonary Disease (COPD) is a respiratory dithat which is the third leading cause of death in the United States, affecting an estimate of more than 11 million people. It is a chronic inflammatory lung disease that obstructs airflow in the lower airways and is caused do the long-term exposure to irritating gases, particulate matter, most often experienced by smoking. A recently discovered phenomenon linked with COPD is Expiratory Central Airway Collapse (ECAC) which is the flattening and collapse (of more than 50% of the surface area) of the trachea during expiration. This occurrence leads to abnormaairflowow rates due to shortness of breath, cough an,d mucus production that worsens respiratory quality of life. Currently, the mechanisms for initithe ation and progression of ECAC are not well understood and is the primary motivation of this study. In collaboration with the Department of Medicine at the University of Alabama at Birmingham (UAB), we have hypothesized that pathophysiological wall shear stress (WSS) due to abnormal airflow rates could lead to heterogeneous progression of ECAC. Through the use of Computational Fluid Dynamics (CFD) simulations, we aim to observe and compare the WSS responses of eigpatient-specificfic tracheal geometries, four with ECAC and four normal tracheas, under nominal, 0.5 L/s, and coughing, 6 L/s, breathing conditions. Through a previous experiment, the heterogeneous progression of ECAC was found to show 13.8% higher WSS values for geometries with ECAC when understeady-stateate aairflowsimulation. Following this logic, we predict that the ECAC geometries will show larger WSS values under coughing conditions than under nominal breathing conditions. Standardized meshing parameters have been utilized to further simplify simulations. For a more vigorous and realistic inspection of the progression of ECAC, a pulsatile transient inlet flow rate had been administered for the breathing conditions.

Title: Preparatory arm swing on vertical jump performance
Primary Author: Kosek, Jerad J.
Additional Authors: Weimar, Wendi; Wilburn, Christopher; Hill, Imani
Department: Kinesiology
College/School: College of Education

Abstract:
The vertical jump is a common movement used to identify lower extremity power. The countermovement vertical jump includes an arm swing component and previous literature has implied that this arm motion contributes to the jump by increasing the vertical ground reaction force. However, this conclusion negates the muscular synergy of the Latissimus Dorsi and the Gluteus Maximus. Therefore, the purpose thof is project is to investigate the influence of muscle preparation of the Latissimus Dorsi on the force parameters of the vertical jump. Specifically, does a pre-preparatory arm swing allow the Latissimus Dorsi to increase the stabilitof y the pelvis so that the Gluteus Maximum can create a larger force for jumping. Kinetic data [AMTI (Watertown, MA, USA)] of 4 participants(n=4) were collected during 6 jumping trials, 3 with preparatory arm sw,ing and 3 without. Jumping conditions of vertical jump with preparatory arm swing and vertical jump without preparatory arm swing were completed in randomized order. The results showed the average time to peak force for the preparatory arm swing condition was 0.0185 s, compared to 0.0189 s for the non-preparatory arm swing condition. Also, peak force was greater in the preparatory arm swing condition, 1000.97 N, compared to the non-preparatory arm swing condition, 958.90 N. A dependent sample paired t-test was run and there was no significance found (t=0.690) for propulsive time. A second dependent sample paired t-test was run and there was significance found for peak force (t=0.022). These results indicate that a preparatory arm swing may have practical significance for athletes who needa powerful hip extension, as the pre-preparatory arm swing allows the lower extremity to develop greater forces faster.

Title: Do traumatic events at work put veterinary professionals at risk for PTSD and other negative mental health outcomes?
Primary Author: Kramper, Sharon
Additional Authors: Crosby, Eric; Waitz-Kudla, Sydney; Clark, Malissa; Weathers, Frank; Witte, Tracy
Department: Clinical Psychology
College/School: College of Liberal Arts

Abstract:
Frequent exposure to danger or injury in the veterinary workplace may contribute to negative mental health outcomes (e.g., depression, posttraumatic stress disorder [PTSD]). The U.S. Department of Labor reports that individuals employed in veterinary services have the fourth-highest incidence rate of injuries (e.g., bites, being crushed) and illness (e.g., zoonotic infections, exposure to anesthetic gases); more than half of veterinarians and approximately 98% of veterinary technicians report sustaining an injury at work. However, there is a scarcity of research focused on the psychological consequences of these incidents. For this study, our sample included individuals (N = 293) recruited from professional organizations in Alabama and Tennessee who were employed as a veterinarian, veterinary technician, veterinary assistant, or veterinary technologist. Participants completed an online, anonymous, 30-minute survey. Using grounded theory analysis, we will code and categorize the types of occupational events that veterinary professionals regard as unusually distressing and explore whether veterinarians are exposed to certain types of events more frequently than veterinary technicians, veterinary technologists, and veterinary assistants. Then, we will determine what proportion of veterinary professionals have experienced events that qualify as traumatic events per the American Psychiatric Association's Diagnostic and Statistical Manual Version 5 (DSM-5) criteria and estimathe te prevalence of PTSD symptoms. Finally, we will examine the relationships between unusually distressing events and negative mental health outcomes aside from PTSD, including depression, psychological distress, suicide ideation, suicide attempt, substance use, burnout, and job satisfaction. The results of this study will provide the first estimate of the prevalence of PTSD in veterinary professionals. Also, identifying the most distressing events may guide prevention and intervention efforts.

Title: Comparing dog and human olfactory working memory using an odor span task
Primary Author: Krichbaum, Sarah M.
Additional Authors: Vaughn, Jacob; Katz, Jeff
Department: Psychology
College/School: College of Liberal Arts

Abstract:
The current study adapted the odor span task (OST), typically used to study olfactory learning and memory in rats, to evaluate working memory in domestic dogs and humans. The OST is an incrementing non-match-to-sample task such that, on trial one, a single odor is presented and a response to that odor is reinforced. On trial two, and every trial thereafter, two odors are presented (i.e., a session-novel odor and a previously encountered odor from that session) and a response to the session-novel odor but not the previously encountered odor is reinforced. The OST probes working memory because a subject or participant is only successful if they remember encountering the odor that occurred earlier in the session. In this study, dogs (n = 6) and humans (n = 24) were compared on a 72-trial session that consisted of 72 different odors. Dogs (79%) and humans (71%) displayed significantly different levels of accuracy for overall performance in the session and although within-session performance across 12-trial blocks revealed a similar decrease in accuracy for both species, humans displayed lower accuracy than dogs at each of the trial blocks. These results show a qualitative similarity (i.e., slope) with a quantitative difference (i.e., intercept) between dogs and humans on the OST. However, when analyzed for the effect of the number of trials since the previously encountered odor last occurred on the accuracy, dogs and humans did not differ. Both species displayed a decrease in accuracy as the number of trials since the previously encountered odor increased and dropped to chance performance (50%) after eight trials. Comparisons between olfactory working memory in humans and dogs will be discussed, as well as experimental parameters of the OST that can influence results.

Title: A new species of Thelohanellus Kudo, 1933 (*Myxozoa: Bivalvulida*) infecting the somatic muscle of blacktail shiner, *Cyprinella venusta* Girard, 1856 *(cypriniformes: Cyprinidae*) in the Chattahoochee River Basin, Georgia, USA

Primary Author: Ksepka, Steven P.
Additional Authors: Whelan, Nathan; Whipps, Christopher; Bullard, Stephen
Department: Fisheries, Aquaculture, and Aquatic Sciences
College/School: College of Agriculture

Abstract:
Thelohanellus magnacysta n. sp. (*Bivalvulida: Myxobolidae*) infects the somatic muscle of blacktail shiner, *Cyprinella venusta* Girard, 1856 (*Cypriniformes: Cyprinidae)* in Bull Creek, Chattahoochee River Basin, eastern Georgia. Although numerous members of Thelohanellus Kudo, 1933 have overlapping myxospore dimensions with the new species, it differs from all nominal congeners by polar filament coil number and polar capsule width as well as by lacking a mucous envelope, iodinophilic vacuole, and sutural markings. Using novel primers for *Myxozoa*, a phylogenetic analysis of the small subunit ribosomal DNA (SSU rDNA) suggests that the new species shares a recent common ancestor with a clade of cyprinid–infecting species of *Myxobolus Bütschli*, 1882 (*Bivalvulida: Myxobolidae*) and *Thelohanellus*. In addition, and consistent with other published research concerning the systematics of *Thelohanellus*, this result suggested that *Thelohanellus* and *Myxobolus* are polyphyletic and need revision. Histological sections of infected blacktail shiners confirmed that myxospores were only found within a plasmodium and only infected somatic muscle and that plasmodia were encapsulated by a granuloma comprising varying degrees of acute granulomatous inflammation. The new species is the fourth of *Thelohanellus* reported from North America and first reported from *Cyprinella* as well as the first myxozoan described from the blacktail shiner.

Title: Trauma symptoms in sexual and nonsexual offending juvenile delinquents
Primary Author: Kucera, Emily L.
Additional Authors: Thompson, Kelli
Department: Psychology
College/School: College of Liberal Arts

Abstract:
Juveniles in detention often report higher rates of severe mental health disorders, as well as, higher rates of trauma exposure. Since the US leads all other developed nations in adolescent incarceration rates, then it stands to reason that understanding how incarcerated adolescents respond to trauma might be of particular concern to the juvenile justice system. Furthermore, adolescents adjudicated for illegal sexual behavior (AISB) often report higher rates of interpersonal trauma, including childhood sexual abuse, and higher rates of PTSD symptoms when compared to those adjudicated for general delinquent behavior (AGDB). Different types of trauma can lead to different types of trauma reactions. Researching these differences in trauma reactions may help provide evidence for differential treatment options for the two juvenile offending groups. / The current study used archival data to compare rates of trauma symptoms expressed among adolescents residing at a high-security juvenile correctional facility. Groups were formed based on the main committing offense (AISB, n = 89; AGDB, n = 110). Trauma symptoms were measured using the Trauma Symptoms Checklist for Children (TSCC). Data were analyzed using an ANOVA and results indicated the AISB group reported significantly higher rates on five of the TSCC subscales: hyper-response, anxiety, depression, post-traumatic stress, and fantasy dissociations. The AGDB group was not significantly higher on any of the scales. The AISB group was expected to show more trauma symptoms on the sexual trauma scales (sexual concerns, sexual preoccupation, and sexual distress). Interestingly, though, the two groups did not differ significantly on these scales. These results suggest AISB and AGDB may require different intervention options. Individualized treatment planning which is sensitive to screening for trauma allows for a better understanding of how to best rehabilitate these boys and prepare them for the outside world.

Title: Molecular characterization of a 3D engineered in vitro model of colorectal cancer
Primary Author: Kuhlers, Peyton C.
Additional Authors: Hassani, Iman; Anbiah, Benjamin; Ahmed, Bulbul; Habbit, Nicole; Lipke, Elizabeth A.; Greene, Michael W.
Department: Biochemistry
College/School: College of Sciences and Mathematics

Abstract:
Colorectal cancer (CRC) is the 4th leading cause of cancer mortality. Patient-derived xenografts (PDX) are pre-clinical tumor models that can recapitulate the heterogenous nature of CRC tumors in vivo. The degree to which 3D-engineered in vitro tissues derived from PDX cells can recapitulate the in vivo tumor is not known. Therefore, we sought to molecularly characterize a novel 3D-engineered CRC PDX (3D-eCRC-PDX) model and an in vivo CRC-PDX model using RNA-seq. To assess differences in gene expression between the 3D-eCRC-PDX tissues and CRC-PDX tumors, we performed a differential expression analysis and a gene ontology (GO) analysis, which collates genes of similar function. We observed 2193 differentially expressed genes (DEGs) (FDR<0.05) and GO analysis revealed enrichment for cell cycle processes. The top 16 upregulated genes in 3D-eCRC-PDX tissues were not correlated with overall or relapse-free survival in multiple independent CRC cohorts, suggesting that the DEGs between the two models are not clinically relevant. / To assess similarities in gene expression, 3D-eCRC-PDX tissues, and CRC-PDX tumors were compared to tumor-adjacent tissue (normal colon) samples from The Cancer Genome Atlas (TCGA). Differential expression analysis showed ~66% of DEGs overlapped between 3D-eCRC-PDX tissues and CRC-PDX tumors. GO analysis showed enrichment for receptor binding and extracellular matrix components. Subtype analysis of our PDX models revealed a gene expression profile consistent with consensus molecular subtype 1 (CMS1). We found that 9 out of 10 Hallmark gene sets enriched in the PDX models were also enriched in CMS1 primary tumors from TCGA compared to normal colon tissue. Our 3D-eCRC-PDX tissues were found to recapitulate key differences between in vivo PDX tumors compared to normal colon tissue and that prognostic differences between our two models may not be clinically relevant. These data suggest 3D-eCRC-PDX tissues model in vivo PDX tumors.

Title: Nutrient dynamics and eutrophication in Florida lakes: a surface sediment investigation
Primary Author: Lamb, Avery N.
Additional Authors: Waters, Matthew N.
Department: Crop, Soil, and Environmental Sciences
College/School: College of Agriculture

Abstract:
An increase in cyanobacteria and cyanotoxin occurrences suggest drivers that promote their products are becoming more common. Cyanobacteria toxins (cyanotoxins) are metabolites found in water bodies around the world that can have negative effects on aquatic ecosystems and human health. Microcystin (MY) is a toxin of increasing concern and has been frequently documented in Florida, USA. Prior research has attempted to identify the drivers that promote cyanobacteria and cyanotoxin occurrence—including MY—but to a lack of scientific consensus. Common in paleolimnological studies, the analysis of surface sediment samples can produce data over a longer temporal scale (i.e. years) as opposed to capturing variation within limited environmental water samples. The purpose of this study is to document nutrient dynamics and cyanobacterial parameters on a multi-lake scale to identify possible trends and drivers of cyanobacteria presence. In July 2018, a 47-lake water-column and surface sediment survey were conducted throughout the state of Florida using paleolimnological methods; data collected includes organic matter content, (MY) concentrations, nutrient and element concentrations, and photosynthetic pigments. The results of this study will contribute to a better understanding of cyanobacteria and cyanotoxin behavior in the subtropical area of Florida.

Title: *E. coli* bacteriophage PF-2 showed delayed absorption, but not delayed progeny production, following treatment of hypochlorous acid
Primary Author: Landrum, Jack H.
Additional Authors: Landrum, Archie; Smith, Harrison; Bruderer, Madeleine; Higgins, Keah; Hallowell, Haley; Roberts, Megan; Hiltbold Schwartz, Elizabeth
Department: Biomedical Sciences - Pre-medicine
College/School: College of Sciences and Mathematics

Abstract:
The intestine must maintain a delicate balance between tolerance of enteric microbiota and defense against pathogens. The enteric microbiota is composed of a variety of microorganisms, including bacteria and bacteriophage, among others. In intestinal inflammation such as IBD, the enteric microbiota can be altered by-products of the immune system such as reactive chlorine species. While we have some knowledge of how inflammation affects bacteria, we understand significantly less about how inflammatory products impact the dynamics of bacteria: bacteriophage interactions. The primary objective of this study was to determine how immune system products, namely hypochlorous acid, impact bacteriophage infectivity rates. The effect of hypochlorous acid on the infectivity rate of bacteriophage was measured using a modified one-step growth curve, measuringthe growth cycle and burst size of an *Escherichia coli*-specific bacteriophage. Adsorption kinetics were performed to determine the effect of inflammatory productthe s on ability to adsorb. Hypochlorous acid treatment slightly delays the latent period of PF-2. Adsorption kinetics reveal a delay in adsorption in a dose-dependent manner to hypochlorous acid. However, later time points of the infectivity cycle appear unaffected.

Title: Quantifying injury risk using the maximum lyapnuov exponent during a repetitive jump task
Primary Author: Larson, Jacob S.
Additional Authors: Zabala, Michael; Oldfather, Taylor; Perkins, Edmon
Department: Mechanical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Biomechanical analysis is commonly used to determine an individual's risk of anterior cruciate ligament (ACL) injury. Traditional biomechanical analysis techniques use motion capture to evaluate subjects during limited frames of reference, which ignores nuances in variation of a repeated motion over time. Although few studies are analyzing the variability of movements over time, one method of analysis commonly used in non-linear systems is the Maximum Lyapunov Exponent (MLE). This study collected the kinematics of repeated vertical jumps from twenty-seven female D1 soccer, D1 basketball, and club soccer athletes from Auburn University (height = 171.2 ± 8.9cm, weight = 66.3 ± 8.6kg, age = 19.8 ± 1.9yr). Any history of previous knee surgery was recorded and used to separate the subjects into affected and unaffected populations. This study found four key variables with significant mean differences between the affected and unaffected subjects. In all cases with significant differences, the affected population had smaller MLE values, which indicates less variability in movement when compared to the unaffected subjects. This study explores two different logistic classification models with strong ROC values and will look to further explore the connection between MLE and joint health in future studies.

Title: Theoretical studies on non-enzymatic dipeptide hydrolysis reactions and their applicability to other therapeutics
Primary Author: Lawson, Katherine E.
Additional Authors: Adamczyk, Andrew J.
Department: Chemical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Studies on peptide degradation mechanisms are of interest because of the high demand for protein-based therapeutics and the development of biopolymer drug delivery systems in the pharmaceutical industry. Due to the size constraints of experimental systems, molecular models are used to determine critical thermochemical and kinetic parameters of the reactions. One reaction of particular interest is non-catalytic hydrolysis, a degradation mechanism that uses water to cleave peptide chains at the central amide bond. This reaction was modeled at a neutral pH, using quantum chemistry and statistical thermodynamics. The 20 dipeptides used in the training set were split into two reactive classes- ionized and non-ionized- to generalize our model further. Ultimately, our model computed the following quantities (Enthalpy of Reaction (ΔHR), Entropy (ΔS), Gibbs Free Energy of Reaction (ΔGR), Activation Energy (EA), and the Arrhenius pre-exponential factor (log(A)) for each dipeptide. Additionally, our model matched the experimental trends that dipeptide hydrolysis is both an exothermic and spontaneous reaction. From this validation of our model, we can generalize vital reaction properties as a function of the dipeptide reactive class, and subsequently expand these learnings to other systems.

Title: Improving featured-based soft sensing through feature selection
Primary Author: Lee, Jangwon
Additional Authors: Wang, Jin; Flores-Cerrillo, Jesus; He, Q. Peter
Department: Chemical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Driven by the applications of spectroscopic techniques, many advancements have been reported for soft sensor modeling, which infers a sample's properties from its spectroscopic readings. Because the number of wavelengths contained in a sample spectrum is usually much larger than the number of samples, "curse-of-dimensionality" is a common challenge that would affect the predictive power of the soft sensor. This challenge could be alleviated through variable selection, however, there is no guarantee that the truly relevant variables would be selected, and the selected variables are often (very) sensitive to the choice of training and validation data. To help address this challenge, we have developed a feature-based soft sensing approach by adapting the statistics pattern analysis (SPA) framework. In the SPA feature-based soft sensing, the features extracted from different segments of the complete spectrum were utilized to build the model. In this way, the information contained in the whole spectrum is used to build the model, while the number of the variables is significantly reduced. In this work, by integrating a novel variable selection approach we developed recently with the SPA feature-based soft sensor, we not only further improve the soft sensor's prediction performance, but also identify the key underlying chemical information from spectroscopic data. The performance of the improved feature-based soft sensing approach, termed SPA-CEEVS, is demonstrated using four NIR data sets, and compared with several best performing soft sensing approaches.

Title: Effects of laser surface treatment on fatigue behavior of additive manufactured Ti-6Al-4V
Primary Author: Lee, Seungjong
Additional Authors: Ahmadi, Zabihollah; Mahjouri-Samani, Masood; Shamsaei, Nima
Department: Mechanical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Metallic additive manufacturing (AM) has progressively been focused on due to its advantages regarding procedures such as simplification of production and the possibility of constructing complex geometry. The mechanical properties of additive manufactured (AM-ed) parts have been researched to verify its quality in comparison to wrought parts. However, the fatigue performance of AM-ed parts is severely undermined due to several defects caused by the AM process. The surface roughness (SR) especially aggravates fatigue life hence the SR results in post-processing after the AM process. There are conventional post-processing methods for reducing SR, however, these methods lack time proficiency, waste materials, and are not economically efficient. In this study, the laser surface treatment (LST) is presented as an alternative to post-processing. The specimens were fabricated by the laser beam powder bed fusion (LB-PBF) method and exposed by a continuous-wave (CW) laser. The final process parameter of LST was based on experimental results. To obtain SR values, a focal variation microscope was used for both as-built (AB) and laser-treated (LT-ed) surface conditions. Fatigue testing and fractography were conducted to compare the fatigue behavior using fatigue life and observed fracture surface. In addition, the microstructure was investigated especially for the region close to the surface. Results indicate that the fatigue lives of LT-ed parts were significantly longer than AB parts due to reduced surface roughness.

Title: AU-ROOAD; a preliminary overview on MCI study subjects and disease status
Primary Author: Lee, Hayden; Mathwich, Taylor; Patel, Priyal
Additional Authors: Patel, Jessica; Patel, Komal
Department: Pharmacy
College/School: Harrison School of Pharmacy

Abstract:
Alzheimer's disease (AD) is a multifaceted, irreversible neurodegenerative disorder. AD tends to develop slowly over time with hallmark signs of progressive memory loss, decline in cognitive abilities, and changes in mood or personality. MCI can involve problems with memory, language, thinking and judgment that are greater than normal age-related changes. MCI may increase the risk of developing dementia, AD, or other neurological conditions. Auburn University Research on Olive Oil for Alzheimer's Disease (AU-ROOAD) recruited participants with MCI to study the possibility of halting the progression from MCI to AD with the use of extra-virgin olive oil (EVOO). This randomized, double blinded study placed patients into two arms, phenols-low EVOO and phenols-rich EVOO to test the hypothesis "EVOO consumption stops or delay MCI conversion to AD". A number of risk factors have been reported to affect the development of MCI among individuals including age and disease state. The objective of this abstract is to evaluate correlation of MCI with disease status from subjects enrolled in our AU-ROOAD study. Preliminary data demonstrated that about 42% of MCI enrolled subjects have hyperlipidemia and 39% have hypertension. Of these subjects, there are 28.6% who have both hypertension and hyperlipidemia. These disease states are consistent with the literature, which are considered risk factors of AD.

Title: Cub survival, den habitat, and juvenile dispersal of black bears (*Ursus americanus*) in Alabama
Primary Author: Leeper, Hannah J.
Additional Authors: Steury, Todd
Department: Wildlife Sciences
College/School: School of Forestry and Wildlife Sciences

Abstract:
Black bears (*Ursus americanus*) are historically native throughout Alabama. However, historic populations have diminished as a result of over-hunting and habitat degradation. Now, only two small populations remain in the state. One is a newly recolonized population in northern Alabama (NAL) that is growing quickly; the other is a remnant population in the Mobile River Basin (MRB), which does not exhibit the growth that is expected from a healthy population. One proposed explanation for this low rate of growth is low cub survival, resulting in limited recruitment rates. Our objectives are: 1) to estimate black bear cub survival; 2) determine how den habitat and structure influence cub survival; and 3) determine juvenile dispersal patterns. We will capture juvenile and adult bears with Cambrian style traps, and fit them with GPS tracking collars so that we can find their den site in the spring. When we locate newborn cubs in the den, we will fit them with a mortality-sensitive VHF collar. The collar will allow us to monitor cub survival daily from a distance and determine cause of death, when applicable. We expect results to indicate that the MRB population has extremely low cub survival, while the NAL population has much higher survival rates. We also expect to find NAL bears dispersing far, in a southwesterly direction, while MRB bears remain close to the mother's home range. Understanding the underlying growth trends that each population exhibits will help us adjust and prepare for future growth trends throughout Alabama.

Title: Effect of dietary protein source on broiler chicken growth performance, myogenic stem cell activity and heterogeneity, and muscle fiber morphometrics
Primary Author: Leiva, Samuel F.
Additional Authors: Sandoval, Jorge; Keel, Jake; Tejeda, Oscar; Starkey, Charles; Starkey, Jessica
Department: Poultry Science
College/School: College of Agriculture

Abstract:
Dietary protein source has been shown to affect broiler growth performance and muscle accretion. A randomized complete block design experiment was conducted to assess the effect of dietary protein source on broiler growth performance, Pectoralis major (PM) myogenic stem cell (MSC) mitotic activity and heterogeneity, and muscle fiber cross-sectional area (CSA). On d of hatch, female Ross 708 × Yield Plus broilers (n = 360) were placed in raised floor pens and randomly allotted to 1 of 3 dietary treatments. The 3 corn and soybean meal-based crumbled diets included: 1) soybean meal as the sole protein source (SBM), 2) soybean meal + a 50% poultry by-product meal and 50% poultry feather meal blend (PBM), or 3) soybean meal + meat and bone meal (MBM). From d 0 to 8, birds were housed with 4 birds per pen and individually from d 9 to 20. On d 20, 1 h prior to PM muscle sample collection, birds ($n \geq 2$ per diet; total n = 12) were intraperitoneally injected with 5'-bromo-2'-deoxyuridine (BrdU) to label mitotically active cells. Samples were analyzed using cryohistology followed by immunofluorescence staining to enumerate the mitotically active (BrdU+), MSC populations expressing the myogenic regulatory factors (MRF) MyoD and Pax7, by digital fluorescence microscopy. Muscle fiber density and fiber CSA were determined for each bird. Data were analyzed with SAS (V9.4) PROC GLIMMIX and means were separated with PDIFF at $P \leq 0.05$. Feed intake, BW gain, and FCR from d 0 to 20 were not altered by dietary protein source ($P \geq 0.1925$). The PM muscle MSC mitotic activity and MRF heterogeneity as well as fiber CSA and density were similar among broilers fed the 3 different dietary protein sources ($P \geq 0.1304$). However, birds fed SBM and PBM had a greater proportion of fibers with CSA from 1,500 to 1,999 μm2 compared with MBM ($P = 0.0227$). Overall, PM fiber CSA distribution was altered by dietary protein source and warrants further investigation into the mechanisms of muscle accretion.

Title: Medicare Part D prescription payments by prescriber specialty types in 2017
Primary Author: Li, Chao
Additional Authors: Fahim, Shahariar; Westrick, Salisa; Qian, Jingjing
Department: Health Outcomes Research and Policy
College/School: Harrison School of Pharmacy

Abstract:
Medicare Part D prescription expenditures across prescriber specialties varied by different medical specialty's preferences or prescribing patterns. Better understanding of the prescribers' preference and patterns can help form strategies to reduce Part D expenditures. The objective of this study was to describe Medicare Part D prescription payments by prescriber specialty type for better understanding prescription utilization and needs among Medicare population. This cross-sectional analysis used the recently available 2017 Medicare Part D Prescriber Public Use and Summary data files. Total Medicare Part D Payments and number of Part D prescriptions were aggregated by specialist groups. Payments per monthly supply of drugs were calculated by dividing the total payments by aggregated monthly supply of drugs for each individual prescriber. The proportion of generic claims in each prescriber specialty was calculated by all generic medication claims divided by the total medication claims. Internal medicine, family practice, and nurse practitioner represented the highest total number of Part D prescribers and were the top 3 healthcare provider groups who received the highest total Medicare Part D payments ($31 billion, $26 billion, and $15 billion, respectively). The top 3 specialties with highest median payment per monthly supply of drugs were hematology/oncology, medical oncology, and infectious disease ($1.01 thousand, $0.96 thousand, and $0.69 thousand, respectively). Part D prescriber specialty types in pulmonary disease, endocrinology, and ophthalmology had the lowest proportion of generic claims among all specialty groups (41%, 45%, and 53%, respectively). In conclusion, prescribers specialized in oncology and infectious disease had the highest payment per monthly supply of medications. Medicare Part D payment to low proportion of generic claims such as pulmonary disease, endocrinology, and ophthalmology could be reduced by increasing generic drug utilization.

Title: Improving sample diversity of a pre-trained, class-conditional GAN by changing its class embeddings
Primary Author: Li, Qi
Additional Authors: Mai, Long; Alcorn, Michael A.; Nguyen, Anh
Department: Computer Science and Software Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Generative Adversarial Networks (GANs) have achieved great success in generating high fidelity images. However, they have a known problem of mode collapse i.e. the generated distribution does not capture all modes of the true distribution. Especially, the recent class-conditional BigGAN has reached an unprecedented state-of-the-art image quality and diversity on ImageNet by using large networks and batch sizes. However, interestingly, we observed that BigGAN samples from a set of ~50 classes exhibit substantially lower diversity than samples from other classes do. Due to the notorious GAN training instability and expensive computation, it's still difficult to find a simple solution to improve the diversity of a mode-collapse class. Surprisingly, we found that, for many classes, mode collapse can be substantially ameliorated by only modifying the class embeddings (i.e. keeping the generator unchanged) and The BigGAN class embeddings qualitatively capture class semantics. We iteratively searched for an embedding input to a pre-trained BigGAN generator that yields random samples that are diverse and recognized as a given conditioned class by an auxiliary classifier. We improved the sample diversity of state-of-the-art ImageNet BigGANs at both 128×128 and 256×256 resolutions. By replacing the embeddings, we can also synthesize plausible images for Places365 using a BigGAN pre-trained on ImageNet, revealing—for the first time—the surprising expressivity of the BigGAN class embedding space.

Title: Beneficial effect of genistein on diabetes-induced brain damage in the ob/ob mouse model
Primary Author: Li, Rongzi
Additional Authors: Li, Rong-zi; Ding,Xiao-wen; Geetha, Thangiah; Al-Nakkash, Layla; Broderick, Tom L.; Babu, Jeganathan Ramesh
Department: Nutrition
College/School: College of Human Sciences

Abstract:
Diabetes mellitus (DM) is associated with various complications affecting most organ systems, including the brain. DM-induced brain damage is characterized by cellular, molecular and functional changes in diabetic patients. The mechanisms include oxidative stress, neuroinflammation, reduction of neurotrophic factors, insulin resistance, excessive amyloid beta (Aβ deposition and Tau phosphorylation. Both antidiabetic and neuroprotective effects of the phytoestrogen genistein have been reported. However, the beneficial effect of genistein in brain of the ob/ob mouse model of severe obesity and diabetes remains to be determined. In this study, female ob/ob mice and lean control mice were fed with either a standard diet or a diet containing genistein (600mg/kg) for a period of 4 weeks. Treatment with genistein reduced weight gain of ob/ob mice and improved hyperglycemia compared to ob/ob mice fed the standard diet. However, our main findings show that genistein treatment increased insulin signaling and the expression levels of the neurotrophic factors nerve growth factor (NGF) and brain-derived neurotrophic factors (BDNF). In these mice, genistein also reduced A□□deposition and the level of hyper-phosphorylated Tau protein. The results of our study indicate a beneficial effect of genistein by improving brain insulin signaling, increasing neurotrophic support, and alleviating Alzheimer's disease-related pathology in the diabetic brain.

Title: Facile synthesis metal oxide/conducting polymer for energy storage
Primary Author: Liang, Yue
Additional Authors: Zhang, Xinyu
Department: Polymer & Fiber Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Transition metal oxides have been diffusely explored as an electroactive materials candidate due to its high theoretical specific capacitance, high electrochemical stability, and excellent redox activities. Especially, nickel oxide (NiO) is a suitable electroactive materials candidates for supercapacitor applications because of its low-cost, high availability and environmental friendliness. However, its practical applications limited by intrinsically poor electrical conductivity and poor stability. To address this shortcoming, the strategy was applied to the fabrication of the nickel oxide and conductive polymer (PPy) nano-hybrid materials by the efficient and fast microwave-assisted solid-state method. The electrochemical properties of synthesized samples were investigated for their performance as potential supercapacitors.

Title: The application of conducting polymer in corrosion protection
Primary Author: Lin, Mao-Chia
Additional Authors: Zhang, Xinyu
Department: Chemical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Conducting polymers (CPs) has been broadly investigated and has been applied in many areas such as the sensor, supercapacitor, antistatic and bio-material, etc. Due to CPs' distinctive redox properties, it can also be introduced into the metal surface as a protective layer by electrodeposition to prevent the metal from corrosion. In the electrodeposition process, there are three main steps which are the formation of the passive layer, the monomer adsorbs on the layer and the polymerization. Among these three steps, the formation of the passive layer is a significant step that affects the anti-corrosion performance. If the passive layer could form as fast as possible, the metal would be protected from dissolving into water. In recent work, I tried both copper and aluminum alloy as the substrate for the deposition of the conducting polymer. By applying different chemicals as dopants, the anti-corrosion performance of the deposited polypyrrole film can be altered. After the electrochemical measurement, all dopants show a tremendous increase in corrosion potential compares to the uncoated metal and alloy. Higher corrosion potential will allow the metal or alloy surface to act as noble metal which is nonactive and resistant to corrosion. In future work, different dopants will be tested to observe their effect on the passivation properties and corrosion protection efficiency. Additionally, switching the substrate into other metals or alloys to study is also feasible.

Title: Evaluation of scaled lamella settlers for treating suspended sediment
Primary Author: Liu, Lan
Additional Authors: Perez, Michael
Department: Civil Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Water quality treatment for agricultural, urban, and construction stormwater has become an increasingly important topic. Pollutants from these sources create adverse water quality impacts on receiving water bodies. Among these sources, suspended sediment has significant influence on water quality because it is also a media of pollutants. The treatment system for removal of suspended solids is important. Compared to other land uses, construction operations produce a large amount of sediment yield due to the earth disturbing the nature of land-grading activities. In addition to sediment, pollutants carried by soil particles create adverse water quality impacts to downstream receiving water bodies. This study determined the efficiency of sediment removal by developing and analyzing three passive treatment systems: a control tank, and two lamella settlers inserted with 18 plates, and 9 plates. In this study, five types of soils: A25, Snobrite 75, Pigment 60, Minex 4, and Kaolinite at 500 mg/L, 1000 mg/L, and 5000 mg/L were treated in system consisted of 18 plates, 9 plates, and no plates with 30 minutes, 1 hour, and 1.5 hour residence time. It was founded that all considered factors significantly influenced the turbidity reduction compared to the selected base conditions at 500 mg/L sample solution with 30 minutes residence time in the system without plates. The numbers of plates inserted into the system always had the greatest or second greatest impact on turbidity improvement which recommended to insert more plates to increase system's efficiency. Based on the results of multiple linear regression analysis, 18 plates inserted with 90 minutes residence time with 5000 mg/L sample treatment produced the most efficient turbidity removal rates. The calculated turbidity removal rates for different types of soils were reasonable corresponding to the calculated settling velocities.

Title: Competition, Host defense and environmental stress: how do plant pathogenic bacteria manage them?
Primary Author: Liyanapathiranage, Prabha D.
Additional Authors: Potnis, Neha
Department: Plant Pathology
College/School: College of Agriculture

Abstract:
For the successful infection by bacterial plant pathogens is a result of a complex, multifaceted process mediated by multiple pathogenic determinants that function across different stages of the infection, asymptomatic, pathogenic and dissemination phase. In case of foliar plant pathogens, adaptation to the phyllosphere environment and successful niche occupancy is a crucial phase during which pathogen successfully overcomes nutritional/water limitation, host defense, competition with the resident microflora and the environmental stress. An in-frame deletion mutant of foliar bacterial pathogen, *Xanthomonas perforans* core T6SS-III gene, tssM and complement when tested in planta indicated that mutant had a significant advantage over wild-type (WT) in terms of overall growth and disease severity. We further tested the contribution of T6SS towards the asymptomatic epiphytic phase during the infection of tomato in transplant house-mimic conditions. Under the high humidity and high temperature conditions, higher WT epiphytic populations were isolated from the seedlings that showed lower disease severity. These suggest T6SS being proficient in overcoming environmental stresses and host defense on the leaf surface. These results indicating higher epiphytic fitness of the WT over the mutant led us to further investigate the role of T6SS in osmotolerance, since low water availability is a significant obstacle faced by microbes on leaf surfaces. Thus, T6SS contributes to the strategy of the latent sit-and-wait approach of a pathogen to prolong its association with the host and improve its transmission. This work has also highlighted the importance of initial asymptomatic colonization phase being a determinant of the fate of a pathogen.

Title: Simultaneous self-folding of tessellated origami structures
Primary Author: Long, Ryan M.
Additional Authors: Mailen, Russell
Department: Aerospace Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Origami-inspired structural design utilizes patterns from the traditional paper folding art to impart structures with novel properties , such as increasing stiffness or tailoring surface roughness. Tessellated patterns are highly configurable and can be easily scaled to a range of applications. However, a significant challenge involved in utilizing such patterns is that a single repeat unit contains an assortment of faces and vertices, which must be accurately repeated to form the desired final shape. Two common approaches for producing tessellated structures are folding from a planar sheet and assembly of rigid components. Traditional folding of tessellated patterns from a two-dimensional (2D) sheet is time consuming, imprecise, and creates a final product structurally dependent on creased base material. A built-up tessellated structure requires a large number of parts, depends structurally on integral glue or fasteners, and is prone to propagating alignment errors which could significantly impact the final shape and mechanical properties of the structure. To address these challenges, we explore the use of self-folding shape memory polymer (SMP) sheets to consistently self-fold tessellated origami patterns. A line printed on the surface of the SMP will cause the sample to fold in that direction when heated by an infrared light. By coordinating patterns of lines on the top and bottom surface, simultaneous folding of mountain and valley folds can be accomplished. We use this approach to fabricate a variety of fold patterns with rigid hinges, without the need for direct manual assembly.

Title: Analysis of the potential for carbon sequestration using drill cores from the Tuscaloosa group, Alabama (USA)
Primary Author: Lopez, Nora V.
Additional Authors: Uddin, Ashraf; King Jr., David
Department: Geosciences
College/School: College of Sciences and Mathematics

Abstract:
Geologic carbon sequestration refers to the process of capturing CO2 from the atmosphere or industrial processes and storing it within a porous zone of a host rock formation, which is overlain by a cap rock unit. The natural process in which excess CO2 is removed from the atmosphere is known as the carbon cycle. However, since there has been a mayor increase of CO2 in the atmosphere due to human activities, the carbon cycle is becoming insufficient. Therefore, carbon capture is designed to remove more than the naturally up-taken amount of CO2. Studying the consequences of carbon sequestration is of great importance because analyzing the reaction of the process is fundamental for understanding the process of carbon sequestration and its efficacy. In this project the Upper Cretaceous Tuscaloosa Group of the subsurface of southern Alabama will be the geological unit that will be analyzed. According to previous studies, the Tuscaloosa Group qualifies as a near limitless reservoir for storing CO2 because of its composition, porosity, permeability and depth. This study will use core samples of the Tuscaloosa Group to determine the properties of its various sedimentary facies as a way of determining if this geological formation group can be used to store CO2. A total of 43 samples were collected from the Julian F. Mcgowin #1 drill hole. The reason this core was selected to collect samples is because it is thought to be the most complete core that contains the Tuscaloosa Group. The cores will be analyzed with regard to lithological changes, to measure overall and porous zone thickness, to study the sedimentary structures and textures, and to observe any vertical changes in grain size and mineralogy. Petrographic analyses as well as XRD and SEM analyses will be done before and after CO2 is injected into the core samples to see any changes in porosity and mineral composition.

Title: Day-lighting Parkerson Mill Creek to reveal aquatic ecosystems
Primary Author: Lopez, Laura L.
Additional Authors:
Department: Landscape Architecture
College/School: College of Architecture, Design & Construction

Abstract:
The headwaters at Parkerson Mill Creek (PMC) perfectly portray the energetic culture that Auburn University's campus is known for. This busy spot on campus (at the intersection of Mell street and Roosevelt street) where the water begins to collect before it takes off downstream with great speed is composed of several dynamic flows of interactions that, in a way, characterize today's busy egocentric culture. Research pertaining to the conceptualization of a landscape architecture project consisted of fieldwork studies, site's land use and history, connectivity analysis, PMC ecologies and biomes, and study of the Auburn campus Landscape Master Plan. Through fieldwork observation the relationship of dynamic flows composed of pedestrians, vehicles, the buried creek and infrastructure mapping, the following question was formulated: How can the timelessness and the inclusiveness of the site's qualities at PMC allow for different terrestrial ecosystem flows (humankind and freshwater aquatic biome) to coexist in the same node spatially? The question is particularly important to campus sustainability, where social engagement, environmental justice and nature activism are attracting increasing attention. This project deliberates how design was used as a method to research this historically celebrated creek, and critically engage with history through the proposal of alternative daylighting designs. The project at PMC headwaters reminds everyone that PMC's dynamic flow and aquatic biomes valued in Alabama had existed long before the establishment of Auburn University and played a role in the growth of the university. Daylighting Parkerson Mill Creek's headwaters also encourages society to slow down to coexist with nature, slow down water, decrease sediment downstream, filter pollution, and takes a step closer towards reaching Auburn's campus sustainability goals.

Title: Identification of ERBB4 tumor driver mutations: a strategy for targeting BRAF WT metastatic melanomas

Primary Author: Lucas, Lauren M.
Additional Authors: Cullum, Richard; Waits, Damien; Ghosh, Taraswi; Cook, Laura; Jacobi, Megan; Kaufmann, David; Knerr, Elizabeth; Markham, Jessica; Rael, Cristina; Williams, Erin; Woods, Andy; Halanych, Kenneth; Riese II, David
Department: Pharmacology
College/School: Harrison School of Pharmacy

Abstract:
The treatment of metastatic melanoma (MM) has been dramatically improved due to targeted therapies directed to the ~50% of patients whose tumors have a BRAF mutation. However, there are no targeted therapies available to treat the ~50% of MM patients whose tumors possess the wild-type (WT) BRAF wild-type gene. Using The Cancer Genome Atlas metastatic melanoma (TCGA-SKCM) dataset, we have discovered that 50% of BRAF WT melanomas harbor a missense mutation in ERBB4, which encodes a member of the epidermal growth factor receptor (EGFR/ErbB1) family of receptor tyrosine kinases. Hence, our goal is to evaluate whether ERBB4 mutant alleles are bona fide biomarkers of melanoma aggressiveness and targets for therapeutic intervention in BRAF WT MMs. Of the 469 genomes in the TCGA-SKCM dataset, 70 harbor at least one missense mutation in ERBB4, resulting in a total of 76 unique ERBB4 missense mutations. These mutations do not appear to be random occurrences, but instead appear to be the result of selection. Our data suggest that ERBB4 mutant alleles cause elevated PI3K signaling, which cooperates with elevated RAS signaling to drive the genesis and/or progression of BRAF WT MMs. These 76 unique ERBB4 mutations in the TCGA-SKCM dataset highlights one of the challenges in identifying the ERBB4 mutant alleles that function as bona fide BRAF WT MM drivers. Additionally, ERBB4 functions as a context-dependent oncogene and tumor suppressor gene. Hence, we will describe the ongoing development and validation of innovative, positive-selection screens for gain-of-function ERBB4 mutant alleles and for loss-of-function ERBB4 mutant alleles from the library of ERBB4 mutant alleles found in the TCGA-SKCM dataset. We will present our progress in developing and validating positive selection strategies to identify which of the 76 ERBB4 mutant alleles found in the TCGA-SKCM dataset function as bona fide drivers of BRAF WT MMs.

Title: Attitudes toward sleep and sleep behavior
Primary Author: Lumsden, Julie M.
Additional Authors: Turano, Alexandra; Rager, Jillian P.; Swiney, Caroline; Muench, Baylee; Shirley, Emma; Schloenbacher, Sarah Beth; Lust, Sarah
Department: Psychology
College/School: College of Liberal Arts

Abstract:
An abundance of research indicates that sleep is important for health and well-being, however many college students report poor sleep quality. Potential intervention targets such as psychological factors that impact sleep-related behavior are not well understood. One model that has been used to better understand several health domains is the Theory of Planned Behavior (TPB). The TPB model focuses on attitudes, normative beliefs, perceived behavioural control, and intentions. One study that applied the TPB model to heart disease prevention found that attitudes toward exercise affected individuals' intention of exercising. Another study found that intentions to engage in good sleep hygiene behaviors could be accurately predicted by participants' attitudes, perceived normative pressure, and perceived behavioral control. However, very little research has investigated whether the TPB model is predictive of sleep behaviour. For this study, participants (n=39 undergraduate students in psychology courses) completed a questionnaire that asked about their sleep quantity and quality, their attitudes toward sleep, normative beliefs about sleep and perceived control over getting sufficient sleep. Results revealed a significant relationship between positive attitudes about sleep and intentions to sleep more than 4 hours each night the next week. Surprisingly, there was not a relationship between attitudes about sleep and sleep satisfaction or actual sleep obtained. Normative beliefs about sleep also did not predict intentions to get sleep in the future. Perceived behavioral control was positively correlated with average sleep. Participants were more likely to report getting more sleep when they felt getting 8 hours of sleep was "extremely possible." Together these preliminary results suggest that the TPB model may be promising for understanding sleep behavior, however more research is needed on these variables before they serve as good targets for intervention.

Title: Comparative transcriptome analysis during the seven development stages of channel catfish (*Ictalurus punctatus*) and tra catfish (*Pangasianodon hypophthalmus*) reveals novel insights for the terrestrial adaption

Primary Author: Ma, Xiaoli X. M.
Additional Authors: Mei, Shang; Max, Bangs; Veronica, Alston; Shangjia, Li; De, Xing; Rhoda, Mae Simora; Baofeng, Su; Xu, Wang; Anthony, Moss; Yen, Duong; Rex, Dunham
Department: Fisheries
College/School: College of Agriculture

Abstract:
Channel catfish (*Ictalurus punctatus*) and tra catfish (*Pangasianodon hypophthalmus*) both belong to Siluriformes, one of the most taxonomically diverse orders in all vertebrates. The two species are the largest aquaculture commodities in the United States (channel catfish) and in Vietnam (tra catfish). Channel catfish does not possess an air breathing organ (ABO) and thus cannot survive in anoxic water. Tra catfish are facultative air breathers and use a modified swimbladder to breathe air when they encounter anoxic water, which is a highly advantageous survival mechanism. These two species present a unique research opportunity to study the mechanism of air breathing in teleost fish. In this study, we conducted RNA sequencing with whole fish samples for channel catfish at 2, 5, 6, 7, 8, 9, 10 dpf (days post fertilization) and tra catfish at 2, 4, 6, 8, 9, 10, 11 dpf. The timepoints were selected based on the developmental stage and a previous study rather than absolute age and have been verified using developmental correspondences and heterochrony analysis. In this study, we identified differentially expressed genes during development within each species. The expression profiles had considerable variation with the development of channel catfish and tra catfish. Comparative transcriptome analysis revealed that a set of 131 genes were present in the tra catfish but absent in the channel catfish. Expression profile analysis and subsequent time series analyses were performed to further narrow the list of key genes. Histology experiments were also conducted to substantiate the results, which indicated that the swimbladder started to develop at 6 dpf in tra catfish. Taken together, 3 (CX3CL1, GRP, HRG) genes are identified to be most likely to play a key role on ABO development. This study provides a model for studying evolutionary genetics during the transition from life in the ocean to terrestrial living and a novel insight for the evolution of vertebrates.

Title: Characterization of the microbial gene catalog in domestic cat gut microbiota using metagenomic sequencing
Primary Author: Ma, Xiaolei
Additional Authors: Cao, Wenqi; Brinker, Emily; Watanabe, Rie; Graff, Emily; Wang, Xu
Department: Biomedical Sciences
College/School: College of Veterinary Medicine

Abstract:
The gut microbiota is the entire community of microorganisms in the gastrointestinal tract, including viruses, archaea, bacteria, fungi and other eukaryotic microbes. They are essential for nutrition and directly affect the host metabolism and nearly all aspects of physiology and metabolic homeostasis. To date, there are only a few studies on the feline microbiota, all of which examined the 16S rDNA profiles, with the limitation of taxonomic resolution at the genus level. To fill this critical gap, in this study, the microbial composition at the species/strain level was captured through whole-genome shotgun (WGS) metagenomic sequencing to generate a comprehensive understanding of the feline gut microbiome. Fecal samples were collected from 8 male neutered purpose-bred domestic cats. DNA samples were extracted for metagenomic sequencing library preparation. A total of 2.49 billion sequencing reads (or 385 Gbp) were generated and they assembled into 400,754 microbial genome contigs with a total length of 710 Mbp. Taxonomy annotation of assembled contigs revealed that Firmicutes, Bacteroidetes and Actinobacteria were the most abundant phyla in feline gut microbiota. 1,011,541 microbial protein coding genes were annotated in the microbiome, which was 45-fold more than the number of genes in the cat genome. Standard fecal sample collection protocols result in host DNA contamination. To solve this issue, we evaluated a new protocol using mineral oil (MO) as an inert lubrication during sample collection. Based on the metagenomic sequencing results with a sample size of 8, we discovered that using MO could improve the uniformity and amount of the sequencing yield compared to no-lubrication, without alterations in the percentage of host contamination (Kruskal-Wallis Test, P-value=0.92). In summary, we established a fecal sample collection protocol and built a comprehensive feline gut microbiome gene catalog, which will facilitate the gut microbiota research in domestic cat.

Title: Intravenous AAV gene therapy improves lifespan and clinical metrics in feline Sandhoff Disease

Primary Author: Maguire, Anne S.
Additional Authors: Diffie, Elise; Gross, Amanda; Lahey, Hannah; Sena-Esteves, Miguel; Martin, Douglas
Department: Biomedical Sciences
College/School: College of Veterinary Medicine

Abstract:
Sandhoff Disease (SD) is a neurodegenerative lysosomal storage disease that causes the death of severely affected children before 5 years of age. This autosomal recessive disease results in the dysfunction of the enzyme ß-hexosaminidase (Hex) and the subsequent accumulation of GM2 ganglioside in neuronal lysosomes. In previous studies in a feline model of infantile SD, intracranial administration of gene therapy in the form of an adeno-associated viral (AAV) vector quadrupled lifespan and increased quality of life. In an attempt to reduce the risk of intracranial surgery and achieve greater systemic vector distribution, we treated 11 SD cats intravenously (IV) at one month of age with a bicistronic AAV9 vector expressing both subunits of Hex. These cats were divided into three groups: low dose (5e13/kg) short-term (n=3), low dose long-term (n=4), and high dose (2e14/kg) long-term (n=4). Animals in the short-term group were euthanized 16 weeks post-treatment, while cats in the long-term group were followed to a predetermined humane endpoint (inability to stand). While untreated SD cats live to 4.3±0.2 months, cats treated with the low and high doses lived to 8.3±1.2 and 11.1±1.5 months, respectively, with one cat in the high dose group currently alive at 15.1 months. In-life assessments revealed clear clinical benefit of AAV treatment, with the most dramatic improvement seen in the reduction of tremors, the most debilitating feature of feline SD. Bimonthly neurological examinations demonstrated markedly improved quality of life in AAV-treated animals. Cerebrospinal fluid (CSF) levels of aspartate aminotransferase (AST) and lactate dehydrogenase (LDH) were decreased both at 16 weeks post-treatment and at long-term endpoints, indicating a reduction of cell damage within the central nervous system. These results support the efficacy of IV delivery of a bicistronic AAV vector, especially at a high dose, for improving lifespan and quality of life in a feline model of SD.

Title: Susceptibility of *Aphis gossypii* to imidacloprid in Alabama
Primary Author: Mahas, John W.
Additional Authors: Jacobson, Alana
Department: Entomology
College/School: College of Agriculture

Abstract:
Aphis gossypii Glover is a highly polyphagous pest that causes economic losses to many crops worldwide. Evolution of resistance to insecticides is a major concern when managing populations of *A. gossypii*, and resistance has been reported in numerous studies. In the southeastern U.S., few effective insecticides have historically been available for management of *A. gossypii*, and a reduction in efficacy of imidacloprid, one of the most widely used active ingredients, has been observed by stakeholders in Alabama. The objective of this project was to quantify the susceptibility of *A. gossypii* populations collected from different cotton production regions across Alabama to imidacloprid. The LC50s at 72 h for field collected colonies, ranged from 0.307 ppm – 19.99 ppm, while resistance ratios ranged from 4.26 ppm – 277.64 ppm. The results of this experiment indicate variable levels of susceptibility among *A. gossypii* populations with some exhibiting high levels of resistance.

Title: Measurement of blood brain barrier permeability in human brain using magnetization transfer effect at 7T MRI
Primary Author: Mahmud, Sultan Zaman
Additional Authors: Denney, Thomas; Beyers, Ronald; Bashir, Adil.
Department: Electrical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Blood brain barrier (BBB) plays a very important role in regulating water and nutrients delivery between vascular circulation and central nervous system (CNS). Any disruption in the blood brain barrier may cause the alteration of normal functional activity of the nervous system. Many CNS diseases such as Multiple Sclerosis, Alzheimer's disease etc. are associated with compromised BBB. The techniques currently available to measure BBB permeability are either invasive or prone to certain limitations and potential side effects. Hence these techniques can not be applied to a lot of the patient population. The supply of blood water and other nutrients to capillary bed is known as perfusion. Previously it was assumed that all the blood water that is supplied to the capillary bed by blood vessels, are exchanged with the tissue space. But evidence of limited water exchange between cerebral vascular circulation and tissue space makes perfusion signal a strong tool to assess BBB permeability. The permeability of the blood brain barrier controls the water exchange between blood vessels and tissue space. In this study we demonstrated a novel non-invasive technique of evaluating BBB permeability using the magnetization transfer (MT) effect on endogenous water labeled by arterial spin labeling (ASL) technique as a perfusion tracer.

Title: CXCR3/CXCL9 axis plays a pertinent role in the progression of severe asthma
Primary Author: Makhija, Sangeet
Additional Authors: Jaiswal, Anil; Mishra, Amarjit
Department: Biomedical Sciences
College/School: College of Veterinary Medicine

Abstract:
Asthma is a heterogeneous disease that results in chronic inflammation that presents a major heath burden all over the world. Novel therapeutic approaches are much coveted, as the symptom suppressive approach carries with it a prominent side effect profile. The heterogeneity and complexity of the disease further make it difficult to treat. Type 1 asthma phenotype represents airway inflammation and exacerbation with a predominant population of neutrophils. Whereas, mild to moderate type 2 asthma manifests an eosinophilic inflammation. Using murine models of asthma we studied various parameters of inflammation comparing type 1 and type 2 asthma conditions. Microarray data from type 1 inflamed lungs showed a significant 134 fold increase in chemokine ligand CXCL9 expression in type 1 asthma. Further, it was observed that lung cytokines IL-17 and IFN-γ were significantly increased too. m-RNA expression analysis in inflamed lung of experimental mice had an 80-fold change in type 1 asthma. Our findings shed light on an imperative pathway of asthma progression as the mechanism of CXCL9/CXCR3 axis is yet to be determined in context of airway inflammation. Since, CXCL9 expression has been shown to be increased in sputum samples from human patients of airway inflammation, our findings will address the mechanistic link between asthma and the importance of CXCR3/CXCL9 axis, and further pave way for therapeutic strategies with CXCR3/CXCL9 axis as target.

Title: Bioeconomics of *Flavobacterium columnare* vaccine pond trials for channel catfish *Ictalurus puncataus*
Primary Author: Malecki, Jillian K.
Additional Authors: Hanson, Terry; Arias, Covadonga; Truong, Nhat Triet
Department: Fisheries, Aquaculture, and Aquatic Sciences
College/School: College of Agriculture

Abstract:
The United States farm-raised catfish industry stocks channel catfish (*Ictalurus punctatus*) and hybrid catfish (*I. punctatus*, ♀ x blue catfish, *I. furcatus*, ♂). In recent years, this industry has had a variety of problems, both in the ponds and in the marketplace. Increased disease pressures in the last few years have come primarily from the pathogens responsible for Columnaris (*Flavobacterium columnare*), Enteric Septicemia (ESC, *Edwardsiella ictaluri*), and virulent *Aeromonas hydrophila* (vAh). For this project, pond trials with an experimental live-attenuated Columnaris vaccine and a non-vaccinated control were conducted to evaluate survival, feed conversion ratio (FCR), antibody presence, and economic benefit. This trial is a follow-up to promising laboratory results of the vaccine, but will be a more accurate comparison to commercial catfish production which use earthen ponds. Columnaris SPF channel catfish fingerlings were vaccinated through bath immersion at the time of stocking in April and fed until harvest in October, with routine periodic growth sampling and blood collection. The production timeline overlaps with periods during two columnaris outbreak peaks in the spring and fall as seasonal temperature changes occur. Results showed no significant increase in survival; significantly higher average weight at harvest; and a 36.6% improvement in the FCR of vaccinated fish versus control fish ELISA results and budget analysis will be presented at the Auburn Student Symposium in March 2020.

Title: Phosphorus leaching in tall fescue pastures of Sand Mountain region of north Alabama
Primary Author: Malhotra, Kritika
Additional Authors: Lamba, Jasmeet; Way, Thomas; Budhathoki, Suman; Prasad, Rishi
Department: Agriculture
College/School: College of Agriculture

Abstract:
Phosphorus (P) transport from agricultural landscapes to surface waters can occur in surface runoff and subsurface lateral flows. Recent research efforts have shown that P loss in subsurface flow pathways can be significant. Therefore, it is critical to better understand fundamental processes that control the fate and transport of P in subsurface flow pathways to facilitate the development of appropriate best management practices (BMPs) aimed at mitigating P loss from agricultural landscapes. The goal of this study was to determine the effect of soil physical and chemical properties on the flux, fate, and transport of P (especially colloidal-facilitated P). Soil samples to a depth of 50 cm were collected from a pasture field located at the Sand Mountain region of north-Alabama, USA at each topographic position (upslope, mid-slope and downslope) within a field. Soil macropore characteristics were quantified using X-ray computed tomography. Laboratory-based analysis (i.e., pH, EC, texture, organic matter, hydraulic conductivity, total P, water extractable P, water dispersible colloids) were performed on the samples to assess the tendency of different soils to transmit P to leachate. Results on the effect of soil macropore characteristics on P loss in leachate will be presented.

Title: Effects of ammonium meta-vanadate impregnation on mechanical strength of γ-Alumina pellets
Primary Author: Manning, Christy J. W.
Additional Authors: Miletic, Marta; Carrero, Carlos; Gu, Yu
Department: Civil Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
This project aims to investigate the effect of impregnation on the mechanical properties of γ-alumina catalyst supports. Work on the mechanical strength of supports has been carried out extensively, but very little investigation on impregnation effects has been done to date. Pellets were impregnated via wet impregnation with 6% ammonium meta-vanadate and calcined at 600oC for three hours. The process was selected because the catalyst beads must be designed in such a way to have high chemical activity and selectivity in the desired industrial use, in this case, a propriety reaction under study by another department. Single catalyst tensile and compressive tests, together with the bulk crushing and direct shear tests were performed on impregnated, plain, and calcined pellets. Particle size analysis was carried out on single catalyst failed specimens via ImageJ analysis, and on bulk specimens via sieve analysis. Pellets were tested in the plain condition as a control, in calcinated only condition to isolate the variable of heat treatment, and impregnated condition. Contrary to expectation, it was found that mechanical strength increased after impregnation and calcination, with calcination only resulting in the greatest strength. Even though the increase in porosity and flaws should have resulted in weaker pellets, the crystallization effect outweighed the porosity effect, creating stronger pellets. The increase in porosity and flaws was verified using SEM analysis. Impregnation demonstrated weaker strength than calcinated due to the possibility of mixed-phase of the V2-O5 bonds. Further, the results imply that new metrics for mechanical strength may be needed to reflect reactor performance more accurately and that testing of plain pellets alone, although the standard thus far, may yield improper information about the actual catalyst performance due to a variety of results.

Title: PAN RNA in Kaposi's Sarcoma-associated herpesvirus (KSHV): probing the dynamic status of N6-methyladenosine modifications
Primary Author: Martin, Sarah E.
Additional Authors: Toomer, Gabriella
Department: Biological Sciences
College/School: College of Sciences and Mathematics

Abstract:
Polyadenylated nuclear (PAN) lncRNA is a multifunctional transcript crucial for KSHV lytic reactivation and regulation of cellular and viral gene expression. PAN is abundantly expressed in the nucleus, is packed within viral particles, and has a highly flexible conformation and protein binding profiles. However, the processes that regulate its structure and function are undetermined. Recently, the functionality of many RNAs has been shown to be modulated by chemical modifications, or epitranscriptomics. N6-methyladenosine (m6A) is one of the most abundant chemical signatures that influence RNA structure, function, and metabolism. Incorporation of m6A acts as a switch that alters RNA structure, regulating its availability for effector binding. We have employed a single-nucleotide resolution method that allows mapping m6A sites on PAN during latent and lytic stages of KSHV replication where PAN is specifically captured using RNA antisense purification (RAP) followed by reverse transcription with selenium tagged dTTP, triggering truncations at bases adjacent to an m6A. To confirm the position of m6A on PAN, we have also applied direct RNA-sequencing using Nanopore technology. Additionally, using RAP-MS, we have identified enzymes regulating the dynamics of PAN m6A modification, including m6A readers, writers and erasers. Currently, we are using the selective 2'-OH acylation analyzed by primer extension and mutational profiling (SHAPE-MaP), to address the structural influence of m6A on PAN in KSHV positive BCBL-1 cells with siRNA-knockdown m6A writer and eraser. Through m6A status determination, structural probing, and cellular protein interactions, we aim to determine the effect of the epitranscriptome in relation to the structural and functional plasticity of lncRNAs in the viral lifecycle. Considering the tight link between post-transcriptionally modified ncRNAs and human diseases, this study may aid in the development of therapeutic approaches.

Title: Non-canonical Wnt16-Fzl1/2/7 signaling in early patterning of the sea urchin anterior-posterior axis
Primary Author: Martínez-Bartolomé, Marina
Additional Authors: Range, Ryan
Department: Biological Sciences
College/School: College of Sciences and Mathematics

Abstract:
A Wnt signaling network governs early anterior-posterior (AP) specification and patterning of the deuterostome sea urchin embryo. We have previously shown that non-canonical Fzl1/2/7 signaling antagonizes the progressive posterior-to-anterior downregulation of the anterior neuroectoderm (ANE) gene regulatory network (GRN) by canonical Wnt/β-catenin and non-canonical Wnt1/Wnt8-Fzl5/8-JNK signaling. This study focuses on the non-canonical function of the Wnt16 ligand during early AP specification and patterning. Maternally supplied wnt16 is expressed ubiquitously during cleavage and zygotic wnt16 expression is concentrated in the endoderm/mesoderm beginning at mid-blastula stage. Wnt16 antagonizes the ANE restriction mechanism and this activity depends on a functional Fzl1/2/7 receptor. Our results also show that zygotic wnt16 expression depends on both Fzl5/8 and Wnt/β-catenin signaling. Furthermore, Wnt16 is necessary for the activation and/or maintenance of key regulatory endoderm/mesoderm genes and is essential for gastrulation. Together, our data show that Wnt16 has two functions during early AP specification and patterning: (1) an initial role activating the Fzl1/2/7 pathway that antagonizes the ANE restriction mechanism; and (2) a subsequent function in activating key endoderm GRN factors and the morphogenetic movements of gastrulation.

Title: The impact of educational cultural experiences: growing cultural intelligent students
Primary Author: McCann, Abbi-Storm
Additional Authors:
Department: Global Education
College/School: College of Human Sciences

Abstract:
The purpose of this study is to investigate the effects of cultural experiences, both domestically and abroad, on students' cultural intelligence levels. Existing data collected using the Cultural Intelligence Scale collected through the Cultural Intelligence Center will be analyzed through descriptive statistics and analysis of variance tests run through an established computer software systems SPSS. The current study will explore the data through the lens of three hypothesis. The author expects to find varying degrees of increased cultural intelligence levels dependent upon the interaction with the cultural experience. This study will contribute to the growing research segment of cultural intelligence literature, specifically research that uses the Cultural Intelligence Survey.

Title: Corrosion of additively manufactured 316L stainless steel bio-implants in simulated human body fluid
Primary Author: McConatha, Catherine E.
Additional Authors: Lou, Xiaoyuan
Department: Materials Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Additively-manufactured (AM) metal implants have been adopted by healthcare services to provide patient-specific medical outcomes, including prostheses, orthopedic implants and cranial/facial reconstructions. However, compared to traditional implants, the behavior of AM alloys in human body environments are less understood. This research investigates the corrosion behavior of AM 316L stainless steel (SS) in Hank's Balanced Salt Solution (HBSS), a simulated body fluid, with the comparison to its wrought counterparts. Two conditions of AM 316L SS were studied, including as-built and solution annealing conditions. Cyclic potentiodynamic polarization, long-term corrosion potential monitoring, and electrochemical impedance spectroscopy were employed to understand the pitting and repassivation kinetics. Materials characterization using white-light profilometry and scanning electron microscopy revealed the pit initiation mechanisms in AM materials. The study confirms as-built AM 316L SS exhibits much higher corrosion resistance that the wrought 316L SS, primarily due to its unique microstructural characteristics.

Title: A meta-analysis of associations between coping with peer stress and psychosocial adjustment among youth
Primary Author: McConnell, Leanna M.
Additional Authors: Erath, Stephen; Yildirim, Elif; VanDenBerg, Carlynn
Department: Human Development and Family Studies
College/School: College of Human Sciences

Abstract:
Youth inevitably encounter peer stress experiences. Whether such stressors engender negative outcomes depends on coping responses. The existing literature on coping with peer stress has not been meta-analysed and includes inconsistencies, limiting clear conclusions. The present study is a meta-analysis of 87 studies (N=29,911) examining linkages between two styles for coping with peer stress (i.e., engaged and disengaged) and five strategies for coping with peer stress (i.e., problem-solving, support-seeking, internalizing, externalizing, and avoidance) and three outcomes of peer victimization, internalizing problems, and externalizing problems. The sample includes youth age 5-19 and is conducted using random-effects models. Analyses showed in the context of coping with peer stress the use of more engaged styles and strategies is associated with lower levels of externalizing problems. Disengaged coping styles and strategies are generally associated with higher levels of adjustment difficulties in all three domains. We discuss possible peer-specific mechanisms linking coping strategies with psychosocial adjustment. Recognizing heterogeneity between studies, we emphasize directions for future research.

Title: Motivational interviewing-based telehealth for diabetes management: a systematic review of randomized controlled trials
Primary Author: McDaniel, Cassidi C.
Additional Authors: Kavookjian, Jan; Whitley, Heather P.
Department: Health Outcomes Research and Policy
College/School: Harrison School of Pharmacy

Abstract:
Implementing motivational interviewing (MI) through electronic means has been demonstrated, but the evidence base for impact on diabetes outcomes from MI delivered through telehealth has not been synthesized. The objective was to explore and report evidence and gaps in the literature for the effects of MI delivered via telehealth on diabetes outcomes, including intermediate, clinical, humanistic, and economic outcomes. A modified Cochrane approach was used to search via Pubmed, CENTRAL, CINAHL, PsycINFO, and Clinicaltrials.gov. Included studies were randomized controlled trials published in English before April 14, 2019 evaluating MI-based telehealth on outcomes for adults with type 1 or type 2 diabetes. Studies were abstracted from databases or via hand search and were assessed for methodological quality using the 'Cochrane Collaboration's tool for assessing risk of bias in randomized trials.' Initial search yielded 164 publications after duplicates were removed; at the final review tier, 15 articles were retained, qualitatively synthesized, and reported into an evidence table. The effects of MI-based telehealth on diabetes outcomes were variable. Fourteen of the 15 retained studies reported at least one statistically significant impact of MI-based telehealth on target outcome, with 10 studies detecting 1-3 statistically significant effects. Results varied with MI-based telehealth demonstrating statistically significant impact on some clinical outcomes (A1C in 12 of 15 retained studies), lifestyle behaviors, anthropometrics, psychosocial outcomes, and economic outcomes (lower total costs for intervention participants ($6600) versus control ($9300)). Further research is needed to address evidence gaps from heterogeneity of methods and measures, minimal research among a broader spectrum of patient populations (e.g., minority patients, persons with prediabetes), and studies delivering MI through increasingly prevalent technological means, such as videoconferencing.

Title: Effects of gender and gender typicality on hiring outcomes
Primary Author: McKinnell, Gabrielle E.
Additional Authors: Hickey, Hayden
Department: Psychology
College/School: College of Liberal Arts

Abstract:
Gender Bias often impacts how job candidates are evaluated during the interview process, and ultimately, can affect hiring decisions. In order to test how gender and gender typicality— the perception of how much a person's attributes match their gender— affects hiring outcomes, we conducted a study in which 100 undergraduate students participated in a hypothetical hiring scenario. Participants were shown the social media profiles of four candidates, representing four different categories of gender typicality: a masculine male, a feminine female, a masculine female, and a feminine male. Participants rated which candidate they considered to be the most hirable for the job in one of three job conditions: a male dominant job, a female dominant job, or a gender neutral job role. Throughout the study, participants' eye movements across the computer screen were recorded. Eye movements were compared to hiring ratings to determine significant differences in participant fixations between gendered groups. Results indicated that although participants did not favor one candidate profile overall, there were significant differences in hirability ratings within the male and female job conditions. Specifically, masculine men were considered most hirable for the male job condition, and masculine females were considered most hirable for the female job condition. These findings indicate that participants typically preferred to hire the gender that matched the specific job condition as well as a favorability towards masculine candidates. Bivariate correlations were used to determine the relationship between hirability ratings and eye-tracking indices. We found significant correlations in the female dominant job category between hirability and dwell time for the feminine male candidate, as well as hirability and total fixation duration for the masculine female candidate, indicating the length of time spent fixating on these candidates may have influenced their appraisals of hirability.

Title: Safety review of an ingredient of dietary supplements: Japanese sophora flower
Primary Author: McLachlan, Caleb R.
Additional Authors: Madden, Emily; Calderón, Angela
Department: Drug Discovery and Development
College/School: Harrison School of Pharmacy

Abstract:
Both the flowers and flower buds of the Japanese Sophora plant [*Styphnolobium japonicum* (L.) Schott (Syn. *Sophora japonica* L. Mant.)] have long been used as herbal ingredients for medicine in China, Japan, and Korea. This is due to the fact that they both exhibit a variety of pharmacological functions in the treatment of many blood disorders. Today, the Japanese Sophora flower is used in dietary supplements within the U.S. and across the world for its anti-oxidative properties The most common use of this flower is as a source for the extraction of rutin and other useful flavonoids, such as quercetin The focus of this presentation on the traditional uses, phytochemistry, and pharmacological activity of the Japanese Sophora flower in order to evaluate its safety as a dietary ingredient. A comprehensive review of published scientific literature was conducted to identify papers that focused on these aspects of the Japanese Sophora flower. Based on these findings, the Japanese Sophora flower is not known to be associated with any serious health risks if consumed properly.

Title: What's your arch type: an investigation on traditional and novel arch height assessments
Primary Author: McLaughlin, Robert J.
Additional Authors: Wilburn, Christopher M.; Kosek, Jerad J.; Hill, Imani N.; Weimar, Wendi H.
Department: Kinesiology
College/School: College of Education

Abstract:
The arch of the human foot is essential component in providing propulsion, weight bearing, and shock absorption during locomotion. Alterations in the arch can produce pathologies motions of the lower extremities that can increase the susceptibility of injury. The implementation of footwear is the most common method utilized to adjust the architectural changes and decrease the risk of injury. However, many individuals do not choose the most appropriate footwear options due to the inability to correctly identify personal arch height. Research has shown that more that 50% of individuals cannot properly identify personal arch types. In addition, the current means of measuring arch height requires the use of expensive equipment and great anatomical expertise. Thus, the purpose of this study was to assist with quantifying more affordable and easily accessible methods of identifying personal arch type. Students at Auburn University were recruited to participate in this research study. Participants were instructed to complete arch height measurement techniques, the Arch Height Index Measurement System Device (AHIMS) and use of a measurement application in an iPad. Each measurement techniques identified four distances, total foot length (TF), truncated foot length (TFL), arch height unweighted (AHU), and arch height weighted (AHW). Intra-class correlations were performed to determine if the anthropometric measurements between the AHIMS and iPad were consistent. The results demonstrated moderate reliability in TF (ICC = .768 (95% CI: .515- 887) and TFL (ICC = .711 (95% CI: .412- 858) while, poor reliability was displayed in AHU (ICC = .112 (95% CI: .455- 899) and AHW (ICC = .320 (95% CI: .353- 758). The results of this study indicate that the iPad can be moderately reliable when measuring larger specific anatomical distances. Additional modifications should be implemented into the iPad to account for sensitivity of smaller anatomical distance and improve overall measurements.

Title: Production and characterization of cellulose nanofibrils (CNFs) and their applications for film formability

Primary Author: McMichael, Philip S.
Additional Authors: Iglesias, Maria C.; Ehman, Nanci V.; Area, Maria C.; Peresin, M. Soledad
Department: Sustainable Biomaterials and Packaging
College/School: School of Forestry and Wildlife Sciences

Abstract:
In recent years, interest in nanocellulose has increased exponentially for a variety of purposes, from biomedical applications, to flexible plastics and packaging, to use as a filler in adhesives. Though substantial work to chemically modify and characterize nanocellulose has occurred, a truly comprehensive understanding of the material is essential. Quantifying how each step in the processing and manufacturing methods of nanofibrillated cellulose (CNF) affects resultant chemical and mechanical properties may serve to give a more full understanding of how CNF production can be tailored based on desired properties and applications. Southern pine was the raw material of choice due to its abundance and popularity throughout Alabama and the Southeastern United States. Chips were processed and pulped at varying chemical compositions, then characterized before CNF production via mechanical defibrillation. The resulting CNFs with differing compositions were then characterized by a variety of methods. Special attention was paid to surface free energy and to the film formability of the CNFs, as well as dynamic light scattering. This analysis allows us to better understand the stability and wettability of the nanofibers, and furthermore, their potential applications as polymers for packaging and other relevant industries.

Title: The role of Sequestosome-1/p62 in ER stress pathways in two dichotomous *Peromyscus* species

Primary Author: McMullen, Emily J.
Additional Authors: Seibenhener, Michael L.
Department: Organismal Biology
College/School: College of Sciences and Mathematics

Abstract:
The ubiquitous protein Sequestosome-1/p62 (SQSTM1/p62) has been linked to key roles in cellular transport, mitochondrial functionality, behavior, autophagy, DNA damage and importantly, ER stress response. We examined if variation of expressed SQSTM1-p62 and its known association with autophagic pathways contribute to dichotomous ER stress pathways in two native *Peromyscus* species that co-exist in a natural environment. These mice were chosen in order to allow for a more natural examination of ER stress pathways free from the constrains of laboratory induced stress and inbreeding in standard lab mouse strains. Tissue samples from multiple sources in the mice were examined for known ER stress response markers by Western blot and ELISA. We showed that levels of TOM-40, IRE1, BiP, ATF6 and PERK were differentially expressed in the two cohabitating species. We also showed that differentiation in endogenous levels of SQSTM1/p62 affect ER stress levels. This leads to the conclusion that ER stress is managed differently between two dichotomous species of *Peromyscus* and could indicate different adaptation to the environment for each.

Title: Fungal volatile organic compounds: their role in bark beetles' management in the southeastern United States
Primary Author: Menanyih, Sylvester A.
Additional Authors: Cale, Jonathan; Calderon, Angela; and Eckhardt, Lori
Department: Forestry
College/School: School of Forestry and Wildlife Sciences

Abstract:
The southeastern forest estate of US plays a major role in the wood dynamics of the country, contributing over 50% of the wood demand. Nonetheless, the sustainability of the wood resource base is of concern to stakeholders within the forestry sector due to the incidence of pest and diseases. Southern pine decline (SPD) is one of the complex disease syndromes which slowly and progressively weaken the trees ability to grow. Unfortunately, *Pinus taeda* (loblolly pine), the predominant and economically the most important tree crop in the southeast US suffer from SPD. Bark beetles and their associated ophiostomatoid fungi contribute to the SPD after predisposition by the abiotic factors. However, the relationship between bark beetles and their associated ophiostomatoid fungi are mediated by fungal volatile organic compounds FVOCs and these compounds when studied can be used as biocontrol agents for pest management. The project seeks to identify and quantify of volatile organic compounds associated with ophiostomatoid fungi. Volatiles will be sampled from previously isolated strains of *Leptographium terebrantis, Leptographium procerum, Grosmannia huntii* and *Grosmannia alacris* at the laboratory. The outcome of this study will enable us monitor and control pest infestation, and to assist forest managers and plantation owners to effectively manage and minimize economic losses from SPD.

Title: Numerical simulation of filamentation and gridding phenomena in magnetize electric discharges
Primary Author: Menati, Mohamad
Additional Authors: Thomas, Edward; Konopka, Uwe
Department: Physics
College/School: College of Sciences and Mathematics

Abstract:
Self-organization is a commonly observed phenomenon in a wide variety of plasma systems. One of the most recent examples of this phenomenon is the observation of filamentary structures and their associated pattern formation in low-pressure capacitively coupled rf glow discharged plasmas that are exposed to high magnetic fields. ‘filamentary structure’ are distinct, localized regions within a plasma that appear brighter than the surrounding plasma and that extend parallel to the magnetic field lines. The underlying physics that describes the initial formation and long persistence of the filaments remains poorly understood. A model is presented to describe self-organization in magnetized plasmas based on the results from 3D numerical simulations that self-consistently solve the plasma fluid equations along with the Poisson’s equation. The formation of these structures is thought to be mainly due to discrepancy between the fluxes of electrons and ions across and parallel to the magnetic field.

Title: Does bark beetle associated fungi contribute to loblolly pine decline and mortality?
Primary Author: Mensah, John K.
Additional Authors: Sword Sayer, Mary; Nadel, Ryan; Matusick, George; Fan, Zhaofei; Eckhardt, Lori
Department: Forestry and Wildlife
College/School: School of Forestry and Wildlife Sciences

Abstract:
Loblolly pine (*Pinus taeda* L.) is a predominant and economically important timber species in the southeastern United States but suffers from growth decline and mortality. Root-feeding bark beetles and their associated ophiostomatoid fungi (OPF) have been hypothesized to contribute to loblolly pine decline. Nonetheless, the role of the fungi in southern pine decline remains unresolved. We evaluated varying inoculum density of *Leptographium terebrantis* on 13-year-old loblolly pine growth and productivity at Eufaula, Alabama. Artificial inoculations were done using sterilized and *L. terebrantis* colonized toothpicks to simulate the natural feeding habits of bark beetles. Thirty-three months post-inoculation treatment, the high inoculum, and control treatment caused 50% and 19% reduction in relative basal area increment respectively. Growth decline resulted in a 30% mortality among the high inoculum trees. The results demonstrate that the OPF, *L. terebrantis*, contributes to loblolly pine decline and mortality at high inoculum density.

Title: *Centella asiatica* extract affects the glutamatergic signaling to induce neuroprotection
Primary Author: Mentlick, Kassandra M.
Additional Authors: Ahuja, Manuj; Buabeid, Manal; Ramesh, Sindhu; Govindarajulu, Manoj; Almaghrabi, Mohammed; Alturki, Mansour; Smith, Forrest; Suppiramaniam, Vishnu; Moore, Timothy; Dhanasekaran, Muralikrishnan
Department: Pharmacy
College/School: Harrison School of Pharmacy

Abstract:
Centella asiatica (*CA*) is a well-known medicinal herbal drug traditionally used in folklore Indian Ayurvedic medicine and other parts of Asia for hundreds of years to treat a plethora of ailments. The aerial portion of the plant is highly rich in various biologically active compounds. Several lines of evidence report antioxidant and neuroprotective actions of *CA* but the mechanism of action is unknown. Moreover, recent reports and ancient texts mentions cognition enhancement as one of the beneficial medical properties of *CA*. In the current study we commercially obtained a concentrated extract of *Centella asiatica* containing 20% asiaticoside and used it to elucidate the neuroprotective and antioxidant action against well-known pro-oxidants and neurotoxins in 2 neuronal cell lines. In addition, we also investigated the molecular mechanisms related to neuroprotection as well as mnemonic activities in the hippocampal neuronal cell line H19-7. In addition to preliminary characterization of the current extract, the neuroprotective action of *Centella* against hydrogen peroxide was also studied in hippocampal cell line. These results were found to be reproducible in the other neuronal cell line PC12. Reactive oxygen species were found greatly reduced in-situ as well as homogenized samples of H19-7 cells. Caspase activity was found to be greatly reduced in presence of *CA*. We also found *CA* to increase the phosphorylation of ERK1/2 and CREB by itself at different doses and affect the NMDA receptors in differentiated and un-differentiated H19-7 cells. Similar observations were found when cells were treated with hydrogen peroxide in presence or absence of two concentrations of *CA*. Thus, the current study describes anti-caspase, antioxidant actions of *CA* namely attributing to its asiaticoside concentration. Modulation of glutamatergic receptors and stimulation of ERK1/2-CREB-BDNF pathway was one of the putative mechanisms involved in synaptic strengthening shown by the *Centella*.

Title: The light and dark side of religion: religious motivation, greed and the mediating effect of moral disengagement
Primary Author: Mercer, Ian S.
Additional Authors: Walker, Alan; Smithers, James
Department: Management
College/School: Raymond J. Harbert College of Business

Abstract:
Prior research has examined the relationship between religiosity and numerous important work-related outcomes including ethical judgements, moral reasoning, and pro-social behavior to name a few. However, no research to date has examined the relationship between religiosity and one seemingly relevant and timely construct in today's business landscape – greed. This paper examined the relationship between a measure of intrinsic versus extrinsic religious motivation and a trait measure of greed. As predicted, results indicated that intrinsic religious motivation was negatively related to a trait measure of greed, while extrinsic religious motivation was positively related to greed. Further, results revealed that moral disengagement mediated the relationship between religious motivation and greed. More specifically, drawing from social interactionist identity theory, we predicted and found that intrinsically-motivated individuals were less likely to engage in moral disengagement strategies than were extrinsically motivated individuals. Results thus revealed both "light" and "dark" aspects of religiosity. These findings demonstrate the need to consider the potential impact of both "light" and "dark" aspects of religiosity as well as moral disengagement when attempting to explain greed in the workplace.

Title: Effects of experimental warming on *Solenopsis invicta* and southeastern arthropod communities
Primary Author: Merchlinsky, Alex R.
Additional Authors: Mohan, Jacqueline; Frankson, Paul; Ray, Charles; Lepczyk, Christopher; Gitzen, Robert
Department: Wildlife Ecology and Management
College/School: School of Forestry and Wildlife Sciences

Abstract:
The red imported fire ant (RIFA, *Solenopsis invicta*) is an ant native to the Amazon River Basin which was introduced to the United States in the early 20th century and has since expanded across most of the Southeast. RIFA have become a significant economic pest species, and additionally have been shown to harm native wildlife species. As global temperatures rise, average temperatures in the Southeast United States will grow closer to those of RIFA's native range, leading to concern about possible range extensions and increases in activity in its introduced range. Our study tests the hypothesis that warmer air and soil temperatures will results in greater RIFA activity. We used 3.6 meter x 5 meter chambers in Whitehall Forest, Athens, GA, equipped with buried heating cables, to warm enclosed areas based on 4 treatments: ambient temperature, 3 degrees Celsius above ambient, 5 degrees above ambient, and unenclosed non-chamber control plots. We deployed pitfall traps in 3 chambers of each treatment to monitor arthropod activity under each treatment. Traps were left open continuously, from October 2018 to September 2019, and samples were collected for analysis approximately weekly. Over the course of sampling, we have observed 2739 total ants across 43 species. We have found that, in trapping sessions that contained ants, RIFA on average accounted for 39.1% of captured ants in non-chamber control plots, 44.7% of captured ants in chambers at ambient temperature, 31.4% of captured ants in chambers heated by 3 degrees Celsius, and 51.7% of captured ants in chambers heated by 5 degrees Celsius. We did not detect a significant effect of warming on the proportion of samples made up of RIFA ($p=0.124$). These results may indicate less reliance on high temperatures than we hypothesized.

Title: Type IV pili genes play differential roles in movement and natural competence of *Xylella fastidiosa*
Primary Author: Merfa, Marcus V.
Additional Authors: De La Fuente, Leonardo
Department: Plant Pathology
College/School: College of Agriculture

Abstract:
Xylella fastidiosa, a Gram-negative bacterium that causes diseases in many economically important crops worldwide, is naturally competent. This feature allows this bacterium to take up DNA fragments from the environment and incorporate them into its own genome, which may lead to host shift and emergence of novel plant diseases. Type IV pili (TFP) play a central role in both natural competence and twitching motility of *X. fastidiosa*. Many proteins, encoded mainly by pil genes, are responsible for TFP biogenesis and function. However, only few pil genes were evaluated for their role on movement in *X. fastidiosa*, a key virulence factor of this bacterium. Thus, the goal of our study is to assess the role of different pil and other associated genes on movement and natural competence of this organism. Here, we show the contribution of pilA1, pilA2, pilB, pilC, pilE1, pilF, pilO, pilP, pilQ, pilR, pilS, pilT, pilU, pilX2, pilY1-1, pilY1-2, fimT1, fimT2, fimT3, chpC and recA for both these features of X. fastidiosa by performing site-directed mutagenesis. Results showed that mutation of pilB, pilC, pilE1, pilO, pilP, pilQ, pilR, pilT and pilY1-1 eliminated twitching motility. On the other hand, the natural competence feature was lost in the □pilB, □pilC, □pilE1, □pilO, □pilP, □pilQ, □pilT and □recA mutants. Overall, results showed that different pil and associated genes have different roles on twitching motility and natural competence of *X. fastidiosa*; while higher twitching motility usually correlates with higher recombination rates through natural transformation. We believe that understanding the mechanisms by which this pathogen acquires exogenous DNA and evolve will contribute to the development of new management approaches geared towards reducing the impact of these processes, by providing molecular targets for such management approaches.

Title: Reflecting sunlight via unique methods for self-folding origami
Primary Author: Miller, Noah S.
Additional Authors: Russell, Mailen
Department: Aerospace Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Self-folding origami enables the conversion of flat, patterned substrates into three-dimensional structures, and has applications for self-deploying shelters, containers for food and water, and biomedical devices. Previously, we investigated self-folding origami using pre-strained polystyrene sheets activated by energy from the Sun. Pre-strained polystyrene sheets shrink to approximately half their original size when heated, and gradients of shrinking can be used to induce self-folding. We used a solar reflector to heat a platform, which pre-heats the sample. Then, a convex lens above the sample focuses solar energy onto ink patterned regions, which creates a gradient in shrinking and the sample folds. Previous designs were unable to sufficiently heat the sample platform due to sensitivities to the intensity of sunlight, wind, and stability of the support structure. We improve on the previous design by utilizing reflective mylar blankets, supported by a more rigid structure, to reflect sunlight and uniformly heat a sample platform. Flat-panel and parabolic shaped reflectors are evaluated. The flat-panel reflector features triangle-shaped reflective panels that are fitted together in the shape of an inverted pyramid. To make the parabolic reflector, the reflective blankets are stretched to create a smooth surface before being inflated into a parabolic shape. The parabolic shape is then coated with fiberglass resin and allowed to cure, which produces a uniform and unobstructed reflector. We evaluate multiple reflector designs due to the low cost of materials. The reflector designs are compared according to the temperature and heating rate of the sample platform, and the effects of reflector area, orientation, and shape are evaluated. Following successful heating of the sample platform, we investigate the ability of each device to fold SMP origami patterns using only energy from the Sun for use in remote deployment of self-folding origami.

Title: 60 MHz 1H nuclear magnetic resonance spectroscopy: a case study with mixed microstructure polyisoprenes and other polyolefins
Primary Author: Minkler, Michael J.
Additional Authors: Chakrapani, Sneha; Kim, Jung Min; Shinde, Vinita; Beckingham, Bryan
Department: Chemical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Low-cost, accurate, and timely characterization of synthetic polymer materials is crucial to the ever-growing world economy. Nuclear magnetic resonance (NMR) spectroscopy is arguably one of the most widely used characterization techniques as it is capable of characterizing many critical aspects of polymer materials. Traditional, or high-field, spectrometers (spectrometers rated at >300 MHz) are the most widely used version of these instruments in contemporary macromolecular science as they produce high-quality data and are capable of detecting subtle but distinct differences in polymer architecture. However, high-field spectrometers have several critical requirements for operation including: cryogenic fluids, specially-trained personnel, and large amounts of laboratory footage. Recently, low-field NMR spectrometers have started to take a foothold in the industry as a viable replacement for their high-field counterparts. The main drawback of low-field NMR spectrometers as compared to high-field instruments is the broader peaks often associated with the weaker magnetic fields. This problem is further exacerbated by the repeat units within polymer backbones, as repetitive signals coalesce and widen the observed spectral peaks further. To combat this issue, many experimental parameters can be tuned such as sample concentration and molecular weight. In addition many instrumental parameters, such as the number of scans and relaxation delay, can be adjusted to more closely emulate a high-field experiment. In this work we demonstrate the ability of a low-field NMR spectrometer (60 MHz) to accurately determine the microstructure of mixed microstructure polyisoprenes through a plethora of combinations of experimental and instrumental parameters to within 1-2% of a high-field NMR spectrometer (400 MHz).

Title: The effect of a pH-dependent arginine switch on protein-based cofactor formation in catalase-peroxidase (KatG)
Primary Author: Minton, Laura, E.
Additional Authors: Xu, Hui; Krewall, Jessica; Goodwin, Douglas
Department: Chemistry And Biochemistry
College/School: College of Sciences And Mathematics

Abstract:
Higher eukaryotes, including humans, produce hydrogen peroxide (H_2O_2) as an immune response to microbial infection. Correspondingly, pathogens such as *Mycobacterium tuberculosis* utilize an enzyme called KatG (catalase-peroxidase) to thwart H_2O_2-based microbicidal assaults, thus tuberculosis is a global health concern. Although its general structure is common to the rest of its peroxidase superfamily, KatG is the only enzyme in the group that also has catalase capability, making KatG a particularly devious adversary to combat. Catalase activity is contingent upon the formation of a protein-based cofactor composed of crosslinked methionine-tyrosine-tryptophan (MYW), as well as the pH-dependent conformation of an arginine-switch (R-switchR418). Both the MYW cofactor and R418 are contributors to KatG's robust catalase activity, but R418's role in the formation of the MYW cofactor is unknown. To investigate the extent to which the R-switchR418 is responsible for directing active-site electron transfer events toward formation of this cofactor and subsequent catalase activity, we generated R418N KatG through site-directed mutagenesis. R418N's proficiency at MYW adduct formation and catalase activity were further examined based upon timing of heme insertion in holo-as-isolated (hR418N) and reconstituted (rR418N) forms. Stopped-flow methods were consistent with the presence of the MYW cofactor in hR418N, as well as its initial absence but eventual formation in rR418N. In terms of *tuberculosis*, the *Mycobacterium* genus depends on its mycolic acid cell wall for protection. Isoniazid (INH), an antitubercular pro-drug, is activated when an isonicotinoyl acyl radical (IN) couples to NAD^+. IN-NAD inhibits InhA, an enoyl acyl-carrier reductase enzyme that controls mycolic acid biosynthesis. Results of R418N's impact on INH suggest a fascinating correlation between rR418N and its particularly efficient rate of IN-NAD formation, which could influence future drug development.

Title: The effects of moisture and soil type on egg survival and hatchling performance in an invasive lizard
Primary Author: Miracle, Jocelyn E.
Additional Authors: Scruggs, Cindy; Hall, Joshua; Warner, Daniel
Department: Organismal Biology
College/School: College of Sciences and Mathematics

Abstract:
Nest site selection is an important determinant of offspring survival for many animals. For example, in reptiles, there is an optimum amount of nest moisture that is conducive to egg survival because water uptake by eggs is essential for proper development. Therefore, a female's ability to select optimal nest sites, with respect to moisture, will influence her fitness. For many species, however, optimal conditions have not been defined. Moreover, optimal conditions may change with context (e.g. habitat type). To determine context-dependent optimal conditions for nesting, we collected brown anole lizards (*Anolis sagrei*) from small spoil islands in the intracoastal waterway of Florida. We bred lizards in the lab, collected eggs twice weekly, and incubated eggs in a 2 by 4 factorial design. We manipulated soil type and water content during incubation (2 soil types, 4 water concentrations). The two soil types are commonly used by lizards in the field. One is located near the shoreline and is composed of sand and crushed seashells. The other is from the island interior and consists of soil and leaf litter. The water concentrations were based on nests from our field site. We report results concerning how the optimal moisture conditions differ among soil types and results on egg water uptake, egg survival, hatchling body size, and hatchling performance.

Title: Influence of published studies on spontaneous reporting of adverse kidney events with proton pump inhibitors (PPIS)

Primary Author: Mishuk, Ahmed Ullah
Additional Authors: Chen, Li; Gaillard, Phillipe; Westrick, Salisa; Hansen, Richard ; Qian, Jingjing
Department: Health Outcomes research and Policy
College/School: Harrison School of Pharmacy

Abstract:
Objective: Proton Pump Inhibitors (PPIs) are widely used among the U.S. population and are generally considered safe. A few published studies reported kidney-related adverse events (AEs) with PPI use. This study examined the influence of these published studies on spontaneous reporting for PPIs with kidney AE events. / Methods: The 2004-2018 U.S. FDA Adverse Event Reporting System (FAERS) data were analyzed. Individual PPI's brand and generic names were used to identify AE reports. The Medical Dictionary for Regulatory Activities (MedDRA) and Standardized MedDRA Queries (SMQs) were used to identify Acute Renal Failure (ARF) and Chronic Kidney Disease (CKD). The year of first publications indicating risk of ARF (Klepser 2013) and CKD (Lazarus 2016) were used as the cut-off time points to analyze the relative reporting rates (disproportionality analyses using the reporting odds ratio (ROR) with 95% confidence interval (CI)) of these AEs before and after of these publications, as well as the entire study period. / Results: Overall, the ROR for ARF with all PPIs was 1.89 (95%CI 1.88-1.91); however, before the first publication in 2013, the ROR showed a protective signal (ROR=0.94, 95%CI 0.93-0.96). However, after 2013 the PPIs had an ARF ROR of 2.96 (95% CI 2.94-2.98). Similarly, the overall CKD ROR between 2004-2018 was 1.78 (95%CI 1.77-1.79), but the signal did not exist before 2016 (ROR=1.01, 95%CI 1.00-1.02). / Conclusion: Elevation of safety signals for kidney-related AE reports with PPIs were observed after the publications of key studies. These analyses provide a "text-book" example of how publication bias can influence reporting rates of AEs. Future data mining and interpretation of case reports should carefully consider this problem in risk assessment.

Title: Comparing the anxiety levels of adolescents in a specialized residential treatment program about juvenile sex registry laws
Primary Author: Mitchell, Taylor A.
Additional Authors: Thompson, Kelli R.; Roth, Andrew J.; McTier, Karrington L.
Department: Psychology
College/School: College of Liberal Arts

Abstract:
The treatment of juveniles with problematic and/or illegal sexual behavior is a matter of larger public safety. As such, there is an ongoing debate among legislators regarding the notification of these offenders to the community upon release, such as the sex offender registry. Yet, decades of research has shown that juvenile sex offender registration and notification (JSORN) has been associated with serious mental health sequelae, while demonstrating little to no positive effects on the community at large. Further, there is a need for valid measures of effects specific to JSORN. The Juvenile Sex Offender Registration and Notification Questionnaire (JSORNQ) was developed to measure concerns experienced by juveniles associated with requirements to register as a sex offender. The current study seeks to examine if and how feelings of anxiety or concerns about registration change over the course of treatment for a group of adolescents adjudicated for illegal sexual behavior. It was theorized that anxieties about registration may increase as the release to the community approaches, showing a sense of nervousness about re-entering society on the sex offender registry. Data were collected over the course of two semesters at the Mt. Meigs juvenile correctional facility. Participants were adjudicated male youth in a specialized residential treatment program for sexual offending. Participants were asked to complete the JSORNQ after completing each phase of treatment. Paired samples t-tests were used to test if mean differences changed over time. Results indicated there was no significant change in overall concern over the course of treatment, that is the concerns or anxieties about registration tend to stay stable over time in this sample. This was the first study of its kind known to examine how feelings about juvenile registration may change over the course of treatment. Treatment and policy implications will be discussed.

Title: Curing kinetics of varied molecular weight polyethylene glycol diglycidyl ether: crosslinked networks via a terthiol crosslinking agent
Primary Author: Mobley, Alisa A.
Additional Authors: Minkler Jr., Michael; Beckingham, Bryan
Department: Chemical Engineering
College/School: College of Sciences and Mathematics

Abstract:
With increasing demand for largely fossil-fuel based energy, advances in technologies for extracting fossil fuels from the subsurface has led to an increasing number of production wells to meet demand. With this increased extraction of natural gas and other carbon-based fuels through the process of hydraulic fracturing (fracking) poses major environmental concerns. The drilling process, well operation, and subsurface environmental changes puts strain on the fracking wells over time and microfractures can occur which compromise well integrity. These fractures can leak fluids such as subsurface brines and fracking chemicals into the surrounding environment and can cause threats to drinking water sources. Slurries of water, sand, and harsh chemicals are currently used to fix these microfractures, but they tend not sufficiently fill the small cracks due to the large typical size of slurry particles. Due to this, harmful chemicals can continually seep out of the wells. This research project looks at the use of cross-linked polymer networks as an injectable, cure in place technology to fill such leaks in subsurface wellbores. To test the curing behavior and physical properties of a copolymer system as an injectable sealant for the fissure in wellbores, we utilized a mixture of trimethylolpropane tris(3-mercaptopropinate) (3-SH) and poly(ethylene oxide) diglycidyl ether (PEOD). The isothermal curing kinetics are observed using differential scanning calorimetry (DSC) and the physical properties of large cured specimens is examined. Varied relative composition of PEOD and 3-SH were investigated, and the total cure times and mechanical properties will be compared.

Title: The Alabama parenting questionnaire: a comparison between two distinct adolescent offending populations
Primary Author: Moder, Meredith M.
Additional Authors: Thompson, Kelli R.; Seaton, Kylie; Gusler, Taylor
Department: Psychology
College/School: College of Liberal Arts

Abstract:
Adolescence is a critical period in which disrupted parent-child relationships can have an impact on the likelihood of delinquency and/or incarceration. Currently, the United States is one of the leading countries in adolescent incarceration rates. Within the juvenile correctional system, adolescents who sexually offend share similarities and differences with adolescents who are generally delinquent. These differences can imply differential treatment and intervention solutions. Adolescents who sexually offend are seen as a distinct group of offenders who commit crimes due to special factors different from those of the general population. Children who do not receive sufficient care due to parents' inability to meet the child's emotional or physical needs can be predictive of future juvenile sexual offending. In addition, low levels of parental supervision are related to higher levels of deviance for juveniles in general. Thus, understanding differences in parenting styles between the two offending populations may be of particular concern when planning for treatment and intervention strategies. The current study will examine and compare results of the Alabama Parenting Questionnaire to test for mean differences in parenting styles as self-reported by a group of adolescent offenders. The sample will be divided into two groups based on offending patterns. An ANOVA was used to test for mean differences between the sexual offending group and the general offending group on five scales from the APQ (positive involvement, supervision, use of positive discipline techniques, consistency of discipline, and use of corporal punishment). Results indicated significant mean differences on the supervision scale with the general offending group scoring significantly higher than the sexually offending group. The consistency of discipline scale was approaching significance with the general offending group again scoring higher. Treatment and intervention implications will be discussed.

Title: Soybean cultivar specific growth enhancement with inoculation of *Bacillus velezensis* AP193 and orange peel extract

Primary Author: Moen, Francesco S.
Additional Authors: Pacheco da Silva, Maria Letícia; Warner, Dylan; Saez de Jauregui, Alvaro Sanz; Liles, Mark R.
Department: Biological Sciences
College/School: College of Sciences and Mathematics

Abstract:
In green house experiments, plant growth-promoting rhizobacteria (PGPR) have been found to not only increase plant growth but do so during abiotic stresses. However, when the experiments are repeated under field conditions, the results are variable due to a potential PGPR-cultivar specificity and lack of competitiveness amongst PGPR strains and field microorganisms. The low competitiveness of PGPRs has been attributed to lack of carbon sources available during the first stages of growth, before root exudate production. It has been found that some *Bacillus velezensis* (*Bv*) strains are able to metabolize complex carbon structures, such as purified pectin, increasing the growth and yield of the plants even under field conditions. Other studies have found that *Bv* strains are also able to use orange peel (OP) as a carbon source and promote plant growth. In this study, twenty commercial soybean cultivars were inoculated with the *Bv*+OP treatment, meanwhile another set were uninoculated. The plants were grown in 3L pots containing field soil in a greenhouse with light supplementation until the plants reached R2-R4. The objectives of this study were: (1) Test if the inoculation of *Bv* (PGPR) plus OP (*Bv*+OP) increases plant growth and nodulation in a panel of twenty commercial soybean cultivars; (2) Test if there is cultivar variation in the soybean response to *Bv*+OP inoculation. Our plants showed varying cultivar response to the *Bv*+OP in aboveground biomass, leaf area, nodule number and total root length. We hypothesize that this is due to an increase nodule number and higher nitrogen fixation. Selections of the most and least responsive cultivars have been made to further test in the greenhouse and field experiments.

Title: Graphene based nano-composites for additive manufacturing
Primary Author: Momin, Fahim I.
Additional Authors: Zhang, Xinyu; Triggs, Eldon
Department: Polymer and Fiber Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Polymer/nanofiller composites have been considerably investigated due to their broad applications. Graphene-based materials have been positively incorporated into polymers for innovative applications, such as for the mechanical, thermal, and electrical enhancement. However, to reach optimum properties, the graphene fillers are necessary to be well dispersed in the polymers matrix. But, they have many drawbacks regarding the agglomeration or non-uniform dispersion of reinforcements or fillers. Also, the voids generated during the composite filament fabrication can lead to the properties' defection. 3D printing or additive manufacturing (AM) has revolutionized the way of manufacturing by designing complex structures in a customized feature that cannot be realized by traditional processing methods. The present work provides an overview of additive manufacturing used in the manufacturing of fiber-reinforced polymeric composite materials. The scope of the work delineates different additive manufacturing processes, formulations of different materials, drawbacks, and strengths associated with different additive manufacturing processes. Fabrication of fiber-reinforced polymeric composites remains the protagonist of the entire work. The challenges related to the employability of additive manufacturing technologies in the fabrication of fiber-reinforced polymeric composites are also highlighted towards the end of the work.

Title: Petrographic and geochemical analyses to elucidate the genesis of au-ag deposits on Florida mountain epithermal deposit, Silver City District, Idaho
Primary Author: Monroe, Lucas H.
Additional Authors: Bilenker, Laura, D.; Hames, Willis, E.; Garcia, Raeann, D.; Ebbert, Will, J.
Department: Geology
College/School: College of Sciences and Mathematics

Abstract:
Florida Mountain (FM) is one of a trio of low-sulfidation (LS) epithermal deposits located in Idaho. LS epithermal deposits are a main target of modern exploration because they host high concentrations of gold (Au) and silver (Ag). FM itself has produced a large amount of Au and Ag throughout its 51-year production history. Even though FM has been the subject of extensive mining production, current exploration shows there is still a high potential for profitable mining and little research has been done to understand the deposit itself. Epithermal deposits form at shallow crustal depths from heated fluid flow within the crust and can host high ore grades. During four weeks in June and July of 2019, samples were collected on-site from drill core extracted for mineral exploration. Samples were targeted across depths and compositions to ensure full representation of the deposit. During this time, two geological maps were produced of a neighboring deposit (DeLamar Mountain) for use in the exploration of the area around FM. Using several visual and geochemical methods, I will characterize the minerals present at FM by microscopy, measure a representative age of the deposit, and fingerprint the metals in the deposit by analyzing their compositions. This approach will address the following research questions: 1) When did the epithermal deposit at FM form and can mineralization be attributed to the initiation of the Yellowstone hotspot? 2) What is the source of the ore? 3) What indicators exist to help with ongoing exploration? 4) How are Florida Mountain and DeLamar Mountain, neighboring deposit, related? The answer to these questions will help create a genetic model for FM, which will increase the understanding of all of the deposits in the area and the overall geology of the northwestern United States. It will also help refine exploration techniques for LS epithermal deposits in the future.

Title: TGCSQ coding of therapist behaviors and client alliance
Primary Author: Moore, Amelia S.
Additional Authors: Warren, Kalyn; Ketring, Scott; Gillis, Brian; Novak, Josh
Department: Human Development and Family Studies
College/School: College of Human Sciences

Abstract:
Therapist variability impacts outcomes; accounting for 5-15% of change in couple therapy (Friedlander, et al., 2006), with variability existing for male and female clients (Allgood & Crane, 1991). Focusing on within-session therapist behaviors could aid MFT master's programs focused on molding therapeutic skills, enhancing alliance, and promoting change for both partners in couple therapy (Baker, 2017). The TGCSQ (Evans, Epstein, & McDowell, 2009) measures the therapist's actions focused on the common factors of warmth, empathy, validation, collaboration, therapist presence, systemic based techniques, and session management. The utility of the TGCSQ can be ascertained with a larger sample of community couple clients. Undergraduate and graduate students macro-coded N = 180 couple therapy sessions at a large southeastern university's marriage and family therapy clinic (inter-rater reliability = .80). The goal was to determine if factors of the TGCSQ were related to the therapy alliance as rated by community clients using the Couple Therapy Alliance Scale-Short Version (TAS; Pinsof, Zinbarg, Knobloch-Fedders, 2008) and the Session Rating Scale (SRS; Miller et al., 2002). Path analyses were fit in Amos 25. Two factors of the TGCSQ were related to therapeutic alliance. Higher therapist warmth was associated with higher male client ratings on the TAS (B = 1.08, SE = 0.51, p < .05) and SRS (B = 1.41, SE = 0.60, p < .05), controlling for session number and therapist. Greater validation by the therapist predicted higher female client perception of the alliance on both scales (TAS: B = 0.54, SE = 0.27, p < .05; SRS: B = 0.59, SE = 0.32, p = .06). Objectively measuring therapist behaviors related to alliance in therapy benefits therapists-in-training. Programs wanting to incorporate a student learning directly connected to within-session alliance would benefit from measures like the TGCSQ for evidence-based training.

Title: In-vitro 3D colorectal cancer model using PEG-fibrinogen hydrogels
Primary Author: Moore, Andrew L.
Additional Authors: Hassani, Iman; Anbiah, Benjamin; Greene, Micheal; Lipke, Elizabeth
Department: Chemical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Colorectal cancer is one of the leading causes of cancer related deaths each year in the US. Traditional drug testing on two-dimensional cancer cell platforms fail to provide accurate results due to the inherent differences between 2D cells and native tumor tissues. In order to create an appropriate correlation between clinical testing and drug treatment on native tumors, a three-dimensional model was developed. These models provide recapitulation of the native tumor microenvironment and characteristics that are more relevant for things such as drug trials and cancer research. Three-dimensional models were fabricated using poly(ethylene glycol)-fibrinogen for three different colorectal cancer cell lines, HCT116, HT29, and SW480, and were kept in culture for 29 days. Cell viability was monitored in order to prove the models, or hydrogels, can remain viable over time. Colony and hydrogel growth were quantified showing the periphery of each hydrogel forms larger colonies as time progresses compared to the midpoint and core. Things such as cell proliferation and migration were visualized by using immunofluorescent stained images. Mechanical stiffness data provided evidence for an increase in Young's moduli over time for the hydrogels showing a trend similar to native cancer tumors. The viability of the models and similar characteristics and trends between the generated hydrogels and native tumors demonstrates a successful link among the two. With a more suitable model, further research in anti-cancer drug testing could be performed possibly resulting in more accurate results for clinical studies.

Title: An evaluation of currently used cognitive assessments in detecting mild cognitive impairment
Primary Author: Moore, Harley N.
Additional Authors: Bitely, Riley; Nguyen, Emily; Darakjian, Lucy; Kaddoumi, Amal
Department: Pharmacy; Engineering
College/School: Harrison School of Pharmacy; Samuel Ginn College of Engineering

Abstract:
An estimated 5.5 million people in America have Alzheimer's disease (AD). Deaths from AD have risen by 89% since the year 2000. Our work objective is to evaluate the effect of addition of olive oil to the diet of subjects diagnosed with mild cognitive impairment (MCI) on cognitive function and AD biomarkers. Our trial was a double blind, randomized trial to detect changes in memory function and associated biomarkers after 6 months of olive oil consumption. Our methods using the Mini-Mental State Examination (MMSE), Clinical Dementia Rating (CDR), and the WMS-IV-NL to assess subjects for MCI at the start and end of the study after consuming 30mL of olive oil a day for 6 months. For this poster, we will evaluate these tools for their ability to detect a change in cognition in a short duration, applicability and overall validity of these assessment tools. We focused on the MMSE and CDR, which have the greatest amount of subjective questions and require the most clinical judgment in scoring. A literature search of clinicaltrial.gov and PubMed was conducted to find relevant publications concerning the MMSE and CDR from which conclusion can be drawn to assess their sensitivity, specificity, and accuracy in relation to their use in our study. This literature search has shown that detecting small changes in cognition is difficult with the MMSE and could lead to uncertainty within data when used as the only indicator of cognitive change. Almost 60% of currently active and recruiting phase II and III Alzheimer's Disease clinical trials and diagnostic studies rely on the MMSE scores to determine inclusion in the study. Other tests, such as the CDR scale, have been shown utility in detecting small changes of Alzheimer's, in both the progression and early stages of the disease such as MCI. We will provide a rationale for including multiple cognitive assessments to accurately gauge disease progression and severity of Alzheimer's patients when conducting clinical studies.

Title: Oxidative conversion of lignin to value added products
Primary Author: More, Ajinkya R.
Additional Authors: Elder, Thomas; Jiang, Zhihua
Department: Chemical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
One of the most significant challenges in the 21st century is the development of a sustainable global economy. This calls for development of processes and technologies that allow sustainable production of materials from renewable natural resources. Kraft lignin, one such resource can be valorized using oxidation strategy which produces high value phenolic compounds. The aim of this work is to deepen the fundamental understanding of oxidative processes of kraft lignin and integrate it to current pulp and paper industry. Vanillin is one of the main value added products obtained from oxidation of lignin. However, the current challenge of this process is to selectivity control and improve vanillin yield. Softwood Lignoboost kraft lignin, (LBoost) and enzymatic hydrolysis (H-lignin) were used as starting materials to perform bench scale oxidations with Oxygen and Hydrogen Peroxide. Vanillin (V) was mainly obtained along with vanillic acid (VA), and carboxylic acids such as formic and oxalic acids. In the oxidation with O2, H-lignin provided 2.85% w/w of V, and 2.25% of VA compared to LBoost with 1.84% of V and 1.25% of VA per phenolic OH (mmol/g). The higher yield of H-lignin (5.1% w/w against LBoost - 3.09% w/w) is due to its structural characteristics close to native lignin. The concentration profiles of V and VA, the variation of O2 partial pressure in the reactive medium and the variation of temperature with H2O2 oxidation were also investigated. It was observed that oxygen partial pressure was the critical parameter determining vanillin yield reaching optimum yields at lower pressures & increased vanillin oxidation rate at higher pressures. The results obtained provide a further understanding on factors affecting phenolic aldehyde yield which paves a way to selective improve vanillin yield. These results show a potential to develop a lignin valorization pathway integrating with pulp and paper manufacturing processes, thereby making a sustainable biorefinery.

Title: Ant-ics in the Southeast: fire ant re-invasion and effects on small mammals
Primary Author: Morehart, Morgan A.
Additional Authors: Lepczyk, Christopher A.; Terhune, Theron M.; Sisson, D. Clay; Gitzen, Robert
Department: Wildlife Sciences
College/School: School of Forestry and Wildlife Sciences

Abstract:
Invasive species often have negative impacts on native ecosystems, including declines in biodiversity and reduced ecosystem function. Red-imported fire ants (*Solenopsis invicta*, hereafter RIFA) are an invasive species in the southeastern US that can displace native ant species and purportedly impact invertebrate abundance and species richness. RIFA also decrease survival in many vertebrate populations, including small mammals, which alter foraging activities in the presence of RIFA and whose young could be at risk of depredation. While many commercial products exist to control RIFA, duration of their effectiveness and potential reinvasion pattern by RIFA after treatment need further research. Our objectives were to assess the reinvasion pattern of RIFA following treatment with a toxicant, as well as how small mammal populations respond when RIFA are removed. Private hunting lands in southwest Georgia were treated with Extinguish Plus—a RIFA toxicant and sterilant—and compared against adjacent untreated sites. We hypothesized that RIFA would recolonize treated properties from the edges as they reinvade from untreated areas. We also hypothesized that RIFA removal would result in a positive demographic response for small mammal species with altricial young, but species with semi-precocial young would not show a response. We assessed RIFA occurrence small mammal populations in each area. Results will inform on RIFA reinvasion patterns and effects on small mammals, and can be used to make management decisions regarding restoration of RIFA-invaded habitats. This research seeks to further our understanding of the relationships between RIFA and small mammal populations, and whether controlling for an invasive species in the short term can have positive benefits for other species in the ecosystem.

Title: Developmental effects of hypoxia and temperature on morphology of *Taeniopygia guttata* hatchlings
Primary Author: Morris, Douglas S.
Additional Authors: Wonil, Choi; Wilcoxson, Sydney, T.; Wada, Haruka
Department: Biomedical Sciences
College/School: College of Sciences and Mathematics

Abstract:
Successful embryonic development serves a pivotal role in predicting the long-term survivability of an organism. Embryos are particularly flexible to adjust to environmental cues, such as temperature; thus, an embryonic environment can profoundly influence offspring phenotype. Consequently, alterations in morphology, physiology, and behaviour may lead to considerable advantages or disadvantages in offspring after hatching or being born. Two major environmental stressors avian embryos encounter are suboptimal incubation temperature, which is determined by parents' incubation behaviour, and hypoxia/desiccation, which is determined by eggshell characteristics. To explore the effects of hypoxia and suboptimal incubation temperature on morphology of zebra finch hatchlings, a part of eggs was covered by candle wax to reduce gas exchange across shells and the eggs were incubated either at a control incubation temperature of 37.4°C or an experimental high incubation temperature of 38.9°C. Eggs that were not covered by wax served as controls for embryonic gas exchange. Standardized images of hatchlings were collected, and morphological measurements were analysed blindly to test whether limiting available pores via wax or suboptimal incubation temperature alter wing, tarsi, and head length or head width. We predict that embryos hatched from eggs covered in wax and incubated at higher than optimal temperature exhibit more asymmetry and delayed development than the controls.

Title: An exploratory analysis of male sex trafficking survivors' trauma exposure and biopsychosocial health

Primary Author: Moss, Regan A.
Additional Authors: Ruhlmann, Lauren M.
Department: Human Development and Family Studies
College/School: College of Human Sciences

Abstract:
Sex trafficking refers to the exploitation of an individual for a commercial sex act. It is characterized by extreme, repeated, and prolonged forms of violence. This type of victimization is associated with complex physical, psychological, and social (i.e., biopsychosocial) health problems. Services designed to help survivors cope with these challenges are sparse and existing programs are often incompatible with or insufficient to meet the unique needs of this population. Moreover, the existing research used to inform these health and support service models does not represent the diversity of the survivor population. It is limited by small, homogeneous samples comprised predominantly of female participants. The present study addressed this gap by conducting an exploratory analysis of male survivors' trauma exposure and biopsychosocial health. Using data gathered in a national survey of adult sex trafficking survivors, this poster will present preliminary findings from mean-comparison analyses exploring differences between male and female survivors on these constructs. Data collection is ongoing; initial descriptive analyses with the sample gathered thus far indicate that male participants (M=6.00, SD=5.29) reported nearly half the number of traumatic life experiences as their female counterparts (M=11.24, SD=6.51). However, PTSD symptoms were reported at similar levels across survivor groups (male: M=40.67, SD=14.15; female: M=41.4, SD=24.38). On average, male participants' reported alcohol use was higher (M=16.00, SD=14.00) than their female counterparts (M=7.24, SD=9.27), but levels of drug abuse (male: M=7.67, SD=2.52; female: M=5.53, SD=3.50), history of self-harming behaviors (male: M=2.00, SD = 2.00; female: M=2.84, SD=2.92), and diagnosed physical health conditions (male: M=2.67, SD=1.16; female: M=2.94, SD=2.40) were comparable. These findings provide a useful first step in understanding the unique needs and experiences of male trafficking survivors.

Title: Elucidating the neuroprotective effects of 7,8 DHF in prenatal exposed rats
Primary Author: Mullins, Claire E.
Additional Authors: Bhattacharya, Dwipayan; Ramesh, Sindhu; Govindarajulu, Manoj; Bloemer, Jenna; Bhattacharya, Subhrajit; Buabeid, Manal; Escobar, Martha; Moore, Timothy; Suppiramaniam, Vishnu; Dhanasekaran, Muralikrishnan
Department: Pharmacy
College/School: Harrison School of Pharmacy

Abstract:
After observing the FASD model in rats, moderate prenatal alcohol exposure demonstrated significant deficits in both learning and memory tasks, as well as reduced synaptic plasticity. Our previous studies have shown that these plasticity deficits are associated with reduced ILK activity and increased GluR2 AMPA receptors at the synapse. From this, we hypothesized that enhancing the ILK activity might restore the behavioural and plasticity deficits that were seen in the FASD model. 7,8-dihydroxyflavone (7,8-DHF) acts as a potent agonist for Brain Derived Neurotropic Factor (BDNF) receptor Tyrosine receptor kinase B (TrkB). Therefore, we hypothesize that intraperitoneal administration of 7,8-DHF in FASD rats, during the early postnatal days, may restore the alcohol associated memory deficits through increasing ILK activity and improve synaptic plasticity. Hence, we investigated the neuroprotective effects that 7,8-DHF in the FASD model. 7,8-DHF led to a significant improvement in the behavioural deficits associated with FASD by causing a significant increase in the ILK activity.

Title: Design and development of a small-scale coaxial rotor for aeroacoustic investigation
Primary Author: Munz, Karlyle D.
Additional Authors: Munz, Karlyle; Raghav, Vrishank
Department: Aerospace Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
The design, development, and validation of a small-scale coaxial rotor for aeroacoustic investigation are presented in this paper. A custom-built small-scale rotorcraft thrust stand was fabricated to demonstrate how aerodynamic performance and aeroacoustic properties of a coaxial rotor are altered when the blade characteristics are varied. The thrust and torque of the coaxial rotor were measured to characterize the aerodynamic performance. Baseline acoustic measurements were gathered to quantify the different sources of aerodynamic noise generated from a small-scale coaxial rotor. This experimental setup was then used to evaluate the aeroacoustic properties of serrated blades relative to the baseline blades on a coaxial rotor. Results confirmed that serrations on the trailing edge of the rotor blades of a coaxial rotor attenuate both overall sound pressure level and middle-to-high sound pressure level.

Title: Pitch matching bias in children and adults
Primary Author: Murdock, Molly E.; Koebernick, Jenny
Additional Authors: Weaver, Aurora J.; DiGiovanni, Jeffrey J.; Ries, Dennis. T.
Department: Audiology
College/School: College of Liberal Arts

Abstract:
This study examined if individuals with extensive music instruction possessed pitch perception and memory more resistant to degradation (e.g., time and interference) than that of individuals with limited musical training. Pitch memory abilities were investigated in sixty-six participants with no known hearing, attention, or cognitive impairment. Participants were placed into subgroups based on age (children and adults) and their self-reported music background (extensive vs limited). Two tasks, which measured auditory perception and memory skills for pitch were conducted: a non-verbal span (Weaver, DiGiovanni, & Ries, 2019) and a pitch matching retention task that was based on Ross, Olsen, and Gore's procedure (2003). We found that individuals with greater music instruction exhibited enhanced pitch perception and memory processes along with smaller standard deviation (SD) across pitch matches. Unexpectedly, based on the paradigm, the young children demonstrated statistically significantly sharper (positive) constant error (CE) across pitch matches than the older participants. This implies that children ages 10-13 either perceived the target pitch to be higher than it was, or their memory for the pitch tends to shift higher in pitch over time than adults.

Title: Neural basis for listening music
Primary Author: Murphy, Elizabeth H.
Additional Authors: Krishnamurti, Sridhar
Department: Communication Disorders
College/School: College of Liberal Arts

Abstract:
Music is a big source of entertainment and relaxation which often engages people cognitively on a day to day basis. More than nine million American employees work in a noisy environment and face the prospect of occupational hearing loss. With the growing aging population in America (over 65 years of age), more seniors are at risk for hearing loss. Hearing impaired people affected by occupational noise exposure or aging face two main problems: hearing high frequencies (spectral deficits) and timing (temporal deficits) which leads to social isolation, intellectual decline, and emotional problems. There is currently no clear link between music perception and neural response. The goal of the study was to simulate the effects of a hearing impairment in young, normal hearing listeners and study the neural firing patterns from the brain for spectrally and temporally modified orchestral music. A total of twenty young females participated in three different listening conditions in the study. In the unfiltered music condition, an original orchestral music sample was selected for listening and cortical (P1-N1-P2) responses were recorded via electrodes placed on the participant's mastoid and high forehead, using a clinical EEG system. In the second condition, the original music was spectrally modified by filtering out high frequencies to simulate the effects of a hearing impairment. The third listening condition involved temporally modifying the original orchestral music to play at a faster rate. Data analyses indicate that spectrally modified music in the filtered condition led to a longer latency (delay in neural firing) when compared to the original orchestral music. When the tempo was altered to a rapid rate, the neural synchrony (timing) was altered, making the peaks and troughs not as distinct. Results argue there is a neural basis for music perception, and commercial music applications should allow greater flexibility to enhance the auditory experience for listeners.

Title: Synthetic staphylocoagulase analogs as novel hemostatic agents
Primary Author: Muse, Charlotte G.
Additional Authors: Panizzi, Peter R.
Department: Pharmaceutical Sciences
College/School: Harrison School of Pharmacy

Abstract:
Acute trauma is the greatest cause of death in patients between 1 and 46 years of age according to the National Trauma Institute and even outpaces cancer and heart related deaths among this population. Despite significant medical advancements over the past decades, management of uncontrollable bleeding in acute trauma is a major source of human morbidity and mortality. The human body is designed to mitigate the damage done by blood loss, but achieving sufficient coagulation may require the use of supplementary thrombotic products, which are often in short supply, risky, and costly. Staphylocoagulase (SC), a Staphylococcus aureus protein and prothrombin activator, allows S. aureus to elude the host immune system by forming a fibrin clot around the infection site. In this investigation, we develop and optimize production of SC that could be used in a situation of acute, uncontrollable bleeding and that would be temperature-stable and endotoxin free. The SC is first produced through fermentation in non-pathogenic Escherichia coli in a bioreactor and separated via liquid chromatography. Induction of E. coli by either lactose or isopropyl β-d-1-thiogalactopyranoside is conducted in shaker flasks and compared for quantity per total mass and relative purity using densitometry. While lactose generated an apparently larger quantity, the time needed to complete the induction and amount of non-target proteins is greater. Preliminary thermostability testing suggests that 70% of the clotting-induction capability of SC is retained following incubation at 80°C. Samples of SC were centrifuged following high-temperature incubation and assayed for prothrombin activation kinetics as monitored by chromogenic substrate hydrolysis using spectrophotometry. The results of these experiments yield valuable information about a novel product that has the potential to be produced on a commercial scale, free from immune activators, and stable in extreme environments.

Title: A comparative sandstone petrographic and heavy mineral study of the oligocene sediments from the Bengal Basin and southeast Shillong, India
Primary Author: Naher, Jasmin
Additional Authors: Uddin, Ashraf
Department: Geology
College/School: College of Sciences and Mathematics

Abstract:
The Oligocene deposits of the Bengal Basin, exposed only at the Sylhet Trough, is relatively thin (~ 800 m) and mainly composed of siltstone, silty shale, and sandstone. In contrast, the arenaceous Oligocene deposits of the southeast (SE) Shillong which is situated to the north of the Sylhet Trough is ~4650 m thick and divided into three formations from old to young: Laisong, Jenum, and Renji formation. The depositional environments ranged from marginal marine to turbiditic at the SE Shillong and shelf dominated tide at the Sylhet Trough. A distinct variation in lithofacies, sandstone modal analysis, and heavy mineral analysis may suggest a difference in source rock of these two neighboring Oligocene deposits at the foreland basin of eastern Himalaya. / Oligocene sandstones from both locations consists dominantly of monocrystalline and polycrystalline quartz, sedimentary lithic, metamorphic lithic with very little feldspar. Sandstones in Sylhet Trough are more quartzose and contain less feldspar and lithic fragments (indicate relatively high sediment maturity) than those of the SE Shillong. The ZTR (zircon-tourmaline-rutile) index is higher (36.41%) in Sylhet Trough sediment compared to the ZTR index of Shillong sediments (26.4%). The ZTR index and overall low mineral assemblages of Oligocene deposits of Sylhet Trough resemble higher maturity and intense chemical weathering and suggesting that the Indian craton toward the west might have been a possible source area for the Oligocene sediments of the Bengal Basin. On the other hand, the sandstone composition of Sylhet Trough (Qt78 F 1L20) and SE Shillong (Qt66 F 4L30) reflect a recycled orogenic province. During the Oligocene, the Bengal Basin perhaps was positioned further south by the equator resulting in exposure to intense chemical weathering and Himalayan tectonism during that time was probably more distant from the Bengal Basin than at present.

Title: Associations between financial strain in childhood and sleep duration in college
Primary Author: Ngugi, Karen M.
Additional Authors:
Department: Nutrition/ Wellness
College/School: College of Human Sciences

Abstract:
Sleep is an integral part of health and an important source of physiological and psychological resilience, especially during the college years. Childhood stress may impair individuals' response to stressful life situations during early adulthood, resulting in disruptions of the neuroendocrine systems that affect circadian rhythms. The current study examined the relationship between childhood indicators of socioeconomic stress and actigraphy-assessed sleep duration among college students. The study consisted of 263 undergraduate students (53% female; Mage=19.27 years) from a large research university in the southeast United States. Sleep was assessed through actigraphy, with a primary focus on sleep duration. Socioeconomic stress during childhood was measured through retrospective reports including the number of years on welfare, and financial strain, a three item measure which includes the family's ability to pay bills, how well off their family was, and how much money their family had at the end of each month. Regression analyses indicated significant associations between actigraphy-based sleep duration and both measures of financial strain and welfare status, such that higher exposure to socioeconomic strain during childhood was predictive of less sleep duration during college. These findings persisted after accounting for race, gender and age. The association between these measures suggests that there are complex relationships between individuals and their environments during childhood that influence sleep during the college years.

Title: Financial literacy and the choice of alternative financial services by underbanked and unbanked households
Primary Author: Nguyen, Nguyen T. H.
Additional Authors: Barth, James; Hartarska, Valentina; Hilliard, Jitka
Department: Finance
College/School: Raymond J. Harbert College of Business

Abstract:
Our paper examines whether financial literacy affects the use of alternative financial services (AFS) by households throughout the United States. AFS includes payday loans, auto title loans, pawnshop loans, tax anticipation loans, and rent-to-own services. Households are classified as unbanked if they do not have a bank account, while underbanked households use both banking services and AFS. The examination uses information from the FINRA Foundation's National Financial Capability Study (NFCS) surveys of financial literacy, data on the use of banking accounts and alternative financial services, and demographic characteristics of the households surveyed. Analysis of the data indicates that there are substantial differences across states in financial literacy and the percentages of households that are unbanked and underbanked. Of particular interest is the observed decrease in several measures of financial literacy over time. Our examination indicates that, on average, a more financially literate household is less likely to be unbanked, underbanked and more likely to be banked and not use AFS, controlling for various characteristics of households, the socioeconomic condition and the density of bank offices in the counties in which households are located. Also, we find that more financially literate households tend to use fewer types of AFS. Lastly, we find that financial literacy also affects the choice of different AFS. Our findings have both practical and policy implications regarding the importance of financial literacy in the choice of more costly alternative financial services by households. Of particular importance is the need to provide individuals at a fairly early age with a greater knowledge of various financial services that are available as well as the benefits and costs of each service.

Title: Physiological mechanisms regulating sperm motility initiation in eastern oyster, *Crassostrea virginica*

Primary Author: Nichols, Zoe G.
Additional Authors: Rikard, Scott; Hadi Alavi, S.M.; Bradford, Jordan; Walton, William; Butts, Ian
Department: Fisheries and Allied Aquacultures
College/School: College of Agriculture

Abstract:
Many oyster farms rely on seed produced at hatcheries via assisted reproduction. Hatcheries in the Southeastern US report poor larval production. Hatchery success can often be dependent on gamete quality. Unfortunately, there is limited information on gamete biology of the Eastern oyster, especially pertaining to males. Males and females release sperm and oocytes into the water column to be fertilized. Upon release, sperm is exposed to the external environment where physical and chemical properties of seawater affect sperm motility performance, which is a key determinant for fertilization success. Thus, providing the optimal environmental conditions will maximize sperm activity and fertilization success. The objective of our work was to determine the physiological mechanisms regulating sperm motility initiation in this species. Sperm swimming kinematics were evaluated by computer assisted sperm analysis (CASA), and curvilinear velocity (VCL) and percentage of motility were measured. Sperm were activated with artificial sea water (ASW) buffered to make a pH gradient from pH 6.5 to 10.5. Sperm were also activated across a range of salinities from 4 to 32 PSU. Na+, K+, Mg2+, and Ca2+ free ASW and their respective channel blockers were used to elucidate ionic signaling involved in sperm motility initiation. Results show that sperm motility was highest from pH 6.5 to 7.5 and salinity from 12 to 24 PSU. Compared to ASW, sperm motility was lower in Na+, K+, Ca2+, and Mg2+ free ASW. Moreover, sperm motility initiation was suppressed in the presence of K+ and Ca2+ channel blockers. These results show that environmental salinity affects sperm motility initiation and indicate that sperm motility initiation is Ca2+-dependent and require K+ exchange through plasma membrane. Our study provides insights into physiological mechanisms of sperm motility signaling in bivalves and provides valuable information to improve fertility in hatcheries and optimize cryopreservation protocols.

Title: Testing mechanical and hydrological soil strength effects of native Alabama vegetation along streambanks and roadsides
Primary Author: Niedzinski, Victoria M.
Additional Authors: O'Donnell, Frances; Calhoun, Jessica; Montgomery, Jack
Department: Civil Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Native vegetation is often planted along streams and roads for soil stability and erosion control. Riparian woody species are planted along stream banks during short-term restoration projects as the roots can contribute both mechanical and hydrologic effects. Soil alone is strong when dry in resisting compression forces but not pulling (tensile) forces. Initial research compared two common, native Alabama species of woody plants on their root system's ability to add mechanical strength and change soil hydrology. Stream bank microcosms were created and tested after 4 and 8 month intervals for root tensile strength and the crop evapotranspiration coefficient. The silky dogwood was able to grow thicker roots and provide stronger tensile stability while the black willow was able to dry out the soil faster, improving the hydrology of the microcosm. Current research is underway to determine vegetation that can provide similar hydrologic and mechanical strength to improve soil stability and decrease erosion along roadsides. A large test-area will measure different native grass/shrub species' ability to decrease sediment run-off and increase shear strength of the soil.

Title: Chemical tools for detecting protein lysine mono-methylation
Primary Author: Nwajiobi, Ogonna J.
Additional Authors: Monika, Raj
Department: Chemistry and Biochemistry
College/School: College of Sciences and Mathematics

Abstract:
Post-translational modifications (PTMs) of proteins like lysine methylation are covalent chemical markers responsible for mediating a variety of biological functions. Protein lysine methylation being a reversible process is controlled by a variety of lysine methyltransferases (KMTs) and lysine demethylases (KDMs). Dysregulation of lysine methylation has been linked to human immunodeficiency virus (HIV), cardiovascular diseases, multiple sclerosis, and cancers. There has been an increased research effort towards understanding in depth the significance of lysine methylation by mapping out its epigenetic role in development and diseases. However, the mainstay of these effort has employed the specificity of antibodies, mass spectrometric proteomics and most recently the use of small molecule sensors with each of them suffering from serious setbacks. More interestingly, there is no single chemical method reported in literature for detecting lysine mono-methylation. Here, we propose site-selective covalent methods for labelling of protein mono-methylation: the first involves using the classical Petasis reaction to chemo-selectively label mono-methylated lysines and fish them out of the proteome while the second method using involves using electron-rich diazonium salts to form stable triazene products. Our methods are chemo-selective, fast and works under physiological conditions.

Title: Assessing the disruptive nature of digitally-enabled food delivery on the US restaurant industry
Primary Author: O'Neill, Sorcha R.
Additional Authors: Bernard, Shaniel; Traynor, Mark
Department: Hospitality
College/School: College of Human Sciences

Abstract:
Digitally-enabled food delivery has emerged as the most disruptive force in the foodservice industry today. Increased consumer demand for convenience alongside the rapid pace of technological advancements are said to be the driving factors of this trend. As a result, restaurants have experienced a decrease in foot traffic, affecting the restaurant value chain. Specifically, the emergence of third-party delivery aggregators (TPDA) has led to an array of both opportunities and challenges for foodservice operators. Opportunities range from lower financial and logistical barriers, accessing new geographical markets, as well as the potential for increased sales volumes. However, it has been reported that service fees paid to the TPDAs by restaurants are consuming already slim profit margins. Other reported challenges include operational issues and lack of consistency of food and service quality. Hence, the decision to offer delivery services provides foodservice operators with an enigma, whether to use in-house delivery over contracting the services to a TPDA. While there is a growing number of industry publications highlighting the disruptive nature TPDA has on the industry, there is a noticeable gap in academic literature. This study aims to address this literature gap by exploring how the arrival of TPDA has impacted the restaurant value chain from the perspective of foodservice operators. A qualitative research approach is being used to explore the motivations to use TPDA, and the positive and negative impacts the emergence of TPDA is having on the foodservice industry. To date, 15 semi-structured interviews have been conducted with managers and owners of restaurants in the Southeast U.S. Data analysis involves an inductive thematic analysis of transcriptions of the interviews to identify themes and subthemes. The findings from this study will support foodservice operators in the decision-making process for selecting the most suitable form of food delivery.

Title: Improving drinking water systems in Haiti: a focus on training and technology
Primary Author: Ogisma, Lonege
Additional Authors: O'Donnel, Frances; Molnar, Joseph
Department: Technical Education and Engineering
College/School: College of Education

Abstract:
VIBRIO Cholera appeared in Haiti for the first time in recent history in October 2010. Recent epidemiological and molecular-genetic evidence point to the 2010 United Nations peacekeeping troops from Nepal as the source. The ensuing epidemic progressed rapidly, affecting all ten (10) departments in the country within one month. The presence of V. Cholera throughout the country has come under scrutiny because it has become a causative agent of waterborne and foodborne illness and numerous deaths in isolated outbreaks. Assessments of its present-day occurrence demonstrated that the microbe is present in all media including soil, water and air. The risk of exposure remains very high for Haitian families due to the presence at all levels in the environment and poor hygienic conditions at the household level. Transportation time and water sources analysis will be conducted in the field at different counties with significant grouping of the population in the Northern Corridor to measure the risk exposure related to any used water sources by households. The assessment of Cholera effects in the Northern corridor of Haiti though the accessibility to water testing services will be analyzed includes three main crucial factors: the road network, the populations in the counties, and the water sources available. For the road networks and the water sources, we intend to plot and enumerate in Google Earth (Google Inc., Mountain View). Water sources and roads enumeration consist of counting and marking visible road and sources of water on the Google Earth image with all the satellite images from Google Earth regarding transportation and water supply. All populations living in the Northern Corridor including North and Northeast departments according to the Institut Haitien de Statistique et d'Informatique (IHSI, 2019) publications will be considered. The goal of this paper consists of analyzing the risk exposure the disease and design training, organization, supply, and communication.

Title: The effect of a study abroad program on engineering student's perspective of art
Primary Author: Oldfather, Taylor W.
Additional Authors: Zabala, Michael
Department: Engineering; Education
College/School: Samuel Ginn College of Engineering

Abstract:
Modern American engineering has seen a large shift from an artistic and creative focus to strictly quantitative technical and science-driven work. This shift in focus has led students and faculty alike to lose value for work or concepts with limited tangible outcomes. This study focused on a four-week study abroad course 'Biomechanics and Engineering in the Arts' that took place in Florence, Italy, which educated students on the biomechanics and engineering associated with multiple forms of art. The purpose of the study was to determine whether exposure to art relating to engineering in a study abroad setting influenced their perspective on art in engineering. Participants included engineering students, eight men and eight women, from graduate and undergraduate programs (age = 19-26). A de-identified 15-question survey was given on the first and last day of the course. The questions were comprised of rating scale questions from one to 10, with 10 agreeing the most with the statement provided. The statements were on art and art in engineering. The pre-trip surveys were compared with the post-trip surveys with a two-tailed T-test with a 95% confidence interval. / Students significantly agreed more with three statements after the study abroad course. The first and second statements were 'I value art in my development as an engineer' (-3.6499<p <-0.1701) and, 'Exposure to the arts in engineering has made me a better engineer' (-4.4067<p< -0.4017). This change in opinion suggests exposure to art in their field of study enabled them to see the value of art in their own development as engineers. The third statement that was significantly different was, 'Ability to appreciate art leads to well-rounded engineers' (-3.266 <p< -0.114). This significant difference suggests the program changed their opinion on art applying to all engineers, not just themselves. The conclusion to these findings is that a study abroad course can improve student's opinions on art in engineering.

Title: Elucidating the anti-cancer effects (B cell lymphoma) of cannabinoids
Primary Author: Omer, Saba
Additional Authors: Boothe, Dawn; Mansour, Mohammed; Alghenaim, Fada; Pondugula, Satyanarayana; Dhanasekaran, Muralikrishnan
Department: Biomedical sciences
College/School: College of Veterinary Medicine

Abstract:
Aggressive B cell (Non-Hodgkin) lymphoma is the fifth leading cause of human cancer death, being characterized by one of the fastest growing mortality rates among cancers. B cell lymphoma is also one of the most commonly encountered neoplasms in dogs. Approximately 30% of human and 95% of canine B cell lymphoma tumours develop chemotherapy resistance. Novel strategies which might be effective against therapy-resistant lymphoma are needed. The anti-cancer effects of cannabinoids (CB) have been studied extensively in the last decade with evidence of potential efficacy demonstrated using various cancer models. The purpose of this study was to demonstrate the anticancer effects of CB in canine B cell lymphoma, which is strikingly similar to human B cell lymphoma. Canine B cell lymphoma cell lines 1771 and CLBL1 were cultured in RPMI. Expression of CB receptors was studied using qPCR. Since all cell lines expressed both CB receptors, cells were then treated with CB1 and CB2 receptor agonists (AEA, 2AG, CBD, THC, WIN and HU-210,) and antagonists (S16 and S28). Cell proliferation was assessed using MTT assay and oxidative stress and apoptotic makers of cell death were assessed using spectrophotometric and flurometric analysis. Data were analysed using one-way ANOVA (Prism®). Cell proliferation assay demonstrated significant dose dependent decrease in cell proliferation with all CB agonists except for 2AG. Biochemical analysis revealed a significant increase in nitrite and caspase activity in treated cells as compared to control. Our results suggest that cannabinoids have anti-proliferative and pro apoptotic effect on canine lymphoma cells and support the need for further studies providing evidence of efficacy against both human and canine B cell lymphomas.

Title: The paleolimnological reconstruction of two Coosa River reservoirs
Primary Author: Orndorff, Tristan L.
Additional Authors: Waters, Matthew
Department: Crops, Soils, and Environmental Sciences
College/School: College of Agriculture

Abstract:
Reservoirs are extremely important energy sources that provide tremendous benefits. However, reservoirs often trap large amounts of materials behind dam structures and change the natural biogeochemistry of river systems forever. This project aims to study the anthropogenic impacts of dams through time as rivers transform into wider regulated systems. Specifically, this study will focus on two major Alabama reservoirs on the Coosa River—Weiss Lake and Lay lake. Weiss Lake will be used as a spatial proxy to understand trans-boundary deliveries (GA-AL) through time and space, whereas Lay Lake will be used to understand trophic changes through time in multi-reservoir systems, given that it is known for being eutrophic and is over 100 years old. Multiple surface sediment samples and sediment cores will be collected from each reservoir using a ponar grab sampler and a gravity corer, respectively. The surface sediment samples will provide a comprehensive assessment of spatial distribution of materials deposited in each reservoir while the sediment cores will be used to reconstruct reservoir deposition and ecological change through time. The samples will be measured for nutrients, heavy metals, and photosynthetic pigments using paleolimnological techniques and analyses. Once this data is collected, it will be used to interpret reservoir succession, sediment transport, land use in the surrounding watershed, as well as water quality parameters for both reservoirs– temporally and spatially. Our findings will be used to aid the state of Alabama in producing a state-wide comprehensive water plan, as well as to provide recommendations for future reservoir management.

Title: Sampling for remote estimation through queues: age of information and beyond
Primary Author: Ornee, Tasmeen Zaman
Additional Authors: Sun, Yin
Department: Electrical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Recently, a connection between the age of information and remote estimation error was found in a sampling problem of Wiener processes: If the sampler has no knowledge of the signal being sampled, the optimal sampling strategy is to minimize the age of information; however, by exploiting causal knowledge of the signal values, it is possible to achieve a smaller estimation error. In this work, we generalize the previous study by investigating a problem of sampling a stationary Gauss-Markov process named the Ornstein-Uhlenbeck (OU) process, where we aim to find useful insights for solving the problems of sampling more general signals. The optimal sampling problem is formulated as a constrained continuous-time Markov decision process (MDP) with an uncountable state space. We provide an exact solution to this MDP: The optimal sampling policy is a threshold policy on instantaneous estimation error and the threshold is found. Further, if the sampler has no knowledge of the OU process, the optimal sampling problem reduces to an MDP for minimizing a nonlinear age of information metric. The age-optimal sampling policy is a threshold policy on expected estimation error and the threshold is found. In both problems, the optimal sampling policies can be computed by bisection search, and the curse of dimensionality is circumvented. These results hold for (i) general service time distributions of the queueing server and (ii) sampling problems both with and without a sampling rate constraint. Numerical results are provided to compare different sampling policies.

Title: Effect of different levels of whole corn inclusion in broiler diet from 14 to 42 days of age on productive and processing performance of broilers
Primary Author: Ovi, Fozol K.
Additional Authors: Starkey, C.; Rueda, M.; Pacheco, W.
Department: Poultry Science
College/School: College of Agriculture

Abstract:
Previous researches have suggested that inclusion of some whole grain can reduce grinding cost and improves broiler performance. The objective of this study was to evaluate the effect of different inclusion levels of whole corn prior to pelleting on broiler growth performance, processing yield and organ development from 14-42 d. A total of 1,000 male Ross × Ross 708 broilers chicks were randomly distributed among 4 treatments with 10 replicate pens per treatment and 25 broilers per pen. The treatments consisted of four inclusion levels of whole corn (0%, 3%, 6% and 9%). A common starter diet was fed in crumbled form from 1 to 14 d of age. Treatment diets were provided from 14 to 42 d of age as 4-mm pellets. Body weight (BW) and feed intake (FI) and feed conversion ratio (FCR) were measured at 14, 28, and 42 d of age. At 42 d, two birds from each pen were euthanized to determine relative weight of crop, proventriculus, gizzard, liver and ceca. 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 weight was determined. At 44 d, carcasses were deboned to determine breast meat weight and breast meat yield. Data were statistically evaluated using ANOVA and means were separated by Tukey HSD test. The inclusion of whole corn did not influence BW, FI, FCR, and relative organs weights (P>0.05) from 14 to 42 d of age. However relative proventriculus weight showed a negative linear relation(P<0.05) with whole corn inclusion. The 9% whole corn inclusion resulted a greater carcass yield (P<0.05) in broilers than 0% whole corn (77.86 vs 77.32%). Feed with 9% whole corn had a significantly higher pellet durability index (P< 0.05) than feed containing 0% Whole corn (61.12 vs 52.01). The results of this experiment indicated that up to 9% of whole corn could be used between 14 to 42 d with certain benefit on carcass yield.

Title: Numerical and experimental investigations of Wetumpka impact crater
Primary Author: Pacetta De Marchi, Leticia
Additional Authors: Agrawal, Vinamra; King Jr, David T.
Department: Geology
College/School: College of Sciences and Mathematics

Abstract:
Impacts are the most crucial process in the formation of the solar system, since planets and other solid bodies are considered to have formed by accretion of small objects through collisional processes. By studying craters on Earth, we can have a better understanding on how this process works on other planetary surfaces and thus improve our knowledge on the formation of our solar system. The process of impact cratering in marine target materials, which is the focus of this project, has been a topic of significant interest because of its connections to ancient oceans on other planetary bodies such as Mars. The Wetumpka impact crater, located in central Alabama, is a good candidate for this study, since it was formed in a shallow sea environment, approximately 85 million years ago, during the late Cretaceous. Using numerical simulations, field observation and experimental studies, this work aims to provide a better understanding of the formative process of Wetumpka impact crater. Simulations focus on how water depth, tsunami wave formation, and mechanical properties in the target can affect the cratering process. For the model, the impactor was considered as a granitic sphere of 400m in diameter and velocity of 20km/sec, and the target was made of three layers, granite as bedrock, 110 m quartzite, and uppermost sea water layer of different thickness (60 m and 125 m). Numerical results so far confirm geological observations in relation to emplacement of sedimentary infilling units and the collapse of the crater's rims by mass movements of target materials. To provide more accurate input values for material parameters, rock samples from Wetumpka's craters were collected and prepared for tensile and compressive tests, which are currently being analyzed.

Title: Peptide-Grafted Hydrogels for Selective Cell Capture and Endothelial Regeneration.
Primary Author: Paez, Mayra A.
Additional Authors:
Department: Chemical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Cardiovascular diseases (CVD) are one of the leading causes of death worldwide and the major one in the USA. Coronary artery disease (CAD) is one of the most common forms of CVD and is caused by atherosclerosis, which is characterized by a plaque buildup in the artery wall and involves inflammation and weakening of the endothelium. Surgical treatments for CAD include balloon angioplasty and coronary artery bypass graft, but these procedures entail a high risk of endothelial injury and further complications. Therefore, it is important to develop technologies that promote re-endothelialization. Endothelial progenitor cells (EPCs) have the potential to differentiate into vascular endothelial cells, consequently supporting the regeneration of the endothelium, which motivates the development of materials that allow capturing this type of cell. Commercially available alternatives involve the use of antibodies to capture EPCs from the bloodstream. Although they allow for increased rates of re-endothelialization, their main drawback is the lack of cell targeting specificity that can promote platelet binding and lead to thrombosis. Antibodies have complex structures and high immunogenicity that result in loss of activity and immunoreaction. Alternatively, peptides have high specificity, low immunogenicity and do not lose activity easily. In this study, previously identified peptide combinations were grafted on hydrogels to further understand their ability for selective cell capture. This was tested by platelet adhesion and endothelial colony forming cells (ECFCs) migration assays. These results provide insight into the use of different peptides to promote a more selective cell capture and proliferation for improved endothelial regeneration.

Title: The role of intermediary relationships to engage school stakeholders and support school wellness promotion
Primary Author: Page, Jamilah R.
Additional Authors: Parmer, Sondra M.; Funderburk, Katie; Reznicek, Erin; Struempler, Barb
Department: Nutrition
College/School: College of Human Sciences

Abstract:
Schools are a primary setting for targeting childhood obesity using school wellness initiatives. However, school wellness is an ongoing process requiring expertise, collaboration and support. The process can be overwhelming for school stakeholders wearing multiple hats. Local organizations are effective intermediaries for national organizations seeking to influence local change. Specifically, nutrition educators of intermediary organizations can be vital in providing the support, expertise and technical assistance in the revision of school wellness policies and practices related to nutrition and physical activity. The Alliance for a Healthier Generation (AHG) is a national organization committed to kids' development of lifelong healthy habits. Alabama SNAP-Ed at Auburn University, who specifically targets limited resource, low-income individuals, serves as an intermediary for the AHG Healthy Schools Program using its Quest for Healthy Schools initiative. Alabama SNAP-Ed at Auburn University partners with schools across 58 Alabama counties. SNAP-Ed educators engage school stakeholders and assemble a diverse group of school administrators, teachers, staff, parents, and community members as a School Wellness Committee. QHS supports the School Wellness Committee in completing and analyzing the AHG Healthy Schools Program School Wellness Assessment. Based on assessment findings, School Wellness Committees identified strengths and areas for improvement to develop and implement a School Wellness Action Plan. As a result, partnering schools have implemented various new wellness initiatives such as breakfast in the classroom, bike rodeos and school gardens. Therefore, intermediary relationships are a key component in influencing schools' policy, systems and environmental changes.

Title: Increased nitrous oxide emissions in East Asia as estimated by bottom-up and top-down approaches

Primary Author: Pan, Naiqing
Additional Authors: Tian, Hanqin; Xu, Rongting; Pan, Shufen; Thompson, Rona L.; Canadell, Josep G.; Jackson, Robert B.; Winiwarter, Wilfried; Zhou, Feng
Department: Global Change Ecology
College/School: School of Forestry and Wildlife Sciences

Abstract:
Nitrous oxide (N2O) is the third most important greenhouse gas. Since the early 1980s, East Asia (including China, Mongolia, Japan, South Korea and North Korea) has experienced rapid agricultural and industrial developments, accompanied by increased fertilizer use, manure application and atmospheric N deposition; however, the trend and drivers of the associated nitrous oxide (N2O) emissions in this region remain uncertain. Here we use bottom-up (BU: Terrestrial Biosphere Models, emission inventories, and statistical models) and top-down (TD: three inversion frameworks) approaches to estimate the magnitude and trend of N2O emissions in East Asia between 1980 and 2016 and quantify the contributions of different drivers. The results suggest that, for East Asia total emissions, the BU ensemble mean (1.7 Tg N-N2O yr-1) is close to the TD ensemble mean (1.6 Tg N-N2O yr-1) over 2007-2016. A similar large uncertainty range was also detected in BU (1.2-2.4 Tg N-N2O yr-1) and TD (1.1-2.1 Tg N-N2O yr-1) estimates. The anthropogenic emission was the major source, accounting for 85% of the total emissions, among which 'Direct effects of N addition to agriculture', 'Other direct anthropogenic sources', and 'Indirect effects of N additions from all sources' were three dominant contributors. In comparison, 'Natural soil emissions' only accounted for 15% of the total amount. During the study period, N2O emissions rapidly increased. All sectors except 'Natural soil emissions' had significant increasing trends. 'Direct effects of N addition to agriculture' made the largest contribution to the increasing emissions. Among all countries, China alone contributed 85% of the increase in N2O emissions. Our findings suggest that reductions in fertilizer use, manure application and fossil fuel burning, particularly in China, are critical for mitigating N2O emissions in East Asia.

Title: Effect of electrolytes on optical and mechanical properties of cellulose nanocrystal films
Primary Author: Parit, Mahesh B.
Additional Authors: Jiang, Zhihua
Department: Chemical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Cellulose nanocrystals (CNC) have attracted a great attention due to biodegradability, excellent mechanical properties, and natural abundance. CNC films can be used for optical applications due to its ability to self-assemble into chiral nematic liquid crystal phase with helical arrangement. The chiral nematic self-assembly of CNC can be fine-tuned by controlling the interaction between the CNC rods by the addition of electrolytes, polymers and application of sonication energy to the suspension prior to film casting. So far there are very few reports on the effect of electrolyte addition on CNC film optical and mechanical properties. In this study we have used electrolytes with various sizes (CsCl, NaCl), valencies (NaCl, CaCl2, AlCl3), pH (NaCl, NaOH); in the concentration range of 0.5 to 5 wt.%. The resultant films were characterized using UV-Vis spectra, XRD and tensile testing. Chiral nematic to isotropic transition concentration was dependant on the type of electrolyte. Notably for large size and higher valency of counter ion higher transition concentration was needed. Also, the transparency of the CNC films was electrolyte concentration dependant, which was maximum in certain concentration range. At lower electrolyte concentration CNC film retained iridescence while at higher concentration hazy film was obtained due to CNC aggregation and electrolyte precipitation. XRD results showed that the %crystallinity of pure CNC decreased with increase in electrolyte concentration. Addition of electrolyte also showed improvement in the tensile strength (upto 60%) and % strain (upto 170%) of CNC film. This may be due to the presence of ionic interaction between the sulfate ester groups of CNC and positively charged counter ions of electrolyte thereby improving the stress transfer between the rods. Moreover, the amorphous phase introduced at higher electrolyte addition can act as the energy dissipation binder phase thus effectively making the CNC films strong and flexible

Title: Capture and in-house utilization of carbon dioxide in pulp and paper manufacturing
Primary Author: Parkhi, Amod D.
Additional Authors: Cremaschi, Selen; Zhihua, Jiang
Department: Chemical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
In pulp and paper manufacturing, majority of Carbon Dioxide (CO2) released is of biogenic origin. In a Kraft pulp mill, Recovery boiler, Bark boiler and the limekiln are the largest sources of carbon dioxide. The recovery of the quick lime [CaO] from lime mud [Ca(OH)2] takes place in a rotary limekiln. In Limekiln, the lime mud is introduced uphill, feed end and slowly makes way to the downhill end. A burner on the downhill side burns the fuel. Carbon dioxide is released from the limekiln because of the calcination of calcium carbonate to CO2 and the combustion-related reactions. As a result, limekiln has the highest concentration of carbon dioxide as compared to other flue gases from the recovery boiler and the bark boiler. Carbon dioxide, depending on the mill-specific details such as the chosen practices and the raw material, also has very many applications in the pulp and paper manufacturing. Carbon dioxide can be used in the Tall oil manufacture, lignin manufacture, Precipitated Calcium Carbonate (PCC), pH control in the Brown Stock Washing and the stock preparation and in Near Neutral Bleaching. This research work focuses on capture of CO2 from the limekiln flue gas using conventional 30%wt. Monoethanol amine (MEA) solvent absorption process. ASPEN plus software is used to simulate the carbon dioxide capture process. We did a preliminary techno-economic analysis (TEA) for the CO2 capture process. We did a sensitivity analysis by varying the flue gas carbon dioxide concentration on the total overall capture cost. We observed a sharp decline in the capture cost for concentration change at lower flue gas carbon dioxide concentrations. Further, coupling the CO2 capture ASPEN plus flowsheet with a derivative-free optimization tool might provide an overall optimal configuration by minimization of the total capture cost.

Title: Manganese dioxide (MnO2) nanowire phase behavior and microstructure in various polar solvents
Primary Author: Parsons, Lindsey E.
Additional Authors: Hamade, Fatima; Bockhold, Mackenzie; Davis, Virginia A.
Department: Chemical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
The focus of this work is to investigate the phase behavior of manganese dioxide (MnO2) nanowires dispersed in various polar solvents. MnO2 nanowires were synthesized using a facile double-solvent synthesis method. The resulting materials were characterized using microscopy and spectroscopy techniques to further understand the material interactions and microstructure for alignment. Since the nanowires are anisotropic, they have the potential to form lyotropic liquid crystal phases with increasing concentration; such phases facilitate processing into highly aligned solid materials. However, poor nanowire-solvent interactions can result in the formation of isotropic flocs and aggregates which are detrimental to the manufacture of uniform materials. A range of MnO2 concentrations were then dispersed in ethylene glycol and dimethyl sulfoxide, which have been observed as favorable solvents for nanowire dispersibility. UV-vis spectroscopy was performed to quantify dispersion stability in ethylene glycol and dimethyl sulfoxide. Polarized optical microscopy was used to characterize the material microstructure and conveyed that MnO2 in ethylene glycol resulted in the most uniform dispersion and indicated presence of birefringence compared to other solvents. These findings were also in agreement with predictions based on Hansen Solubility Parameter calculations. Therefore, MnO2 in ethylene glycol will also be the focus for constructing a phase diagram. This work will enable understanding of how the dispersion microstructure can be linked to potential applications in aligned films, sensors and energy storage devices.

Title: ATLAS-N: mega-constellations attack and defense strategies with coevolutionary algorithms
Primary Author: Patel, Jay S.
Additional Authors: Somavarapu, Dhathri; Seals, Deacon; Tauritz, Daniel; Guzzetti, Davide
Department: Computer Science and Software Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
The idea of providing global connectivity from space using mega-constellations of Low Earth Orbit (LEO) satellites has become very popular in recent years and can benefit in environmental studies/protection, communication services, Internet services, etc. Over the past years, more and more nations and people rely on the services provided from the space through satellites has caused a new threat environment to the nations around the globe. An increasing threat for satellites in space directs attention to security problems such as taking control over satellites to perform an unusual activity, disrupting global coverage, destroying satellites, etc. The purpose of this study is to develop strategies that maximize the global coverage of mega-constellations against different types of attacks made to break the system. In this study, we develop a framework using Coevolutionary Algorithms (CoEA) to evolve defense strategies for the constellation system against various adversarial actions such as a cyberattack, physical attack, etc. Results are provided for several adversarial scenarios, demonstrating the effectiveness of our approach. These evolved attack and defense strategies can be helpful in the development of robust, reliable and secure mega-constellations systems on a global scale.

Title: Plant-based chemicals with lignin: exploring the effect of phenolation on product yields from lignin depolymerization
Primary Author: Patil, Vivek
Additional Authors: Adhikari, Sushil
Department: Biosystems Engineering
College/School: College of Agriculture

Abstract:
The demand for aromatic hydrocarbons will only go up in the future and crude oil resources can no longer ensure resource security for the world. Plant-derived lignin, an alternative source of chemicals, is gaining importance as the technologies for its valorization becomes available. Thermal depolymerization of lignin at a temperature of around 300°C provides a route to produce a variety of aromatic and phenolic renewable chemicals. However, lignin simultaneously undergoes re-condensation at such harsh conditions, resulting in a reduced yield of desired products. To tackle the challenge of unwanted reactions arising due to its complex structure, structural modification of lignin with a suitable reagent has been widely acknowledged as a promising pathway. Phenol, an aromatic molecule, easily obtainable from lignin itself, can modify the lignin structure by attaching itself to the reactive Cα and Cγ positions. Additionally, it also attacks the C4 position on the aromatic ring of lignin and acts as a scavenger for the lignin-derived reactive fragments. In this study, we explored these multiple functionalities of phenol by carrying out the 'phenolation' of Organosolv lignin prior to its depolymerization. There was a 57.1% increase in the total monomeric product yield on phenolation. The increase was found due to the newly formed phenoxyl group on the lignin structure, which improved the overall lignin reactivity, and subsequently its conversion. This led to a slight increase in char yields as well, which revealed the competing reactions of depolymerization and re-condensation that phenolation pretreatment enabled. Phenolation as a pre-treatment was found to be more effective than simply adding phenol to the lignin depolymerization medium. This study contributes to the prior knowledge of lignin functional group protection by exploring the use of phenol that can simultaneously attack three sites in the lignin structure.

Title: You can catch more flies with honey: benevolence as a potential mediator for rapport-building's effect on eyewitness reports
Primary Author: Peek, Jillian E.
Additional Authors: Carol, Rolando N.; Evans, Jacqueline R.; Arms-Chavez, Clarissa; Tidwell, Pamela
Department: Clinical Psychology; Law
College/School: College of Sciences

Abstract:
Rapport-building is a widely recommended investigative interviewing technique that has been shown empirically to improve eyewitness recall. However, relevant studies have yet to identify why this is so, or to systematically control the (potentially confounding) variable of interaction duration. This study explored benevolence as the mediator between rapport-building and eyewitness memory while fixing the interaction duration prior to the investigative interview to exactly three minutes. One-hundred and nine participants viewed a mock crime video and were interviewed in either a friendly or colder manner regarding the details of the crime. Results indicated that participants questioned by a friendly, rapport-building interviewer displayed significantly more self-reported and behavioral benevolence towards the interviewer than control participants did. Furthermore, while the rapport-building condition did not predict recall, higher benevolence was correlated with reporting more accurate, novel, and peripheral details. These data support benevolence as an explanatory mechanism for why building rapport improves eyewitness recall.

Title: The P2Y2 nucleotide receptor mediates tissue factor expression in human monocytes
Primary Author: Peng, Qianman
Additional Authors: Jianzhong, Shen
Department: Drug Discovery and Development
College/School: Harrison School of Pharmacy

Abstract:
Recently we reported that in human coronary artery endothelial cells, activation of the P2Y2 receptor induces up-regulation of tissue factor (TF), a key initiator of the coagulation cascade. However, it has been shown by others that monocyte TF is more important than endothelial TF in terms of provoking pro-thrombotic state. Thus, we aimed to study whether human monocytes express P2Y2 receptor and its role in control of TF expression. RT-PCR and receptor activity assays revealed that among the eight P2Y nucleotide receptors, the P2Y2 subtype was selectively and functionally expressed in human monocytic THP-1 cells. Consistent with this, stimulation of the THP-1 cells by ATP or UTP at micromolar concentration dramatically increased TF protein expression measured by Western blotting, which was abolished by AR-C118925XX, a selective P2Y2 receptor antagonist, suggesting a key role for P2Y2 receptor. In addition, UTP or ATP treatment induced a rapid accumulation of TF mRNA, which was maximal at 2h and preceded with an increased TF pre-mRNA, indicating enhanced TF gene transcription. However, we also observed a significant increase in TF mRNA stability after UTP and ATP treatment. Furthermore, activation of the monocyte P2Y2 receptor by a low dose of UTP or ATP (1μM) significantly activated the MAPK pathways including ERK1/2, JNK, and p38, along with their downstream transcription factors including c-Jun, c-Fos and ATF-2, whereas blocking the ERK1/2, JNK or p38 pathways respectively, all significantly suppressed P2Y2 receptor-mediated TF expression. These findings demonstrate for the first time that the P2Y2 receptor mediates TF expression in human monocytes through new mechanisms involving ERK1/2, JNK and p38, and that both transcriptional and posttranscriptional mechanisms contribute to a pro-thrombotic status in monocytes through the P2Y2-TF axis, highlighting monocyte P2Y2 receptor may be a new drug target for the prevention and/or treatment of thrombotic diseases.

Title: Comparison of algae growth in the presence of PGPB and non-PGPB bacteria
Primary Author: Peng, Haixin
Additional Authors: Bashan, Luz; Higgins, Brendan
Department: Biosystems Engineering
College/School: College of Agriculture

Abstract:
Microalgae are photosynthetic microorganisms with rapid growth and the potential for production of lipids, proteins, and carbohydrates. Our previous study found that plant growth-promoting bacteria (PGPB), such as Azospirillum brasilense, have significantly increased algal growth rates, driven in part through the secretion of the hormone indole-3-acetic acid (IAA). However, growth with live A. brasilense was significantly higher than growth in the presence of exogenous IAA. There are some other potential symbiosis mechanisms, such as cofactor exchange, dissolved O2-CO2 exchange in the algae coculture systems. In this research, we tested the impact of the plant growth promoting bacteria (PGPB) Azospirillum brasilense, Bacillus megaterium, and non-PGPB Escherichia coli cells on two green algae: C. sorokiniana and Auxenochlorella protothecoides. PGPB are typically found in the rhizosphere of plants and secrete hormones which are known to have impacts on certain green algae. We measured growth, biomass composition, nutrient uptake as well as algal photosynthate changes. Results showed that, all three bacteria stimulated growth in both algae types, but the effect was stronger in C. sorokiniana. They all led to significantly different compositional and nutrient changes. Our findings indicate that there was little difference in the growth-promoting effects of PGPB and non-PGPB bacteria calling into question the importance of plant hormones as a mechanism for symbiosis. For applications in algal bioprocessing, co-cultures can be deployed as part of a two-stage process. In the first stage, algae are grown with bacteria to maximize growth, and then they are transferred to a stress state to induce accumulation of target biomolecules (e.g., neutral lipid, starch).

Title: Teaching a simplified habit reversal to decrease the nail-biting and skin picking behavior of adolescents in a secure residential facility
Primary Author: Peters, Rachel J.
Additional Authors: Kimber, Peta L.; Almanza, Adam J.; McKinnell, Gabrielle; Brogan, Kristen L.; Rapp, John T.
Department: Applied Behavior Analysis
College/School: College of Liberal Arts

Abstract:
Simplified habit reversal has been effective in reducing undesirable repetitive habits for adults, children, and individuals with disabilities. It has been effective for decreasing habits such as nail-biting and skin picking. We investigated the utility of a simplified habit reversal procedure to reduce the nail-biting and skin picking behavior of three adolescents in a secure residential facility. The procedure included self-monitoring, awareness training, and contingent competing response training. Additional measures included mean nail length and a score on the VISIA Acne Severity Scale as rated by the facility nurse. The participants learned three to four different contingent competing responses, including sitting on their hands, putting their hands in their pockets, making fists, and crossing their arms. Results indicated all three participants decreased their self-reported rates of nail-biting and skin picking from baseline after implementing the simplified habit reversal procedures. For the participant monitoring nail-biting, mean nail length also increased after implementing the habit reversal procedures. For one participant monitoring skin picking, scores on the VISIA Acne Severity Scale improved. Scores stayed the same for the other participant, who was also released from the facility shortly after starting the habit reversal program.

Title: Five years of presidents united to solve hunger
Primary Author: Pfister, Luisa
Additional Authors: Powers, Alicia
Department: Hunger Solutions Institute
College/School: College of Human Sciences

Abstract:
PUSH (Presidents United to Solve Hunger) is a consortium of universities from around the world that have the collective mission to end hunger and poverty, both locally and globally. In February 2014 the Hunger Solutions Institute, in partnership with the Association of Public and Land-grant Universities (APLU) and the United Nations Food and Agriculture Organization (FAO), held a High Level interactive forum, "Shaping the Collective Role of Universities as a Partner in Ending Hunger" to determine how to better coordinate efforts to address these critical issues. A consensus outcome from that gathering, which drew 70 leaders from 30 universities in Canada, the United States and Latin America, was the Presidents' Commitment to Food and Nutrition Security, a statement outlining a number of initiatives spanning teaching, research, outreach, and student engagement that university leaders can implement as part of an action agenda to make food and nutrition security an institutional priority. Five years later, this commitment has been signed by more than 100 university presidents around the world. Throughout the fall of 2019, PUSH asked each signatory institution to inventory food and nutrition security, or "hunger-focused", activities in four areas: teaching, research, outreach, and student engagement, to highlight signatory institutions' best practices, identify areas for collective action, and compile a joint portfolio of activities.

Title: Modifying glutamatergic neurotransmission rectifies synaptic plasticity and memory deficits in a 3xTg Alzheimer's disease mode

Primary Author: Pfitzer, Jeremiah C.
Additional Authors: Pinky, Priyanka D.; Qureshi, Irfan A.; Berman, Robert M.; Suppiramaniam, Vishnu; Reed, Miranda N.
Department: Pharmacology
College/School: Harrison School of Pharmacy

Abstract:
Alzheimer's disease (AD) poses a public health crisis. There is an urgent need for effective treatments and disease-modifying therapies. Glutamate dysfunction is a core feature of AD, and glutamate is a validated target for treating AD. We tested a novel 3rd generation tripeptide prodrug of the glutamate modulator, riluzole, that offers improved bioavailability, safety, and dosing. In this preclinical study, we examined the effects of this drug on synaptic function using the triple transgenic (3xTg) AD model. 3xTg mice received the riluzole prodrug (25 mg/kg/day) from 5 -8 months of age. At 8 months of age, drug-treated 3xTg mice were compared to vehicle-treated 3xTg and nontransgenic controls for alterations in synaptic plasticity using acute hippocampal slices. Basal synaptic transmission was reduced by 50-60% in vehicle-treated 3xTg slices compared to controls, and treatment partially attenuated these basal synaptic transmission deficits. To determine if differences in basal synaptic transmission were related to presynaptic modifications, the probability of neurotransmitter release was examined by measuring paired pulse facilitation (PPF). PPF was significantly reduced in vehicle-treated 3xTg slices, indicating an increase in presynaptic release probability. Drug treatment restored PPF in 3xTg mice to that of controls. The amount of readily releasable pool (RRP) of synaptic vesicles was also significantly reduced in 3xTg mice, indicating increased vesicle docking. This treatment significantly increased RRP in 3xTg mice. We next measured long-term potentiation (LTP), a cellular correlate of learning and memory. LTP was reduced by 25% in vehicle-treated 3xTg mice compared to controls. Notably, drug treatment completely restored the synaptic plasticity deficits observed in 3xTg mice. These results suggest that this riluzole prodrug restores synaptic deficits in 3xTg mice and highlight its potential as a novel therapy for AD.

Title: Body anthropometrics affect hitting performance in baseball players
Primary Author: Phan, Johann A.
Additional Authors: Friesen, Kenzie; Downs, Jessica; Oliver, Gretchen
Department: Kinesiology
College/School: College of Education

Abstract:
Hitting is a major skill necessary for success in baseball. While other sports, such as cricket and golf, have correlated athlete anthropometrics with swinging/striking skills there are sparse data regarding anthropometrics and baseball hitting performance. Therefore, the purpose of this study was to examine the effects of arm length, bilateral shoulder and hip isometric strength (ISO) and range of motion (ROM) on batted ball performance. Nine youth baseball players (11.2 ± 1.3 yrs, 149.8 ± 9.6 cm, 51.1 ± 14.1 kg) participated. Participants were required to perform 10 maximal effort swings from a front tossed baseball. Batted ball data were measured using a ball tracking device (Yakkertech, Holand, OH). Performance measurements were batted ball spin rate, ball distance, launch angle, and ball speed. Four of ten trials were chosen for analysis by finding the average launch angle for all trials and by choosing the 4 closest to the mean. All data were considered normal and Pearson's correlation was used to determine significant relationships (p < 0.05). Data showed a strong positive correlation between height and ball speed (r2= .699, p = .036), as well as between mass and ball distance (r2= .717, p = .030), but no significant correlations between arm length or ROM/ISO and batted ball parameters. These results suggest there are many other intrinsic factors that can affect hitting performance. Of interest, ISO did not correlate with ball speed, emphasizing the importance of kinetic chain sequencing and efficient segment contributions above brute strength. Likewise, this lack of relationship also represents the inconsistency of ISO and lean mass development during the prepubescent stage in athletes, as well as the variance in skill level. Future research should be done in various populations with narrower demographics to determine correlations with anthropometrics and performance at certain levels of development.

Title: Elucidation of the mechanism of prenatal cannabinoid exposure mediated learning and memory deficits in offspring: identifying therapeutic targets

Primary Author: Pinky, Priyanka D.
Additional Authors: Bloemer, Jenna; Setti, Sharay; Heslin, Ryan; Du, Yifeng; Smith, Warren; Dityatev, Alexander; Dhanasekaran, Muralikrishnan; Reed, Miranda; Suppiramaniam, Vishnu
Department: Pharmaceutical Science
College/School: Harrison School of Pharmacy

Abstract:
Cannabis is currently the most commonly used illicit drug in the USA. 6-8% of pregnant women use cannabis to reduce morning sickness and improve appetite. Cannabis can cross blood placental barrier causing enduring alterations in synaptic circuitry of the fetal brain responsible for cognition and behavior. The aim of this study is to investigate the mechanism of learning and memory deficits due to prenatal cannabinoid exposure (PCE) in adolescent offspring. An osmotic pump filled with either vehicle or the cannabinoid receptor agonist WIN55,212-2 (2 mg/kg/day) was implanted subcutaneously at gestational Day-3 to deliver the drug until the pups were born. Open field test revealed no significant difference of PCE on the general locomotor activity of the offspring. Hippocampus based task contextual fear conditioning test revealed a significantly reduced freezing behavior in the PCE animals. Spatial memory test Morris water maze revealed the preference for the platform quadrant in control animals while the PCE animals did not show any preference during the probe trial. Electrophysiological experiments on hippocampal slices showed impairment in synaptic plasticity parameters including long term potentiation (LTP) and long-term depression. These impairments were dependent on the change of glutamate receptor subtype NMDA channel activity. An increase in cannabinoid receptor type 1(CB1) expression followed by reduced neural cell adhesion molecule (NCAM) and polysialylated NCAM (PSA-NCAM) expression have also been observed. Later, LTP in the PCE group has shown to be improved by using a PSA-mimetic compound. Thus, we hypothesize that the observed cognitive deficits were due to altered NMDA mediated glutamatergic neurotransmission due to reductions in the signaling through NCAM/PSA NCAM. Understanding this specific NCAM/PSA NCAM-NMDA interdependent signaling cascade will lead to an identification of a specific therapeutic target to improve PCE mediated memory deficits.

Title: Physical dynamic soil properties in a Fall Line Hills ecological site
Primary Author: Platt, Jenna S.
Additional Authors: Shaw, Joey
Department: Soil Science
College/School: College of Agriculture

Abstract:
The Ecological Site (ES) concept groups soils that respond similarly to management for developing site interpretations, models for ecological transitions and responses to change, and restoration pathways to meet conservation goals and improve land management. The USDA-NRCS and cooperators are classifying lands into ESs; therefore, research utilizing the ES concept is timely. Dynamic soil properties (DSPs) are near-surface properties that respond to management and are critical to soil function and ecosystem services. The National Cooperative Soil Survey is developing methodologies to characterize and inventory DSPs, and the ES framework may provide a valid approach. In this study, we are developing an ES for Longleaf Pine (Pinus palustris) -Bluestem (Schizachrium scoparium and Andropogon spp.) systems in the Alabama Fall Line Hills region, and subsequently characterizing and inventorying DSPs within the ES. The reference state is relatively undisturbed Longleaf Pine and Bluestem sites; alternate states include row crop, pine plantation, and pasture sites. The soil components in the ES have been described, sampled, characterized, and verified to be Kanhap- and Kandiudults with sandy surfaces, loamy subsoils, and low activity mineralogy. Measured soil physical DSPs include bulk density, aggregate stability, clay dispersion ratio, and other properties critical to soil function will be discussed. Preliminary results show differences in DSPs based on reference and alternate states of the ES. Project outcomes include a USDA approved ES, and characterization and inventory of DSPs for these ecosystems.

Title: Factors influencing patients' willingness to pay for disease-modifying therapies for multiple sclerosis

Primary Author: Poudel, Nabin
Additional Authors: Ngorsuraches, Surachat
Department: Health Outcomes Research and Policy
College/School: Harrison School of Pharmacy

Abstract:
This study examines factors influencing patients' willingness to pay (WTP) for disease-modifying therapies (DMTs) for multiple sclerosis (MS). Data were obtained from a survey study of 1,200 U.S. patients with MS on their preferences and WTP for DMTs conducted in 2017. Patient's socioeconomic variables (i.e., age, gender, race, marital status, education, employment status, comorbidity, health status, and health insurance) and MS experiences (i.e., number of years with MS, MS type, number of relapses, fatigue, mood-change, MS symptom, and DMT experience) were investigated as influencing factors. Patient's WTP for a DMT was based on one question. A two-part model was estimated using logistic regression and generalized linear regression. Data from 480 patients were analyzed. Their average age was 55 years old. Most of them were female (79%), white (97%), and married (71%). Approximately 46% of them were employed, 59% enrolled in private insurance, 74% had four-year college degrees or higher, 73% considered themselves having good or better health status, and 56% had more than two comorbid conditions. Approximately 63% of them had MS for more than 10 years, 44% had at least one relapse in last two years, 89% experienced fatigue, and 37% experienced mood-change. Most of them had relapsing-remitting MS (66%) and moderate disability or worse (62%). The average WTP for a DMT was $150 per month. Patients with graduate degrees or higher and patients with no fatigue were less willing to pay for DMTs. Patients, who were female, non-white, or uninsured, and patients, who had lower education level, had more than three comorbid conditions, had relapsing-remitting MS, or had used but discontinued DMTs were willing to pay less for DMTs. Various patient's socioeconomic variables and MS experiences, including gender, race, education, health insurance, fatigue, comorbidity, MS type, and DMT experience, influenced patients' WTP for DMTs.

Title: Elucidate the anti-melanoma effects of a polyphenolic compound (Hispolon) derived from *Phellinus linteus*

Primary Author: Poudel, Ishwor
Additional Authors: Alsaqr, Ahmed; Annaji, Manjusha; Majrashi, Mohammed A; Dhanasekaran, Muralikrishnan; Arnold, Robert; Babu, R. Jayachandra
Department: Pharmaceutical Sciences
College/School: Harrison School of Pharmacy

Abstract:
Background: There is a great need for developing novel, safe and effective drugs for the treatment of melanoma. Hispolon is a small molecular weight polyphenol derived from *Phellinus linteus*, which has hepato-protective, antioxidant, anti-inflammatory and anti-proliferative activities. Hispolon has been reported to induce apoptosis in gastric cancer, hepatocellular carcinoma, and myeloid leukemia. However, its anti-proliferative activity in the melanoma is not clear. Objectives: To elucidate the anti-proliferative activity (cytotoxic effects) of hispolon on melanoma cells. Material and Methods: B16BL6 cells were treated with different concentration of Hispolon for 24 hours. MTT assay and Fluorescein diacetate (FDA)/ propidium iodide (PI) dyes based assay were preformed to measure the anti-proliferative activity of Hispolon. Fluorimetric method using DCF dye was used to measure ROS. Nitrite levels were measured spectrophotometrically at 545 nm. Lipid peroxide content was measure calorimetrically using Thiobarbituric acid. Mitochondrial Complex-I and Complex-IV activities in the control and Hispolon treated cells were measured using a spectrophotometric method. Caspase 1 and 3 activities were measured by fluorimetric method. Results: Hispolon is a potent generator of reactive oxygen species, stimulates nitrite and lipid peroxide levels, significantly inhibits the expression of bcl-2 and promotes the expression of Bax, increases the activity of caspase; inhibits mitochondrial Complex I and IV. Future studies: We are further investigating the in vivo mechanisms of chemotherapeutic potential of hispolon.

Title: Assessment of angle of repose as a tool to measure the flowability of different particle size ground corn with and without added soybean oil
Primary Author: Presume, Marc R.
Additional Authors: Sandoval, Jorge L.; Abascal-Ponciano, Gerardo A.; Calderon, Allan J.; Patino, Danny B.; Ordonez, Kevin E.; Avila, Luis P.; Leiva, Samuel F.; Flees, Josh J.; Pacheco, Wilmer J.; Sarkey, Charles W.
Department: Food Science
College/School: College of Agriculture

Abstract:
Flowability (FLOW) is an important factor in feed manufacturing that can impact batching time and transportation. FLOW in ground corn is often affected by particle size (PS), relative humidity and bulk density. One method to assess the FLOW of a material is to measure the angle of repose (AOR), which is the angle formed between the horizontal and the slope of a pile. The objective of this study was to assess the effects of PS and soybean oil (SBO) addition on AOR, and thus FLOW, of ground corn. A randomized complete block experiment with an 8 x 6 factorial treatment structure with 3 replicates per treatment was conducted. Corn was ground using a two pair roller mill at 8 different roller settings to produce samples with mean PS of 693, 882, 968, 1,750, 1,877, 2,826, 2,911, and 3,343 µm. Then, SBO was added to sample of each PS to achieve 0, 2, 4, 6, 8, and 10% fat. A transparent box with a 50.80-mm opening was used to determine AOR and 200-g of sample was poured into the box using a funnel with a 31.75-mm opening. Then, the right and the left angles of the pile were measured with a protractor to determine the AOR for each sample. Data were analyzed using GLIMMIX procedure of SAS (V.9.4) and means were separated using the PDIFF option at $P \leq 0.05$. An interaction was observed between PS and SBO additions (P < 0.0001). For samples containing no added SBO, the AOR did not differ for any PS (P < 0.0001). In every case, increasing additions of SBO increased the AOR (P < 0.0001). For corn with PS of 882, 968, 1,750, 1,877, 2,911, and 3,343 µm, AOR was similar but was differed for 693 and 2,862-µm PS (P < 0.0001). Increasing SBO addition from 8 to 10% increased AOR at every corn PS except 3,343 µm (P < 0.0001). In conclusion, a consistent increase in AOR was observed as SBO additions increased. With no added SBO, the AOR was similar among corn samples with all PS (P > 0.05). Overall, based on their lower AOR, FLOW was enhanced in samples with smaller PS and less SBO.

Title: Efficacy of integrated weed management in peanut and cotton systems utilizing high residue

Primary Author: Price, Katilyn J.
Additional Authors: Li, Steve; Browne, Frances; Langemeier, Ryan
Department: Crop, Soil, and Environmental Sciences
College/School: College of Agriculture

Abstract:
As herbicide resistant weeds continue to emerge and spread, alternative non-chemical control methods integrated into current control programs need to be evaluated. Few studies have been conducted to determine the effectiveness of residual herbicides sprayed onto cover crop residues compared to conventionally tilled systems. The overall objective of this trial was to determine if residual herbicides reach the soil surface providing benefits in a system utilizing high residue cover crop by measuring percentage of weed control, weed population counts, the length of weed control and weed biomass compared to conventionally tilled system. Field trials were conducted in Henry and Macon County in Alabama in 2019. Peanut treatments included; acetochlor 1,260, flumioxazin 107, diclosulam 26, S-metolachlor 1,700 g ha-1, conventionally tilled non-treated check (NTC) and high residue NTC. Cotton treatments included; fluridone 168, acetochlor 1,260, fomesafen 280, fluometuron 1,680 g ha-1, conventionally tilled NTC and high residue NTC. Overall, total weed biomass in peanut plots with high residue cover and soil residual herbicides had significantly reduced weed biomass of 34%-89% compared to conventionally tilled NTC. Flumioxazin and diclosulam with high residue had the highest amount of weed biomass reductions of 89% and 82% respectively, compared to the conventionally tilled NTC in peanut. In cotton, all treatments including high residue NTC had significantly reduced weed biomass from 45-70% reductions compared to conventionally tilled NTC in Henry County. However, in Macon County, no herbicide treatment in combination with high residue or in conventionally tilled plots were significantly reduced from the conventionally tilled NTC in cotton. The combination of residual herbicides with a high cover crop residue provided more effective weed control overall compared to the conventionally tilled NTC meaning some residual herbicides are reaching the soil surface.

Title: Superstitions and student connections
Primary Author: Ptak, Shelby
Additional Authors: Fisher, Emma; Driskell, Sara
Department: Psychology
College/School: College of Liberal Arts

Abstract:
Every university has their own superstitions and legends, but these are typically seen as artifacts of student lore. In this work, we examine the relationship between belief in Auburn's superstitions and students' connections to Auburn. In a large student survey, participants (N=498) were asked to report how much they believe in the superstition that if they step on the Auburn seal, they will not graduate in four years, among other consequences. In addition, participants rated their likelihood of returning to visit campus and donating after graduation. They also completed their demographic information. We found that women students were significantly more likely to believe in the seal superstition than men students. We also found that younger students (i.e., freshmen and sophomores) were more likely to believe in the seal superstition than older students (i.e., juniors and seniors). We also analyzed the correlations between these beliefs and students' connections to Auburn. We found significant positive correlations between students' belief in the seal superstition and their interest in coming back to campus after graduation, their likelihood of donating after graduation, and their feelings of belonging on campus. This suggested that students who believe more strongly in the seal superstition reported a greater connection to Auburn through these variables. This research suggests that exploring students' beliefs in campus superstitions and legends could provide and important clue into their wellbeing on campus and their future connections to campus as engaged alumni.

Title: Metacognitive awareness in Spanish healthcare translation
Primary Author: Putz, Abigail N.
Additional Authors: Gutiérrez-Kerns, Jana
Department: Foreign Languages
College/School: College of Liberal Arts

Abstract:
Language barriers often present obstacles to patients and providers in healthcare settings. With these language barriers, patients may unintentionally receive lower levels of care due to the lack of proper language resources. Many times, these language resources are provided through the means of a translator. Translators may translate patient in-take forms, patient resources, or general practice policies all of which help the patient. However, the techniques of translation often take time to develop, and it is well known that many times a perfect translation does not exist. This is seen in the everyday phrase, "lost in translation." Often, translation requires specific technical terminology in order to translate effectively in a specific field. Only through repetition and practice can translators improve the accuracy and efficiency of their translations. In this study, typical healthcare documents such as clinic policies and medical history forms were translated from English to Spanish at the non-profit healthcare clinics of Women's Hope and Mercy Medical Clinic located in Auburn, AL. Through translating these documents, a single student translator measured improvement over two semesters in the medical translation sector using three metrics. Sofer's "Translation Self-Evaluation" was used to self-determine the level of translation skill improvement over the two semesters. Larson's "Continuum of Translation" and Child's "Beautiful-Faithful Matrix" were also used to measure the quality of the translations over time. Each of these metrics was used to raise metacognitive awareness of the student's translation abilities in order that the student may evaluate what she is or is not capable of translating in the future.

Title: Impact of image resolution on quantification of mineral properties and simulated mineral reactions and reaction rates
Primary Author: Qin, Fanqi
Additional Authors: Beckingham, Lauren
Department: Civil Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
CO_2 sequestration in geological formations has great potential for CO_2 storage, where ultimately CO_2 is mineralized through geochemical reactions. Reactive transport modeling can be utilized to simulate these complex reactions. However, large variations in the estimated reactive surface area can yield very different results. Imaging has emerged as a powerful means of quantifying mineral properties including porosity, abundance, accessibility and accessible surface area which can be used to inform reactive transport modeling. It has been proven in previous work that accessible surface area better reproduced the observed dissolution rates in core-flood experiments and is quantifiable from images. However, the impact of image resolution on the estimated mineral properties is unknown. In this work, the impact of image resolution on estimated mineral properties is evaluated. Scanning electron microscopy images were captured under varying resolution from 0.34 to 5.71 μm for a sample extracted from the Paluxy formation at Kemper County, Mississippi. Mineral abundance and porosity quantified from images agreed relatively well with changing resolution. Mineral accessibility and accessible surface areas were also estimated. The accessibility of mineral phases with small-scale features decreases with decreasing resolution while variations in estimated accessible surface area are less than 1 order of magnitude. Image obtained data were used in CrunchFlow to simulate the CO_2-incduced reactions. Observed variations in accessible surface areas had small impact on the simulated reactions. Simulations were also carried out using specific surface areas and geometric surface areas and produced results with large discrepancies. Each mineral phase was impacted by surface area variations to a different extent. Reactive phases (e.g. carbonates) were mostly impacted by surface area at short times while the more stable phases (e.g. feldspars and clays) were impacted at longer times.

Title: Depression, anxiety and sleep quality in college students
Primary Author: Rager, Jillian P.
Additional Authors: Swiney, Caroline; Turano, Alexandra; Lumsden, Julie; Mitchell, Taylor; Smith, Iyanah; Kieffer, Sophia; Lust, Sarah
Department: Psychology
College/School: College of Liberal Arts

Abstract:
Sleep is important for cognitive function and well-being, however at least one study has found that nearly 60% of college students complain of poor sleep quality. Similarly, another study found that 70% of students obtain less than 8 hours of sleep, which is considered the optimal amount, on average, for adults. Research shows that sleep loss in college students is associated with a lack of sleep hygiene, lack of knowledge on circadian physiology, and the overuse of technology and substances. Unfortunately, anxiety and depression can also have a negative effect on individuals' ability to obtain a healthy amount of sleep. College students may experience particularly high levels of stress and anxiety as they attempt to manage personal relationships, navigate high academic expectations, and balance the pursuit of extracurricular activities such as sports or personal obligations. For these reasons, this study focused on perceived stress, anxiety and depression as the strongest predictors of sleep quality. Participants (n=39 college students) completed a questionnaire that asked about their sleep quantity and quality. The questionnaire also explored the extent to which their sleep was affected by stress, anxiety, and depression. A negative correlation was found between the occurrence of anxiety, depression, and average amount of sleep. There was not a significant correlation between the level of stress and the average amount of sleep. These preliminary results suggest anxiety and depression may play a stronger role in affecting sleep quality than perceived stress, however more research is needed. Ongoing data collection will also incorporate how social media use may be impacting mental health and sleep quality among college students.

Title: Co-pyrolysis of poultry litter and eucalyptus biomass by fast pyrolysis technology in fluidized bed reactor
Primary Author: Rahman, Tawsif
Additional Authors: Adhikari, Sushil
Department: Biosystems Engineering
College/School: College of Agriculture

Abstract:
Co-pyrolysis technique offers joint valorization of multiple feedstocks by thermal decomposition process without oxygen.In this study, the co-pyrolysis process of poultry litter and eucalyptus as a woody biomass was performed via fast pyrolysis approach with different blends from 0-50% poultry litter along with 50-100% eucalyptus ratio. Fast growth rate with low nitrogen and ash content has made eucalyptus hardwood a promising candidate for pyrolysis process. Thermal decomposition of poultry litter is an environment friendly way to reduce this hazardous waste. A fluidized bed reactor was used for the fast pyrolysis of these blends at a temperature of 500℃ under nitrogen flow. Yields of the liquid, solid(char) and gaseous product fractions were calculated from the co-pyrolysis of each blend. Higher heating values of liquid yields were determined using an oxygen bomb calorimeter, and GC–MS was used to identify the compounds in the liquid products. The increasing amount of nitrogen in solid char products with increasing poultry litter ratio in blends was confirmed by elemental analysis. FTIR techniques were used to study the functional groups of the products, and the effect of blend ratios on thermal stability was investigated through thermogravimetric analysis (TGA) in a nitrogen environment. A significant increase in thermal stability was found in char products from higher poultry litter ratio blends. The results have indicated the potential use of poultry litter in woody biomass blends to increase the nitrogen amount with inflammability in solid char products which can be used as binding component of eco-friendly, fire-resistant composite materials.

Title: Geochemistry of groundwater and naturally occurring pyrite in the holocene fluvial aquifers in Uphapee Watershed, Macon County, Alabama
Primary Author: Rahman, Md Mahfujur
Additional Authors: Lee, Ming-Kuo; Uddin, Ashraf
Department: Geosciences
College/School: College of Sciences and Mathematics

Abstract:
Naturally occurring biogenic pyrite has been found in Holocene fluvial aquifers in Uphapee watershed, Macon County, Alabama. Pyrite grains were naturally formed and developed as large (20-200 μm) euhedral crystals (i.e. cubes, octahedron) and none-framboid aggregates. The electron microprobe (EMP) analysis showed that the pyrite grains contain 0.20-0.92 wt% of arsenic (As). The scanning electron microscope and energy dispersive spectroscopy (SEM-EDS) analysis confirmed a similar level of As concentration in pyrite that was consistent with the EMP analysis. The SEM analysis also confirmed the presence of additional trace elements such as cobalt (0.19 wt.%), and nickel (0.15 wt.%), indicative of pyrite's capacity to sequester As and other metals. The XRF analysis of the collected lignitic wood (from the wells) also showed the presence of As. However, the ICP-MS analysis showed that groundwater As level was not high and it was within the EPA drinking water standards (<10 ppb). These results indicate that dissolved As is sequestered in naturally formed pyrite found in the fluvial sediments. Groundwater geochemistry data indicate a redox sequence of oxidation, Mn(IV) reduction, Fe(III) reduction, and sulfate reduction along the flow path in fluvial aquifers. The down-gradient increases in dissolved Mn and then Fe concentrations reflect increased Mn(II) and Fe(II) production via microbial competition as the aquifer becomes progressively more reduced. Bacterial sulfate reduction seems to dominate near the end of the groundwater flow path as the availability of Mn- and Fe-oxyhydroxides becomes limited in sediments rich in lignitic wood where increased sulfate-reducing activities, leading to the formation of biogenic pyrite. The groundwater is a Ca-SO4 type, is not SO4-limited, thus sulfate may serve as an electron acceptor for the bacterial sulfate-reducing reactions that sequester As into pyrite, which in turn results in very low groundwater As concentration (≈1-2 ppb).

Title: Synthesis and characterization of ultra-small ferrite nanoparticles as T1- weighted MRI contrast agents

Primary Author: Rahmati, Shiva
Additional Authors:
Department: Chemical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Magnetic resonance imaging (MRI) is a powerful noninvasive imaging modality which has been widely used in cancer imaging because of its excellent spatial resolution, good anatomical information, high tissue penetration and soft tissue contrast, real time monitoring and also the use of non- ionizing radiation. The low sensitivity of MRI in differentiating healthy and malignant tissues could be highly improved by employing contrast agents and enhancing the contrast of abnormalities such as cancer cells. In general, MRI contrast agents are divided into two groups: T1- weighted (positive) contrast agents inducing brighter images of the tumor area by reducing the protons' (H+) longitudinal relaxation times and T2- weighted (negative) contrast agents inducing darker MRI images by shortening the protons' transverse relaxation times. Due to the risk of nephrogenic toxicity associated with conventional Gadolinium (Gd)- chelates as T1- weighted MRI contrast agents and also the difficulty associated with distinguishing between the dark areas caused by the T2- weighted contrast agents and other pathogenic conditions such as metal-deposits, calcification, internal bleeding, or air-tissue boundaries, ultrasmall metal ferrite nanoparticles (MFe_2O_4) including Fe_3O_4, $MnFe_2O_4$ and $ZnFe_2O_4$ have received considerable attention as T1- weighted MRI contrast agents. Therefore, the aim of this study is to synthesize and characterize various ferrite nanoparticles as T1- weighted MRI contrast agents under different synthesize conditions to come up with efficient MRI agents.

Title: Can plant-soil biotic interactions improve prairie restoration under drought conditions?
Primary Author: Rainey, Raegan E.
Additional Authors: Longmeyer, Jacob; Becknell, Rachel; Stein, Claudia; Mangan, Scott
Department: Environmental Sciences
College/School: College of Sciences

Abstract:
Native tallgrass prairies provide important ecosystem services, including water and air purification, erosion mitigation, biofuel and food production. However, less than 4% of the original 170 million-acre range in North America remains and prairie restorations often fail, becoming overgrown with less desirable species such as invasive weeds. Investigating the ecological drivers of prairie community dynamics, and how they might change under changing climate conditions, is therefore crucial for conservation and restoration efforts. Symbiotic associations between plants and arbuscular mycorrhizal fungi (AMF) are important to plant health, and can provide nutrients, drought tolerance, and disease resistance. However, the presence and quality of AMF communities may vary greatly between undisturbed prairies and the degraded crop land where restorations typically take place. It is important to elucidate how AMF presence varies among different soil sources and what effect that may have on prairie plant growth and health. In the face of global climate change, it is also important to look at how these associations may be altered under drier conditions, ultimately affecting the success of prairie restorations. To address these questions, we grew seven species of prairie plants in a greenhouse experiment in three different soil inocula: old agricultural field, remnant undisturbed prairie, and sterile soil. All plants were grown under well-watered and under drought conditions. We measured plant growth and AMF colonization rates in the roots. Our preliminary results show higher AMF colonization rates and higher biomass in plants inoculated with remnant prairie soil compared to old agricultural soil. The findings of this study could lead to improved prairie restoration techniques. By inoculating old agricultural fields with remnant prairie soil 'probiotics', we might increase prairie restoration success rates.

Title: Validation of C-FAST: campus food aid self-assessment tool
Primary Author: Rains, Sara A.
Additional Authors: Powers, Alicia; Emison, Brytni; Thornton, Kate
Department: Nutrition
College/School: College of Human Sciences

Abstract:
A recent Government Accountability Office report revealed approximately 30% of undergraduate students are food insecure. While much research is being conducted to determine food insecurity prevalence in the college student population, little research is being conducted on best practices to address food insecurity on college campuses. The purpose of this project is to develop and validate the Campus Food Aid Self-Assessment Tool (C-FAST). The C-FAST measures six dimensions within campus food aid culture and resources: campus culture and awareness of food insecurity; student services and supports; involvement; advocacy; education and training; and research, scholarship, and creative works. For each dimension, a campus self-determines level of performance using progressive responses. To validate C-FAST, researchers conducted interviews of five experts in the area of campus food insecurity and assessment/evaluation. Researchers utilized purposive sampling to identify and recruit experts. Interviews are underway via in-person or virtual conversations using a script of planned questions. Researchers will conduct thematic analysis to determine revisions to the C-FAST. Following revisions, cognitive interviewing and beta testing will be conducted in Spring and Summer 2020 to complete validation of C-FAST. Themes from expert interviews and the revised C-FAST will be presented.

Title: One electron oxidation of alkanesulfinates
Primary Author: Rajakaruna, Pradeepa
Additional Authors: Stanbury, David
Department: Chemistry
College/School: College of Sciences and Mathematics

Abstract:
The aqueous oxidation reactions of L-cysteinesulfnic acid (CSA) and methanesulfinate (MSA) with one electron oxidants Ni(tacn)2(ClO4)3 and Os(phen)3](CF3SO3)3 are described in this study. Reaction kinetics are observed at 25 oC, μ = 0.1 M (NaCl), under anaerobic as well as aerobic conditions. The reaction is slower under aerobic conditions and in the presence of O2 compared to at anaerobic conditions. Kinetic data is collected on a stopped flow apparatus equipped with a UV-Vis spectrophotometer. The reactions with Ni(III) as the oxidant are monitored at by following the decay of absorbance at 312 nm. For the reactions with Os(III) as the oxidant, absorbance increase at 610 nm is observed. Under pseudo-first-order reaction conditions both the oxidation reactions with Ni(III) as well as CSA oxidation by Os(III) show first order dependence on [oxidant]0, and [alkanesulfinate]TOT, with mild inhibition by the reduced form of the oxidant. In Os(III) reaction with MSA, strong inhibition by Os(II) is observed requiring the presence of a spin trap to obtain good first order fits under pseudo-first-order reaction conditions. In all four reactions, alkanesulfonyl radical is formed during the first electron transfer step consequently yielding the corresponding sulfonate as the major sulfur containing product.

Title: Evaluating the oxidative stress and mitochondrial functions in aging goat testis
Primary Author: Ramapuram, Hariteja
Additional Authors: Majrashi, Mohammed; Fujihashi, Ayaka; Beamon, Haley; Almaghrabi, Mohammed; Fadan, Maali; Fahoury, Eddie; Jackson, Caroline; Govindarajulu, Manoj; Bradford, Chastity; Bolden-Tiller, Olga; Dhanasekaran, Muralikrishnan
Department: Drug Discovery and Development
College/School: Harrison School of Pharmacy

Abstract:
Recently, there is a significant increase in the commercial use of goat products. Nevertheless, there are very few reports on the characterization of biomarkers of oxidative stress and mitochondrial function in the goat testis. Therefore, in the current study we studied the markers of oxidative stress and mitochondrial functions in the goat testis during the process of aging. Alterations in the markers of oxidative stress (contents of reactive oxygen species, nitrite, lipid peroxide, protein carbonyl, glutathione and activities of glutathione peroxidase, monoamine oxidase) and mitochondrial function (Complex-I and Complex-IV activities) were elucidated during the process of aging. Augmented oxidative stress and decreased mitochondrial function were prominent during aging in the goat testis. Aging can lead to induction of oxidative stress and decreased production of ATP; however, the proxidants generated must be effectively removed from the body by the innate antioxidant defense system to minimize the damage to the host tissue. Conversely, the antioxidants cannot completely scavenge the excessive amount of reactive oxygen species produced during aging or pathological conditions leading to significant cell death and tissue damage. Thus, use of effective and potent antioxidants in the feed could significantly reduce oxidative stress and improve mitochondrial function, resulting in enriched goat health.

Title: Lysophosphatidic acid (LPA)-induced tau hyperphosphorylation through p38 MAPK
Primary Author: Ramesh, Sindhu
Additional Authors: Ramesh, Sindhu; Dhanasekaran, Muralikrishnan; Moore, Timothy
Department: Drug Discovery and Development
College/School: Harrison School of Pharmacy

Abstract:
The number of Alzheimer's disease (AD) cases – currently estimated to be greater than 5.4 million – is predicted to rapidly increase in the coming decades. Current AD treatments provide, at best, only modest and temporary symptomatic relief failing to alter the underlying pathophysiology, which leads to the progression of the disease. Lysophosphatidic acid (LPA), a bioactive phospholipid involved in inflammation, has been associated with development of AD. Hence, the aim of this study was to investigate whether LPA might promote AD pathology through tau hyperphosphorylation and identify the putative molecular signaling mechanisms by which LPA elicits this effect. Furthermore, this study tested whether atorvastatin can attenuate LPA-induced tau hyperphosphorylation. Using human SH-SY5Y cell lines differentiated with 10µm retinoic acid to achieve a neuronal phenotype, dose-dependent effects of LPA and LPA (+) atorvastatin on cell viability and dendritic morphology were determined. PrestoBlue™ cell viability assays showed LPA decreased cell viability at 5 µm and 10µm that was prevented with 1µm atorvastatin. LPA also caused neurite retraction in a time-dependent manner. Neurite retraction was accompanied by the phosphorylation of tau (Ser404 and Thr231. These effects were reversed by the p38 MAPK inhibitor SB203580, the JNK inhibitor JNK(i) II but not by the MEK (MAPK/ERK kinase) inhibitor, PD98059. The downstream effects including NF-kappaB transcription and AP-1 transcription will be determined. Taken together, these studies provide evidence for LPA as a tau-dependent inducer of neuronal degeneration involving the p38MAPK pathway. Prevention of the LPA-induced effects are accomplished by atorvastatin, and therefore these findings open a new avenue for exploring statins as potential therapeutics for AD.

Title: Mitochondrial network dynamics: benefits of a high metabolic demand (lactation) condition in rats
Primary Author: Randall, Ryleigh B.
Additional Authors: Parry, Hailey A.; Hyatt, Hayden W.; Hood, Wendy R.; Kavazis, Andreas N.
Department: Kinesiology
College/School: College of Education

Abstract:
Background: Mitochondria are dynamic, interconnected organelles that form a complex network that is regulated by processes such as fusion (merging of mitochondria), fission (splitting of mitochondria), and autophagy (removal of damaged mitochondria). Lactation/breastfeeding imposes a high metabolic demand (~500 kcal/day) on the mother; and therefore the use of mitochondria during lactation is critical. Therefore, the purpose of this study was to investigate the short and long-term effects of lactation on markers of mitochondrial dynamics in the mother. Methods: Female rats (10 weeks old) were assigned to 1) nonreproductive, 2) reproductive without lactation (did not suckle their pups after birth), and 3) reproductive with lactation (suckled their pups for 21 days) groups. Half of the animals from each group were sacrificed at seven days post weaning and the other half were sacrificed twelve weeks post weaning; six groups of n=8/group. Markers of mitochondrial fusion and fission, and autophagy were measured in the liver via Western blots. A two-way ANOVA followed by a Tukey's post-hoc test (when significance was present) was performed. Statistical significance was established at α<0.05. Results: There was a significant interaction for the mitochondrial fusion marker Mfn2 (p=0.0011). No changes (p>0.05) were observed for the mitochondrial fission marker Drp1. We also observed interactions for two markers of autophagy (LC3BII/LC3BI (p=0.0133) and Beclin1 (p=0.0002)). Conclusion: Dysregulation of mitochondrial dynamics (e.g., reduced fusion and autophagy) have been reported in diseases, including type 2 diabetes. Our data indicate that lactation has rapid and persistent (seven days and twelve weeks post weaning; respectively) beneficial effects. Specifically, we show, for the first time, that the mitochondrial network is favorably adapted via the fusion and autophagy pathways. These data provide support for the "reset hypothesis" with lactation.

Title: Personality and peer factors predicting marijuana use and co-occurring academic problems: insights from the college experiences study
Primary Author: Reeves, Brian C.
Additional Authors: Samek, Diana, R.
Department: Human Development and Family Studies
College/School: College of Human Sciences

Abstract:
Marijuana use is increasingly prevalent in adolescence and young adulthood. Research has demonstrated consequences of frequent marijuana use on subsequent decline in academic achievement, including lower GPA, delayed graduation, and a greater likelihood of dropping out of college. Less is known about how personality and peer factors in the first two years of college work together to predict problematic marijuana use and co-occurring academic problems three years later. The College Experiences Study (209) will be used to address this. This data was collected via comprehensive online surveys (1-2 hours to complete on average) by a random sample of all first year undergraduate AU students in 2015-2016 academic year. They completed another sample approximately 12 months (85% retention) and 3 years later (70% retention, currently). Results will be ready for presentation by the time of the symposium. We hypothesize that greater parent support, prosocial peer affiliation, and overall constraint (a personality trait related to disinhibition and impulsivity) in the first two years of college will predict a lower likelihood of problematic marijuana use and a higher GPA in the transition out of college. Additionally, we predict affiliation to substance-using peers in the first two years of college will predict a higher likelihood of problematic marijuana use and a lower GPA in the transition out of college. Finally, we hypothesize that the personality trait of constraint will moderate these associations. We expect that problematic parent and peer relationship characteristics will more strongly predict lower GPA and problematic marijuana use for those low vs. high in constraint (i.e., for those with greater personality-based risk). If personality traits related to impulsivity or lack of control predict selection into marijuana-using peer groups, marijuana use, and academic decline, such traits could be targeted for prevention or intervention in the first year of college.

Title: Serial harvest across progressively heavier live weights in growing mangalica pigs indicates optimal harvest should occur at much lighter live weights than is currently practiced by producers

Primary Author: Reeves, Maegan A.
Additional Authors: Charlton, C.E.; Wilkerson, S.R.; Rehm, J.G.; Brandebourg, T.D.
Department: Animal Sciences
College/School: College of Agriculture

Abstract:
The Mangalica pig is a European heritage breed that, despite the breed's poor growth performance relative to modern meat breeds, is gaining popularity given its reputation for yielding superior pork. Our group has confirmed Mangalica pork exhibits superior meat quality attributes supporting the notion that higher price points may be justified for Mangalica pork in niche markets. However, the Mangalica phenotype is otherwise poorly described. The lack of information regarding growth and carcass characteristics across this breed's developmental trajectory prevents science-based recommendations on the proper harvest weight for Mangalica pigs. To address this, a growth trial was conducted utilizing a serial slaughter approach whereby harvest weights were stratified (110, 125, 150, 180, 205, 225, 280 lb) to determine how growth performance, carcass composition, carcass and primal cut parameters, and indices of pork quality change in the Mangalica with increasing harvest weight. As expected, live weight significantly increased across weight class (P < 0.0001). Average daily gain (ADG) and feed efficiency (FE) were similar across classes up to 180 lb live weight and then they steadily declined with increasing weight class (P < 0.0025). Loin eye area (LEA), a measure of lean product, was significantly increased up to 180 lb and then plateaued as harvest weight increased (P < 0.003). Primal cuts, fat back and fat all significantly increased with increasing live weight (P < 0.0001). These trends suggest that improvements in pork quality and muscle growth are modest beyond 180 lb live weight while adipose tissue accumulation increases dramatically concomitant with decreased productive efficiency. Collectively, these data indicate an optimal harvest weight occurs between 180 to 225 lb depending upon the premium a producer can receive for marbling. These data offer little objective justification for the current trend to harvest Mangalica pigs at much heavier live weights.

Title: Effect of surface wettability on frost density during initial droplets icing and crystals growth
Primary Author: Ren, Fuqiang
Additional Authors: Cremaschi, Lorenzo
Department: Mechanical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Air-source heat pump and refrigeration systems are used in outdoor or indoor environments of residential and commercial buildings. During their winter operation, the outdoor coil often accumulates frost on its surface. Frost acts as an insulator and blocks air passages, reducing the heat transfer rate and increasing the pressure drop of air passing through the coil. Defrost cycles periodically run to melt away the frost from the outdoor coils. Unfortunately too many defrost cycles penalize the efficiency of the heat pumps. The overarching goal of this research is to advance the fundamental understanding of the effects of surface conditions on frost formation and develop frost mitigating surfaces that increase the energy efficiency of air-source heat pumps. Frost formation on surfaces with different wettability affects freezing time, droplet diameter, and frost thickness during initial droplet icing followed by crystals growth. The surfaces are also fairly sensitive to air temperature, humidity, and velocity. In this research, surfaces with different wettability were investigated under different frosting conditions. The contact angle ranged from less than 10 degree (i.e., superhydrophilic) to over 109 degree (i.e., superhydrophobic). The freezing time and thickness formation based on different surface wettability characteristics will be discussed. The results show the nucleation features and frost/ice growth characteristics for coated finned structures, which are often encountered in heat exchangers.

Title: A lab-scale method for pre-straining shape memory polymer sheets
Primary Author: Reyna, Aura P.
Additional Authors: Mailen, Russell W.
Department: Aerospace Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
We investigate the ability of commercially available polymer sheets to function as shape memory polymers (SMPs). SMPs are prepared under specific conditions such that they change shape when an external stimulus is applied, e.g. light, electricity, or temperature. This ability to change shape depends strongly on an initial pre-straining sequence, or processing steps, in which the polymer is deformed at an elevated temperature before rapidly cooling to maintain a temporary shape. SMPs have not been investigated fully at the lab scale due to a lack of cost-effective pre-straining equipment. This limits the application of this unique material in both research and industry. We implement a cost-effective, lab-scale system to pre-strain various commercially available polymer sheets. Our system incorporates an industry-standard 24” slip roll that has then been modified to integrate a resistance heater and water sprinkler cooling system. By automating the thickness controls, roller speed, and temperature, the pre-straining conditions are precisely regulated. We use this system to study the effects of different pre-straining conditions on the shape memory effect in several polymers and compare the results to commercially available, pre-strained polystyrene. As a result, other researchers will be able to implement our pre-straining system and develop their own SMPs that are synthesized and processed for specific applications. Expanding the available array of SMPs could initiate further implementation of the material in industries such as medicine, aerospace, textiles, and others.

Title: Investigating the neuroprotective effects of extra-virgin olive oil on the blood-brain barrier in Alzheimer's patients

Primary Author: Rice, Rachel
Additional Authors: Williams, Kandace; Hoffman, Emory; Courville, Adrian; Kaddoumi, Amal
Department: VCOM; Pharmacy
College/School: VCOM; Harrison School of Pharmacy

Abstract:
The blood-brain barrier (BBB) is something that researchers are beginning to look into more and more for therapeutic approaches to prominent health issues. Researchers have discovered that the BBB is compromised with natural aging and more in neurological diseases. For instance, in patients with Alzheimer's disease (AD) certain BBB transporters become downregulated. Furthermore, the neuroinflammation that is present in Alzheimer's also contributes to the disruption of the integrity of the BBB. With this knowledge, researchers have begun targeting the BBB in an attempt to slow the progression of neurological diseases such as AD. Findings from our preclinical studies in mice with AD demonstrated daily consumption of phenolic-rich extra-virgin olive oil significantly reduced neuroinflammation and improved the integrity of the BBB. Based on these results, Auburn University Research on Olive Oil for Alzheimer's Disease (AU-ROOAD) has begun a similar olive oil consumption study on human patients with mild cognitive impairment (MCI). AU-ROOAD recruited participants with MCI to study the possibility of halting the progression from MCI to AD with the use of extra-virgin olive oil (EVOO). This randomized, double-blinded study placed patients into two arms, phenols-low EVOO and phenols-rich EVOO to test the hypothesis "EVOO consumption stops or delay MCI conversion to AD". In this work, we will present and discuss the impact of EVOO consumption on the BBB integrity.

Title: The influences of various non-slip socks on the spatio-temporal parameters of walking gait
Primary Author: Riis, Kathryn D.
Additional Authors: Wilburn, Christopher; Kosek, Jerad; Hill, Imani; Weimar, Wendi
Department: Kinesiology
College/School: College of Education

Abstract:
While many hospitals and assisted living facilities utilize non-slip socks to reduce the occurrence of falls, this problem still remains an issue at large. Particularly, research has proposed that the lack of properly fitting socks can reduce proprioception and increase high falling rates during walking. However, the recent advancements within the compositional properties of socks have been shown to improve the foot-sock interface and foot function. Despite these recent findings, research analyzing the influence of such socks, in conjunction with a non-slip bottom, have on falling remain limited. Therefore, the purpose of this study is to evaluate the influence of different sock types have on walking gait. Participants were instructed to walk across an instrumented walkway, at a self-selected pace, under three randomized conditions, barefoot (BF), hospital socks (HS), and compressive hospital socks (CHS). Differences between walking variables, such as velocity (v), normalized stride length (NSL), stride width (SW), toe in (TOE), and center of pressure trajectory (COP), were analyzed using a repeated-measures ANOVA. The results revealed that were statistical significance in NSL($p= .036$, $n2 = .670$) and SW ($p = .020$, $n2 = .789$). Additionally, the results displayed not significant difference amongst the conditions is v, COP, and TOE. Despite achieving significance in COP and TOE, the CHS yields the shortest COP and smallest TOE angle. These trends, in conjunction with the significance in NSL and SW, suggest that the compressive properties of the CHS can improve foot function and stability during gait.

Title: Examining the effect of the presence of Chinese privet (*Ligustrum sinense*) on the occurrence of ground-dwelling herpetofauna species
Primary Author: Ripa, Gabrielle N.
Additional Authors: Stiles, James; Anderson, Christopher
Department: Wildlife Ecology and Management
College/School: School of Forestry and Wildlife Sciences

Abstract:
In bottomland forests of the southeastern United States, Chinese privet (*Ligustrum sinense*) is a common and highly invasive shrub species that can substantially change native flora and fauna communities. Research has examined its impact on certain taxa, however virtually no studies have evaluated if it changes the habitat for smaller, forest ground-dwelling species such as amphibians (e.g., salamanders, toads, tree frogs) and small reptiles (litter-dwelling snakes and lizards). To address this knowledge gap, a study was initiated in 2019 on a large property (>7000 ac) with extensive bottomland forests on the Black Warrior River in Moundville, AL. Using this property, 60 long-term forest monitoring plots (circular plots, 10-m radius) were established across the property: 20 dominated by mature Chinese privet, 20 with little to no privet present, and 20 plots once dominated by privet but undergoing restoration using fire. Over 9 months in 2019-2020, data will be repeatedly collected on microhabitat variables related to ground-dwelling species including: coarse woody debris, leaf litter, soil moisture, and temperature. These data will be compared to corresponding herpetofaunal survey data collected at the same plots. Herpetofaunal surveys will consist of constrained searches (conducted seasonally over one-quarter of the plot) and cover-board data (collected monthly). Associations between important habitat variables and ground-dwelling species will be determined by gathering microhabitat and herpetofaunal data. These results will provide a much better assessment of the relative risk that Chinese privet invasion poses for these fauna.

Title: High chlorophyll dietary intervention in a high red meat diet caused no significant changes in serum and fecal zonulin

Primary Author: Riviere, Aaron J.
Additional Authors: Smith, Kristin; Schaberg, Megan; Frugé, Andrew
Department: Nutrition Dietetics
College/School: College of Human Sciences

Abstract:
Intestinal permeability is a major topic that is being explored in nutrition and health. Zonulin, a tight junction regulatory protein, has not be significantly studied in a human population with dietary interventions. To study correlations of zonulin with diet and inflammatory cytokines, samples collected from the 12-week randomized controlled clinical Meat and Three Greens trial were used. A randomized 20-participant subset was used from the M3G study. The participants' dietary recall and biological samples were taken at the beginning of the study and at each 4-week timepoint. Serum zonulin, fecal zonulin, plasma 8-hydroxy-2'-deoxyguanosine (8OHdG), orosomucoid-1 (ORM-1), lipopolysaccharide binding protein (LBP), and serum inflammatory biomarkers (C-reactive protein (CRP), Interleukin-6, tumor necrosis factor alpha (TNFα)) were analyzed via ELISA. Spearman correlations and paired t-tests were conducted for statistical analysis. There were no significant changes in fecal or serum zonulin during the high chlorophyll dietary intervention period. There were significant correlations between serum zonulin and TNFa ($r=-.550$; $p=.012$) and fiber ($r=-.582$; $p=.007$) intake at the T0 and serum zonulin and ORM-1 ($r=.588$; $p=.006$) and LBP ($r=.648$; $p=.002$) at T4. There were also significant correlations between fecal zonulin and ORM-1 ($r=.565$; $p=.009$) and 8OHdG ($r=.471$; $p=.036$) at T0 and fecal zonulin and vitamin K ($r=-.579$; $p=.007$) intake at T8. LBP during the intervention had a significant correlation ($r=.533$; $p=.015$) with serum zonulin during the intervention period. In conclusion, the high chlorophyll dietary intervention had no significant impact on serum or fecal zonulin levels. Further research is needed to explore dietary impacts on zonulin in human populations. Analysis of gut microbiota will determine if known zonulin-altering microbes had any effects.

Title: Nutrient recovery and biogas upgrading from wastewater treatment plants using a co-culture platform
Primary Author: Roberts, Nathan R. M.
Additional Authors: Wang, Jin
Department: Chemical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Large quantities of water generated for industrial, agricultural and municipal purposes result in large volumes of wastewater with high organic loads. At wastewater treatment plants, anaerobic digestion (AD) is the common technology employed for reducing the organic content and pathogens. Anaerobic digestion produces energy-and carbon-rich biogas (CH_4 and CO_2) as well as high concentrations of nutrients (ammonia (NH_3) and orthophosphate (PO43--P). Thus, valorization of biogas and recovery of the nutrients in AD effluent can allow significant economic and environmental benefits. However, the impurities and low pressure of biogas limit widespread AD practice as expensive equipment is required for biogas cleanup and upgrading. As a result, biogas is mainly flared or utilized for heating and few facilities use biogas meaningfully for power generation. In addition, due to the infectiveness of wastewater treatment processes, excessive release of nitrogen and phosphorus into aquatic systems can cause eutrophication, and negatively impact human health and the economy. / In this work, we have developed a biological wastewater platform for biogas upgrading with simultaneous nutrient recovery from municipal digestate using a co-culture of methanotrophs and microalgae. The industrial potential of the co-culture technology was demonstrated through growth on raw municipal digestate collected from the Columbus Water Works water recovery facility in Columbus Georgia. In addition, we further demonstrated that the model co-culture can achieve zero emission, i.e. complete biogas recovery of both greenhouse gases (CH_4 and CO_2) without an external oxygen supply as well as completely recovering nitrogen and phosphorus in the digestate. This results suggests the co-culture can lead to cleaner water (reduction in water pollutants), reduction in greenhouse gas emissions and the biomass generated can be valorized for value-added products such as animal feed or biofuels such as bio-alcohols.

Title: Collisional modification of electron transport in a magnetic field
Primary Author: Robinson, Conner D.
Additional Authors: Thomas, Edward
Department: Physics
College/School: College of Sciences and Mathematics

Abstract:
In the absence of collisions (i.e., at very low gas pressures), determining the path of electrons within a magnetic field is well-defined problem in classical physics. The electrons travel in a spiral motion with a "straight" component parallel to the magnetic field and circular motion perpendicular to the magnetic field. However, with increasing pressure, evaluating electron transport is significantly more difficult because of the increasing role of collisions between the electrons and the gas atoms. Evaluating how collisions affect electron transport both parallel and perpendicular to the magnetic field remains an outstanding challenge. In this research project, we used a directed electron beam and two detectors – one oriented parallel to a magnetic field and one oriented perpendicular to a magnetic field to study this phenomenon. Experiments are performed over a range of neutral pressures and magnetic field strengths to characterize the evolution of the electron transport. A simulation of the electron transport in these various configurations was made to aid in the evaluation of this experiment. The data regarding the relationship between pressure, magnetic field strength, and electron transport will be presented and compared with simulation results.

Title: Spray evaporation on enhanced tube bundles with low GWP pure refrigerants and refrigerant/miscible oil mixture
Primary Author: Rothe, Joshua A.
Additional Authors:
Department: Mechanical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Most conventional refrigerants used in HVAC and Refrigeration systems today are going to be gradually phased out because of their high Global Warming Potential (GWP) level. Significant efforts have been made to develop new refrigerants that are not only as energy efficient as the conventional ones, but also offer a more environmentally-friendly alternative when used as drop-in fluids in existing systems. Unfortunately, the performance of these new refrigerants in HVAC equipment is not known. Whether the models and correlations originally developed for previous refrigerants can be used to design the heat exchangers is also an open question. My research focuses on investigating two new refrigerants' heat transfer and pressure drop performance for spray evaporator tube bundles, which are used in today's advanced HVAC systems in large buildings' air conditioning applications. The two refrigerants have low GWP of 1, are not flammable, and are not toxic. The current objective of my research is to design, construct, and calibrate a new test apparatus, which will resemble a shell-and-tube heat exchanger in both appearance and function, that will be used for testing these two new refrigerants. By manipulating the heat input to this evaporator via electric resistance heaters, we will be able to control the rate of refrigerant evaporation and, by measuring temperature and pressure at different stages in the process, we will be able to calculate such properties as refrigerant quality and enthalpy. The data we collect will allow us to assess performance and viability of low GWP refrigerants in today's energy efficient HVAC equipment, such as spray evaporator tube bundles.

Title: Hydrogen sulfide adsorption using biochar produced from slow pyrolysis of eucalpytus
Primary Author: Roy, Poulami
Additional Authors: Adhikari Sushil
Department: Biosystems Engineering
College/School: College of Agriculture

Abstract:
Hydrogen sulfide (H2S) is a toxic gas produced from oil and gas-processing plants, wastewater treatment facilities, and landfills. It is highly corrosive, inflammable and carcinogenic. Biochar can be used to adsorb H2S and multiple mechanisms have been proposed by various researchers. According to few authors, biochar surface area, which is related to pyrolysis temperature and activation, is the most important parameter for adsorption. While others have concluded that oxygen functional groups, mineral species, local pH,surface water, moisture in the carrier gas each plays an important role.This mechanism is also not fully understood. The goal of this study is to predict which biochar property best correlates to highest adsorption capacity (breakthrough capacity: mg of H2S/g of biochar) and understand the reaction pathway. Biochar (Eucalyptus biomass) was produced at 500°C, 600°C and 700°C. Adsorption tests were carried out by H2S (100ppm, balance nitrogen) on the biochar. The breakthrough capacity of unactivated biochar (700°C) was ~3 mg/g of H2S, which is in accordance with other literature results. Biochar is also modified by activating it physically (CO2) and chemically (KOH). The biochar was also washed with acid (HCl) prior to pyrolysis to check the contribution of mineral species. Based on the results obtained so far, surface area does play a major role in increasing breakthrough capacity. However, work still needs to be done to understand the reaction mechanism and the highest contributing biochar parameter to H2S adsorption study. A high-resolution 3D image of biochar pore structure by microscopy and spectroscopy study,identification of reaction products and the highest correlated biochar parameter to adsorption capacity can be obtained for the first time ever in this study. This research will be helpful for designing engineered biochar for acid gas adsorption, also for further usage of this doped biochar (with sulfur species) in other adsorption studies.

Title: Pore network modelling of reactive permeability evolution
Primary Author: Sabo, Mollie S.
Additional Authors: Beckingham, Lauren
Department: Civil Engineering
College/School: Samuel Ginn College of Engineering

Abstract:

My research is concerning CO_2 relocation where we are observing the relationship between porosity and permeability within a simulated Pore Network Model. This model utilizes a 10x10x10 cross section composed of random pores and pore throats similar to those contained in actual sandstone specimens. Using MATLAB, we simulate real life scenarios that can result from injecting CO_2 that dissolves into a brine. For example, we developed a scenario observing the effects of precipitation and dissolution being produced simultaneously. This scenario simulates dissolution in pores and pore throats in the front half of the network while precipitation is occurring in the pores and pore throats at the back of network. At the end of each scenario, we will plot the porosity and permeability values for each set of simulations and observe the porosity-permeability relationship given the specific scenarios. In the scenario considering precipitation and dissolution occurring in the back and front half of the matrix simultaneously, we were able to make the observation that permeability stays relatively constant while porosity changes due to permeability being limited by the smallest pore throats. Through these simulations, we aim to develop a better understanding surrounding the relationship between porosity and permeability in a way that will benefit those who want to design underground CO_2 storage systems and eliminate the excess emissions into the atmosphere.

Title: Altered disease severity and population dynamics of *Xanthomonas perforans* on tomato & pepper upon co-infection with *Pseudomonas cichorii* and *Xanthomonas arboricola*
Primary Author: Sadhukhan, Shreya
Additional Authors: Potnis, Neha
Department: Plant Pathology
College/School: College of Agriculture

Abstract:
In nature plants are susceptible to be infected by more than one pathogen and co-infecting pathogens remain a leading challenge due to the nature of their individual level infection risk and disease progression ability. Studies show that co-infection is a potentially a powerful driver of pathogen evolution and epidemiology. Evidence suggests that co-infecting pathogens can interact within the host to influence the individual-level outcomes of infection. In bacterial leaf spot disease of Tomato, presence of *Pseudomonas cichorii* and *Xanthomonas arboricola* has been observed along with the causative pathogen *Xanthomonas perforans*. We hypothesized that the presence of *P. cichorii* and *X. arboricola* might influence the disease severity and pathogenicity of *X. perforans*. Co-inoculation experiment was done with these three species on Tomato in green house condition and the hosts were dip inoculated. Disease severity and population dynamics was studied on 3rd, 6th and 9th day after inoculation. Increased disease severity was observed in the host plants when *Xathomonas perforans* was inoculated with *Pseudomonas cichorii* and *Xanthomonas arboricola*, rather than *Xanthomonas perforans* alone. Results indicated that there might be possible synergistic interaction between the three species. Also the *P.cichorii* or *X. arboricola* might act as an opportunistic pathogen in presence of *X.perforans*. Synergistic interactions between these microbial pathogens in host represent a crucial step for further understanding of pathogenesis caused by microbes.

Title: Sleep moderates associations between racial discrimination and adolescent adjustment
Primary Author: Saini, Ekjyot K.
Additional Authors: Zeringue, Megan; Martin-Pinon, Olivia; El-Sheikh, Mona
Department: Human Development and Family Studies
College/School: College of Human Sciences

Abstract:
A growing literature has documented links between perceived racial discrimination, sleep, and adjustment outcomes among youth such that those experiencing greater racial discrimination and short sleep have worse symptoms (El-Sheikh et al., 2016; Yip, 2016). The present study examines how sleep moderates associations between racial discrimination and internalizing and externalizing symptoms. A representative community sample of 289 adolescents (M age 17.28 years; 50.9% female) participated in sleep and laboratory assessments. Youth came from diverse racial/ethnic (41.8% African American/Black) and socioeconomic backgrounds (37.6% at or below the federal poverty line). Youth reported on their experiences of racial discrimination in institutional, educational, and peer domains. Adolescents also completed well-established measures to assess anxiety, depression, and externalizing symptoms. Additionally, adolescents completed a subjective measure of sleep quality problems and wore actigraphs for 7 nights to provide objective measurements of sleep duration and efficiency (% of minutes asleep). Experiences of racial discrimination were associated with greater anxiety, depression, and externalizing symptoms. Furthermore, racial discrimination significantly interacted with indices of sleep quality (efficiency, subjective sleep problems) to predict both anxiety and depression such that better sleep quality buffered the effects of discrimination on anxiety and depression. Racial discrimination did not interact with sleep to predict externalizing symptoms, and sleep minutes did not moderate any associations between racial discrimination and adjustment. Findings identifying sleep as a risk and protective factor may inform intervention and prevention strategies to reduce adolescent anxiety and depression associated with discriminatory experiences, particularly as they prepare to transition to new contexts and experiences in adulthood.

Title: Coadministration of doxorubicin and cyclophosphamide does not induce hepatotoxicity in mice

Primary Author: Salamat, Julia M.
Additional Authors: Abbott, Kodye; Majrashi, Mohammed; Almaghrabi, Mohammed; Govindarajulu, Manoj; Ramesh, Sindhu; Fahoury, Eddie; Gill, Kristina; McElroy, Trey; Narayanan, Natasha; Desai, Darshini; Nadar, Rishi; Moore, Timothy; Dhanasekaran, Muralikrishnan; Pondugula, Satya
Department: Biomedical Sciences
College/School: College of Veterinary Medicine

Abstract:
It is known that prolonged administration of chemotherapeutics can cause severe adverse drug reactions, including hepatotoxicity. A combination chemotherapy regimen of doxorubicin and cyclophosphamide is employed in treatment of several cancers including leukemia, lymphoma, and breast cancer. It is unknown whether doxorubicin and cyclophosphamide coadministration can induce hepatotoxicity. We therefore sought to determine whether coadministration of doxorubicin and cyclophosphamide results in altered levels of serum biomarkers of hepatotoxicity and changes in liver histology. Male C57BL/6J mice received one intraperitoneal injection of saline or doxorubicin-2mg /kg & cyclophosphamide-50mg/kg per week for 4 weeks. After the treatment period, liver histology and serum biomarkers of hepatotoxicity were assessed. The chemotherapeutics did not alter the serum levels of alanine aminotransferase (ALT), alkaline phosphatase (ALP), bilirubin, albumin, globulin, or total protein. Similarly, coadministration of chemotherapeutics did not result in a noticeable change in liver histology. However, it is notable that the total body weight of the mice was significantly decreased after 4 weeks of treatment with the chemotherapeutics. There was also a significant increase in the serum levels of aspartate aminotransferase (AST). Elevation of AST levels may be due to muscle damage, as serum creatinine kinase (CK) levels were also found to be elevated after treatment with the chemotherapeutics. Taken together, these results suggest that coadministration of doxorubicin and cyclophosphamide, at the tested concentrations and treatment period, does not induce a significant hepatotoxicity in mice. However, dose-dependent and time-dependent future studies are warranted to further confirm that coadministration of doxorubicin and cyclophosphamide does not induce hepatotoxicity.

Title: Quantifying reactive surface area combining numerical simulations with multiscale imaging to predict mineral reaction rates in porous media
Primary Author: Salek, Md Fahim
Additional Authors: Beckingham, Lauren
Department: Civil Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Understanding mineral reaction rates in porous material is crucial in many environmental systems such as natural weathering process, CO_2 capture and storage (CCS) and CO_2 enhanced oil recovery (CO_2-EOR). Prediction of in-situ mineral reaction rates is challenging, and a significant variation is observed between laboratory data compared to field data due to factors like variation in the physicochemical properties of minerals, spatial heterogeneities, chemical composition of the fluid, etc. Previous studies have suggested that this discrepancy is mostly due to the imprecision in determining mineral reactive surface areas. Commonly, the reactive surface area is approximated by considering a uniform spherical grain for all the mineral particles, altered by approximating surface roughness and site reactivity. However, advanced imaging techniques can be useful in determining micro and macro scale pores and accessible reactive surface areas that may more accurately reflect the reactive surface area. Preliminary simulations using accessible surface area determined from multi-scale image analysis have shown more accurate results than those using specific surface areas adjusted by a scaling factor. In this study, 2D SEM imaging will be used to quantify accessible mineral surface areas in a sandstone sample from the Torrey Buff formation. This analysis will be combined with FIB-SEM images to understand the pore network and connectivity. Finally, a continuum scale reactive transport simulation will be conducted to determine the mineral dissolution rates in the formation upon exposure to CO_2 saturated brine.

Title: Effect of particle size and oil addition on near infrared spectroscopy (NIRS) nutrient analysis of ground corn

Primary Author: Sandoval, Jorge L.
Additional Authors: Leiva, S. F.; Flees, J. J.; Calderon, A. J.; Abascal-Ponciano, G. A.; Ordonez, K. E.; Patino, D. B.; Avila, L. P.; Presume, M. R.; Pacheco, W. J.; Starkey, C. W.
Department: Poultry Sciences
College/School: College of Agriculture

Abstract:
Near infrared spectroscopy (NIRS) is used to estimate quality aspects and nutrient composition of feed. The objective here was to evaluate the effect of ground corn particle size (PS) with increasing additions of soybean oil (SBO) on the ability of NIRS to provide accurate nutrient estimates. Corn was milled using a 2-pair roller mill (Roskamp Champion Series 900-12) with 8 different roller settings, providing samples with mean PS from 693 to 3,343 µm. SBO was mixed with the ground corn to achieve samples of each PS with 2, 4, 6, 8, and 10% SBO. Corn was also ground to 267 µm with a rotor grinder (Retsch ZM 200) with a 500-mesh screen to serve as a control. Three replicate samples were analyzed using a Bruker MPA II NIR spectrometer and Adisseo PNE software to estimate dry matter (DM), ash, crude fat (CFAT), crude fiber (CFIB), and crude protein (CP). Data were analyzed with the GLIMMIX procedure of SAS and means were separated using the PDIFF option at $P \leq 0.05$. Dry matter was higher for 267-µm PS samples. For the 267-µm control, DM increased as SBO increased. For PS 693 to 3,433 µm, DM first increased up to either the 4 or 6% SBO additions and then decreased through 10%. Ash increased as SBO increased for each PS. As expected, regardless of PS, increasing additions of SBO increased CFAT, but the increases were not equal to the actual added SBO and only ranged from 0.5 to 1.5%. CFIB was lower for the 267-µm control samples with 2 to 4% SBO and increased for 693 through 2,862 µm PS samples with 4 to 10% SBO. For the 267-µm control, the CP increased as SBO increased. For 693 to 968 µm PS samples, CP decreased with 2 to 4% SBO and then increased with 6, 8, and 10% SBO. Samples with 2,911 and 3,343 µm PS had more consistent CP values with the increasing SBO additions having little effect. In conclusion, sample PS and added SBO interacted to negatively impact the ability of NIRS to provide accurate nutrient values.

Title: Temperature dependency of magnetic particle characterization by particle tracking velocimetry
Primary Author: Sannidhi, Abhinav
Additional Authors: Hanley, Thomas; Todd, Paul
Department: Chemical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Magnetic particles with different composition, size and magnetization are used in cell separation, cell labeling, cellular endocytosis, drug targeting, magnetic resonance imaging, hyperthermia, and *in vivo* diagnostics. By means of particle tracking velocimetry in darkfield illumination, we measured multiple characteristics of several thousand individual particles per sample. The HyperfluxTM velocimeter is utilized to provide quantitative video analysis of particles using high definition particle tracking velocimetry in an isodynamic magnetic field. Image analysis software converts the image data to the parameters of interest such as particle diameter and magnetophoretic mobility, which in-turn provides scope to estimate intrinsic magnetic characteristics, apparent magnetic susceptibility and saturation magnetization on a particle-by-particle basis in few minutes. The present study focuses on the temperature dependence of the mobility measurements of micro-sized particles by particle tracking velocimetry. The magnetophoretic mobility of non-magnetic beads has been analyzed at different temperature conditions: hot, ambient and cold. The differences in the temperature of bead suspensions and glass channel cell resulted in Marangoni flow, or thermo-capillary convection. In conclusion, mobility measurements of particles using particle tracking velocimetry at other than ambient temperature need isothermal conditions to achieve optimal results.

Title: Enhanced hydrogen evolution reaction from microwave synthesized metal chalcogenide/graphene catalysts
Primary Author: Sarwar, Shatila
Additional Authors: Zhang, Xinyu
Department: Chemical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
To resolve the present climate issues and world energy crisis, hydrogen (H_2) is a promising energy carrier for clean and sustainable energy technologies. Although water electrolysis is solely a green approach to generate hydrogen, the production cost is too high because of utilizing expensive platinum (Pt) catalyst. As cost-effective alternatives to Pt, metal chalcogenides (MCs) have emerged as a very promising class of nonprecious, earth abundant catalyst in acidic electrolyte. However, the high cost and difficulty in producing large scale, high quality MCs remain challenges. The present work successfully demonstrates the production of MCs on graphene substrate through ultra-fast (60-90 seconds), facile and energy-efficient microwave-initiated approach. The electrochemical characterizations reveal that the as-produced nanocomposites can be used for hydrogen evolution reaction (HER) to generate useful hydrogen energy through water electrolysis. The resultant molybdenum disulfide on graphene (MoS_2/graphene) and molybdenum telluride on graphene ($MoTe_2$/graphene) composites exhibit outstanding electrocatalytic activities with low overpotential, small Tafel slope with a very high cathodic current density, along with fascinating cycling activation behavior and high stability under acidic condition, even at high operating temperatures (30−120°C). Moreover, the composites enhance their performance with the potential cycling by reaching a very low overpotential, which is very close to the overpotential (53 mV) of Pt catalyst. This single-step microwave approach can be universally employed to produce useful MCs (e.g., $MoSe_2$, WS_2, WSe_2 etc.), that will catalyze substantial development in more widespread uses of MC-based nanocomposites for successful energy applications.

Title: Strength assessment of soil cement base
Primary Author: Scales, Matthew C.
Additional Authors: Mueller, Emily; Schindler, Anton; Anderson, Brian
Department: Civil Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Soil cement is a mixture of soil, cement, and water that, when compacted and cured, is used as a base for pavements. When creating this mixture during construction, many concerns regarding quality control and strength testing have arisen due to significant variances in core strengths. A difficulty of using soil cement base is finding a suitable method to reliably assess its strength for quality assurance purposes. It has been found that there is a correlation between the dynamic cone penetration (DCP) testing and the strength found in a soil cement cylinder. Using the plastic mold method in the laboratory and in the field, this project's goal is to develop a procedure to reliably assess the strength of soil cement for the Alabama Department of Transportation (ALDOT) to use during full-scale field projects. In the laboratory, data was collected for 3-day and 7-day cylinder strengths as well as DCP results for different types of soil cement. These results were compared against one another over strengths ranging from approximately 150 psi to 800 psi. Laboratory results found a strong correlation between cylinders strength and the DCP output, with a logarithmic function providing the best-fit to the measured results. Research has also been done in the field, from which it was found that a stronger correlation exists between the DCP and cylinder strength than when compared to strengths obtained with ALDOT's current method of testing cores recovered from the soil cement. Further laboratory experiments are being conducted to determine the feasibility of using the DCP as replacement for ALDOT's current coring method.

Title: Assessment of age and gender differences in health beliefs and dietary habits related to colon cancer risk

Primary Author: Schaberg, Megan N.
Additional Authors: Smith, Kristen; Greene, Michael; Frugé Andrew
Department: Nutrition Science
College/School: College of Human Sciences

Abstract:
Colon cancer (CC) risk is associated with several behavioral risk factors including diets high in red meat (RM) and low in green leafy vegetables (GLV), and is increasingly diagnosed in younger adults. The willingness of at-risk adults to modify behaviors to reduce CC risk warrants further investigation. The previously validated Dietary Habits and Colon Cancer Beliefs Survey (DHCCBS) was used to assess willingness to participate in health behaviors related to CC risk. This instrument utilized concepts from the Health Belief Model (HBM) to construct the questionnaire. A food frequency questionnaire was also included in the survey instrument to quantify RM and GLV intake over the previous 30 days. Using the FFQ data, participants were dichotomized at the median into high and low RM consumption. Independent samples t-tests compared RM and GLV intake and DHCCBS responses. One way analysis of variance with post-hoc LSD testing was completed to assessed these differences within three age groups (<35, 35-44, and 45-54 years old). A total of 990 validated survey responses were analyzed. Participants with high RM intake perceived a greater risk for CC ($p=0.001$). In contrast, those with low RM consumption perceived more benefits from reducing RM ($p<0.001$) and increasing GLV ($p=0.037$). Perceived severity of CC diagnosis was significantly lower in younger adults (<35) compared to older adults (35-44, $p=0.042$; 45-54, $p=0.003$). Furthermore, younger adults (<35) perceived fewer barriers (i.e. taste preference) to GLV consumption than their older adult counterparts (35-44, $p=0.019$; 45-54, $p=0.002$). These findings from the DHCCBS indicate health beliefs towards CC are influenced by an individual's age and dietary habits. Furthermore, these findings indicate the younger population may not recognize the severity of this disease. Further investigation is warranted for prevention recommendations in this age group.

Title: Changing agroclimate conditions over the breadbasket of the world
Primary Author: Schillerberg, Tayler A.
Additional Authors: Tian, Di
Department: Earth System Science
College/School: College of Agriculture

Abstract:
Anthropogenic induced climate change is resulting in a warming of global temperatures. Globally nearly 80% of agriculture is produced in rainfed regions with irrigation occurring elsewhere. Changes in meteorological variables could result in more stressful environmental conditions resulting in more producer inputs such as irrigation and chemicals. Other regions may become more favorable for agriculture, expanding cropland or allowing double cropping in a growing season. This study will aim to analyze the present (1981-2018) and future (2015-2100) changes of ten agroclimate indices of four global crops (maize, soybean, wheat, and rice). These indices depicting agroclimate conditions include: accumulated frost day, the start of field operations, the start of the growing season, conditions suitable for planting, growing season length, growing degree days, plant heat stress days, dry days, end of the growing season, and conditions suitable for harvesting. Present agroclimate indices will be derived from the NASA POWER and Climate Change Initiative (CCI) Soil Moisture data sets. Projected future agroclimate indices will be derived from CMIP6 for RCP scenarios 2.6, 4.5, and 8.5. The results will show probable changes in agroclimate indices under different emission scenarios regionally and globally. We expect to see a decrease in frost days, an increase in growing season length, dry days, and plant heat stress both at regional and global scales. These results will be beneficial for stakeholders and policymakers, allowing for further analysis, development, and implementation of mitigation practices to prevent disruptions in future regional and global grain crop stores.

Title: Improving butanol tolerance and production in clostridium tyrobutyricum through metabolic engineering and bioprocess engineering
Primary Author: Schlosser, Ian M.
Additional Authors: Wang, Yi
Department: Agriculture
College/School: College of Agriculture

Abstract:
Given the potential of butanol as a valuable biofuel and biochemical, the ability to harness its natural production is desirable by industry and researchers alike. A bacterial strain, *Clostridium tyrobutyricum*, produces butanol under fermentation, but it is inhibited by the toxicity of butanol to the cell. Thus, we attempt to improve the butanol tolerance of *C. tyrobutyricum* to increase the overall butanol production through fermentation. Our methods of improving butanol tolerance are three-fold: firstly, to overexpress the molecular chaperone genes of the cell by metabolic engineering, secondly, to introduce the surfactant Tween 80 to the fermentation mixture, and finally to feed a glucose/betaine mixture into the fermentation. Overexpression of the molecular chaperone genes will improve protein folding within the cell (which could otherwise be damaged by butanol), and thus will enhance the butanol tolerance of the cell. Tween 80 will improve the integrity of the cell membrane and the betaine with in the fermentation broth will protect the cells from high osmotic pressures. These variables, individually and in conjunction, should significantly increase the butanol production in the fermentation with *C. tyrobutyricum*. The improved butanol production will facilitate the downstream butanol recovery process by saving tremendous energy and thus have great economic benefits when the process is scaled up.

Title: Petroleum source rock analysis of the tuscaloosa marine shale
Primary Author: Schneider, Marcus D.
Additional Authors:
Department: Geology
College/School: College of Sciences and Mathematics

Abstract:
The Tuscaloosa Group (Upper Cretaceous) in southwest Alabama is comprised of both sand and claystone units. The sand units are known to be reservoir rocks for oil and gas. The Marine Shale overlies the Massive and Pilot sand intervals, and underlies the Upper Tuscaloosa sands, and is considered to be a seal or cap rock in many locations. With total organic carbon ranging from 0.44% to 2.9% in general, the Marine Shale unit has the possibility to be a hydrocarbon-bearing source rock. However, the analogous shale intervals in Texas, Louisiana, and Mississippi have all been successfully explored for hydrocarbons. This study utilizes various core sample locations within Alabama to conduct petrochemical analyses, with an emphasis on vitrinite reflectance as a basis for determining thermal maturity. Due to the complex nature of the thermal maturity patterns found in the aforementioned analogous basins, and the degree of structural complexity and salt-body interplay of the Tuscaloosa in Alabama, it is possible that zones of maturity exist in the Marine Shale that have not yet been explored. This study aims to identify structures, stratigraphy, and petroleum source potential for the Tuscaloosa Marine Shale in southwest Alabama.

Title: Anti-inflammatory and immunomodulatory activities of *Scutellaria lateriflora*
Primary Author: Schoenmeyer, Kelsey E.
Additional Authors: Lohani, Madhukar; Rajpoot, Mrigendra; Ramesh, Sindhu; Govindarajulu, Manoj; Majrashi, Mohammed; Fahory, Eddie; Moore, Timothy; Shannon, Dennis; Van Ginkel, Frederik; Schwartz, Dean; Kemppainen, Barbara; Dhanasekaran, Muralikrishnan
Department: Drug Discovery and Development
College/School: College of Sciences and Mathematics

Abstract:
Scutellaria lateriflora is a native plant of North America that contains a larger amount of chemically active flavonoids than other commonly used species of the plant genus *Scutellaria*. To date, very limited research studies have been done to measure the immunopharmacological activities of *S. lateriflora*. The purpose of this study was to determine the immunomodulatory and anti-inflammatory properties of *S. lateriflora*. Experiments were designed to measure the effects of an alcoholic extract of *S. lateriflora* (SLE) on pro-inflammatory enzyme (cyclooxygenase-1-COX-1, cyclooxygenase-2-COX-2) and 15 Lipoxygenase (15-LOX) activities, activation of T lymphocytes and major histocompatibility complex class-II (MHC-II) expression in bovine monocyte-derived dendritic cells (MoDCs). The SLE inhibited COX-1, COX-2 and 15 LOX activities but did not affect T cell proliferation or MHC-II expression on MoDCs or pro-inflammatory cytokine production by T cells. Our results established the anti-inflammatory mechanisms of SLE, which validates the potential possibility of treatment for various inflammation driven diseases. Furthermore, computational-based studies will be performed to elucidate the interaction of *Scutellaria lateriflora* on various markers of inflammation (COX-1, COX-2, 15 LOX, MHC-II).

Title: Engineering lignin transformation mechanisms to create value-added products using atomistic modeling
Primary Author: Schuler, Jonathan D.
Additional Authors: Azad, Tanzina; Adamczyk, Andrew; Auad, Maria; Elder, Thomas
Department: Chemical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Lignin is a component of biomass that makes up 20-35% of wood, the other major constituents being cellulose and hemicellulose. The pyrolysis of lignin has been shown to produce valuable materials like phenol, benzene, xylene, and toluene, which can be used in the plastics industry or as renewable biofuels. Pyrolysis is the degradation of a substance at high temperature under a limited amount of oxygen. While lignin, hemicellulose, and cellulose all have industrial potential, most research efforts have focused on only cellulose. Lignin pyrolysis is difficult to study experimentally because lignin has a very irregular, amorphous structure. It is made up of a combination of three different monomers: p-hydroxy-phenyl (P-unit), guaiacyl (G-unit), and syringyl (S-unit), aligned in a seemingly-random pattern. To help alleviate these difficulties, lignin decomposition pathways can be studied using computational chemistry. This approach has the capability of predicting lignin reaction energetics given a reasonable model structure. Typically, lignin pyrolysis has been modeled using dimer systems. This work broadens the scope to structures up to ten G-unit monomers in length in an attempt to address non-bonding forces that would be observed in realistic lignin structures. Bond dissociation energies were calculated using the COMPASS forcefield for conformational sampling and then a BLYP/DNP Density Functional Theory method for geometry optimization and energy calculation. The calculated average bond dissociation energy of 66.46 kcal/mol was quite close to the reported literature value for a G-unit dimer of 67.33 kcal/mol (see Parthasani, 2011). Interestingly, the bond dissociation energy varied with the bond's position in the molecule, ranging from 54-73 kcal/mol. The results from this study give a better idea of the impact of non-bonding forces in lignin pyrolysis and may be used to design more efficient and selective lignin pyrolysis reactors.

Title: Performance enhancement of ditch check practices during highway construction
Primary Author: Schussler, Jaime C.
Additional Authors: Perez, Michael; Cetin, Bora; Whitman, Blake
Department: Civil Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Earthmoving activities associated with highway construction create increased risk of downstream pollution from stormwater runoff. Erosion, and the resulting sedimentation in waterways, has become one of the nation's largest water pollution problems. To minimize downstream impacts, USEPA Construction General Permit requires all construction operators to develop a stormwater pollution prevention plan for all construction activities. This plan includes the design, installation, and maintenance of erosion and sediment control practices to minimize downstream impact from stormwater discharges. Many standard practices have not been formally evaluated for field performance. This project aimed to understand the current performance of standard practices and to evaluate the performance of modified designs for the Iowa Department of Transportation. Ditch check practices were selected based on frequency of use, agency interest, and potential for improved performance. Monitoring was conducted on silt fence and wattle ditch checks on the Highway U.S. 30 Expansion project in Tama County, Iowa throughout the 2019 construction season. Data collection included daily rainfall, channel surveying, LiDAR scanning, and weekly visual inspections. Silt fence ditch check modifications included the addition dewatering weir, wire reinforcement, and v-shape installation. The modified design was installed with both a sliced and trenched installation. When comparing survey results of the modified to standard design improved sediment deposition by an average of 408% and 254%, respectively. Wattle modifications included a channel underlay, sod staples, and tepee staking configuration. Results from the channel survey indicated that wood chip wattle performance increased by 1,215% compared to standard installation. Findings from this research were expected to aid in development of design manual guidance, enhance the stormwater management program, and improve regulatory compliance.

Title: Elucidate the *in vitro* neuroprotective effects of ketone bodies in hippocampal HT-22 neurons

Primary Author: Schwartz, Jack A.
Additional Authors: Majrashi, Mohammed; Almaghrabi, Mohammed; Fujihashi, Ayaka; Ramesh, Sindhu; Reed, Miranda; Suppiramaniam, Vishnu; Dhanasekaran, Muralikrishnan
Department: Drug Discovery and Development
College/School: Harrison School of Pharmacy

Abstract:
Ketone bodies have been the topic of research for their possible therapeutic neurotropic effects in various neurodegenerative diseases such as Parkinson's disease, dementia, and seizures. Ketone bodies provide a superior energy source and they have been shown to increase mitochondrial function along with biogenesis. Ketone bodies are useful alternative source of energy when glucose is not metabolized effectively. Ketone bodies synthesized in lipid stores in the liver where they are produced during periods of starvation. Continuing research on Ketone bodies as a therapeutic for neurodegenerative diseases is necessary to find an effective way to administer/treat patients with Ketone bodies to mitigate their symptoms. In the current study, hippocampal HT-22 cells were treated with β-hydroxybutyric acid at different doses to elucidate the neurotropic effect. Markers of oxidative stress, mitochondrial function and apoptosis were investigated. The ketone body (β-hydroxybutyric acid) showed significant dose-dependent increase in cell viability. β-hydroxybutyric acid exhibited antioxidant effect by decreasing oxidative stress markers such as reactive oxygen species and lipid peroxidation. Moreover, β-hydroxybutyric acid improved mitochondrial functions by increasing Complex-I and Complex-IV activities. Furthermore, β-hydroxybutyric acid significantly decreased apoptosis as seen by decrease in caspase-1 and caspase-3 activities in a dose-dependent manner. We hypothesize that the neuroprotective effect of Ketone bodies is a promising route for research into therapeutics in neurodegenerative diseases.

Title: Effects of thermal stress during incubation on post-hatching development in *Anolis sagrei*
Primary Author: Schweikart, Olivia G.
Additional Authors: Fargevieille, Amélie; Warner, Daniel A.
Department: Organismal Biology: Behavior, Ecology, Evolution, as well as Animal Sciences
College/School: College of Agriculture

Abstract:
Increases in temperature extremes due to global change can threaten species in many ways. Early life stages, such as embryos in species with no parental care, are particularly vulnerable to extreme spikes in temperature. Indeed, at high temperature peaks during incubation, thermal stress can have immediate effects on embryo development but can also affect morphology and fitness in later stages. In the brown anole (*Anolis sagrei*), lab studies have found that thermal stress induced at the embryo stage leads to developmental complications and increased mortality during incubation. However, data collection typically stops when individuals hatch, and thus, we still lack knowledge about how early-stage thermal stress affects post-hatching development and fitness. To answer that question, we incubated brown anole eggs in three different temperature treatments, varying in mean and maximal temperatures. The temperature patterns were set to mimic natural environments, allowing for a temperature spike around mid-day. We compared tail length, snout-vent length, and mass among individuals to determine if different thermal peaks influenced variation in hatchling morphology, by measuring individuals the day they hatched. Hatchlings were then raised in common garden conditions and measured again at 40 days into the study to better track the effect of thermal stress on post-hatching survival and growth rate. We predicted that individuals that experienced high thermal peak during each day of incubation would be relatively small, with a low survival probability after hatching. We also expected reduced growth rate for individuals that experienced relatively high thermal stress.

Title: The influence of water availability on maternal and egg hydration in the brown anole
Primary Author: Scruggs, Cindy D.
Additional Authors: Miracle, Jocelyn; Cobbs, Kerry; Warner, Daniel
Department: Organismal Biology
College/School: College of Sciences and Mathematics

Abstract:
Water availability influences many aspects of an organism's biology and can have direct consequences on components of fitness. In reptiles, the hydric conditions of nests are important for proper embryonic development. Relatively moist conditions facilitate embryonic development and have positive effects on offspring phenotypes and survival. In contrast, eggs can quickly desiccate if they experience negative water balance. Thus, the quantity of water that is maternally allocated to eggs and the hydric conditions of the surrounding incubation substrate can have important effects on offspring. In this study, we quantified the effects of maternal water availability on egg production, egg size and egg hydration by manipulating watering regimes to reproductive females of the brown anole lizard (*Anolis sagrei*). Preliminary results indicate that low water availability reduces egg production but has no effect on egg size or hydration. Subsequently, we examined the effect of maternal watering regime on patterns of water uptake by eggs when incubated under relatively dry vs moist substrates. Water uptake by eggs was strongly influenced by the moisture conditions during incubation, but preliminary analyses suggest that maternal hydration has little to no effect. Subsequent analyses will examine the interaction between maternal hydration and incubation moisture conditions on egg survival and offspring phenotypes.

Title: Family functioning and depression and anxiety in adolescents who have sexually offended
Primary Author: Seaton, Kylie M.
Additional Authors: Thompson, Kelli; Moderi, Meredith; Guslar, Taylor
Department: Psychology; Sociology
College/School: College of Liberal Arts

Abstract:
In the U.S., depression and anxiety are two of the most common psychiatric disorders in adolescents. Factors such as parental divorce and separation can impact the likelihood of depression or anxiety in adolescents. One subpopulation that is particularly susceptible to being diagnosed with these disorders are adolescents in juvenile prisons. Incarcerated adolescents are 3-4 times more likely to be diagnosed with a psychiatric disorder when compared to their non-offending peers; with depression and anxiety being the two most common diagnoses. Disrupted caregiving, a natural consequence of incarceration, is a common stressor in incarcerated youth and may possibly be a cause of the high psychiatric disorders observed in juvenile prisons. Furthermore, depression and anxiety are often outcomes of criminal behavior, rather than risk factors as one might think. The aim of the current study was to examine family functioning and reports of anxiety and depression in a sample of adolescents incarcerated for illegal sexual behavior. Data was collected as part of a pre-treatment evaluation for youth mandated to complete the Accountability Based Sex Offense Prevention Program located at the Mt. Meigs juvenile correctional facility near Montgomery, AL. Results from an ANOVA indicated those who had come from divorced homes reported significantly higher rates of depression as reported by the Millon Adolescent Clinical Inventory (MACI). Further analysis revealed those who were living with a biological mom and a step-father reported significantly higher rates of anxiety than those who were living with a biological dad and a step-mother and those living with adoptive parents. While this data was cross-sectional in nature, and not causal in nature, this research could provide insight into what factors might contribute to the development of depression and anxiety in incarcerated youths. Treatment and intervention implications will be discussed.

Title: Morphological characteristics of ant communities within different habitats in Alabama
Primary Author: Semmes, Joshua O.
Additional Authors: Wills, Bill D.
Department: Insect Ecology
College/School: College of Sciences and Mathematics

Abstract:
A fundamental goal in ecology is to describe and quantify the diversity within a given system. Environmental variation is often considered a major driving force influencing the diversity of populations. For example, different habitats (e.g., forests versus grasslands) can lead to a shift in morphological characters in response to different ecological pressures (e.g., microclimate, habitat structure, etc.). While past work has explored how habitat affects morphological characteristics in ants, recent work in biogeographical comparisons has identified key morphological characters applicable to diverse ant communities. Using these key morphological characters, we compare how habitat influences the morphological characteristics of ant communities in Alabama. We used publicly available databases (antweb.org, antbase.org, globalants.org) to build a collection of measurements and habitat use data from ants in Alabama. With the scaled images available on these public databases, we collected ten morphological character measurements of 120 species. In general, we found that there was minor difference in morphological characters across varying habitats. Data analysis revealed that these morphological characters remained consistent across seven habitat types in Alabama. Future work will explore how field collected specimens from across Alabama compare in morphological characteristics relative to the publicly available specimens. Thus far, our work suggests that the environmental variation among different habitats has little effect on morphological characteristics of ant communities in Alabama.

Title: Evidence for P2Y2 receptor facilitation of hyperglycemia-induced insulin resistance in human hepatocytes
Primary Author: Senfeld, Jared I.
Additional Authors: Shen, Jianzhong
Department: Pharmacology
College/School: Harrison School of Pharmacy

Abstract:
It is known that deletion of the ectonucleotidase CD39 leads to liver insulin resistance in mice; however, it remains unknown whether this phenotype is due to a lack of extracellular adenosine generation or an excessive nucleotides accumulation and signaling. We hypothesized that the nucleotide P2Y2 receptor mediates insulin resistance in human hepatocytes. RT-PCR showed that among the eight known P2Y receptors, only the P2Y2, P2Y6, and P2Y11 mRNAs were detected in cultured HepG2 cells, a human hepatocytes model; however, stimulation of the cells with P2Y6- and P2Y11-selective agonists all failed to induce intracellular Ca^{2+} mobilization, whereas both ATP and UTP induced significant Ca^{2+} signaling in a dose-dependent manner, which was abolished by pretreatment of the cells with ARC-118925XX, a selective and competitive P2Y2 receptor antagonist, suggesting that the P2Y2 receptor is the only functional P2Y receptor expressed in HepG2 cells. In addition, we found that stimulation of the P2Y2 receptor induced MAPK signaling including phosphorylated ERK1/2, JNK, and p38, but not the AKT pathway. Interestingly, stimulation of the cells with ATP or UTP dose-dependently blocked insulin-induced AKT phosphorylation, but potentiated ERK1/2 signaling, indicating a selective disruption of the insulin-AKT signaling axis by P2Y2 receptor. Furthermore, we found that a notable release of ATP into the extracellular space was observed when exposing HepG2 cells to high glucose concentrations (25mM) as compared with normal glucose (6.1 mM). Consistent with this, we also found that extracellular nucleotides signaling through P2Y2 receptor induced a dose-dependent reduction in hepatocyte glucose uptake. We conclude that the P2Y2 receptor mediates liver insulin resistance in response to hyperglycemia, possibly through activation of the JNK pathway and inhibition of insulin signaling to the AKT pathway, highlighting that P2Y2 receptor may be a new drug target for type-2 diabetes.

Title: Comparative genomics and prediction of genome features in *Fusarium oxysporum* f. sp. *vasinfectum* isolates to aid in the identification of virulence factors specific for cotton
Primary Author: Seo, Seungyeon
Additional Authors: Coleman, Jeffrey
Department: Plant Pathology
College/School: College of Agriculture

Abstract:
The genomes of five isolates of *Fusarium oxysporum* f. sp. *vasinfectum* (*Fov*), the causative agent of Fusarium wilt of cotton, were sequenced by a next generation sequencing technique. These high-quality genomes were used to identify the distinguishing factors that confer them the ability to colonize and cause wilt on cotton. Genome alignment with the previously well described *F. oxysporum* f. sp. *lycopersici* genome revealed the presence of eleven "core" chromosomes with high conservation, while the remaining scaffolds, that lacked synteny, were designated as potential accessory scaffolds. The comparative analysis of 17 *F. oxysporum* genomes showed that they encoded a similar proportion of putative secreted proteins; however, a specific subset of putative small secreted proteins existed only in isolates able to infect cotton and could be serving as effectors. Investigation of novel effectors has been hampered due to a lack of consistency between members of the *F. oxysporum* species complex. To overcome this limitation, genomic characteristics of effectors can be exploited as those effectors that reside on accessory scaffolds are closely associated with pathogenicity. Gene disruption mutants of four putative effector genes have been generated by a CRISPR-Cas9 mediated approach. Further understanding of the molecular interaction between *Fov* and cotton would facilitate development of new disease management strategies, including improved breeding approaches and diagnostics.

Title: Pharmacists' knowledge of ACIP recommendations and vaccine availability: comparison across rural, suburban and urban community pharmacies
Primary Author: Shah, Ritu T.
Additional Authors: Westrick, Salisa; Ha, David; Fish, Hannah; Beckner, John
Department: Health Outcomes Research and Policy
College/School: Harrison School of Pharmacy

Abstract:
The objective of the survey was to assess differences in vaccine availability, pharmacists' self-assessed knowledge of infectious diseases, and self-assessed vaccine knowledge based on ACIP recommendations among urban, suburban and rural community pharmacies. An online survey of National Community Pharmacists Association (NCPA) members was conducted in Summer 2019. Participants reported whether they offered vaccines for adults (Hepatitis B, Influenza, Pneumococcal, Tetanus, Zoster), pregnant women (Influenza, Tdap) and adolescents aged 11-18 years old (HPV, Influenza, Meningococcal, Tetanus) in 2018. Next, using participants' self-assessed knowledge about 14 infectious diseases (1=poor to 4=excellent), a composite means score was calculated to represent participants' self-assessed knowledge of infectious diseases. Next, for each vaccine, participants rated their knowledge from 1 (not at all) to 3 (very) for a) indications, b) adverse effects, precautions and contra-indications, and c) preparation and administration. A composited means score, for each vaccine, was calculated to represent their vaccine knowledge. Lastly, RUCA codes were used to classify pharmacy locations into: urban, suburban, and rural. Poisson regression models compared vaccine availability and a series of ANOVA compared pharmacists' knowledge of diseases and vaccines across locations. 283 participants completed the survey (Response rate=2.7%), representing 37 states. Pharmacies offered, on average, 3.73(SD=1.53), 0.99(SD=0.82), and 1.40(SD=1.22) vaccines for adults, pregnant women and adolescents; there was no significant difference among urban/suburban/rural pharmacies. The knowledge of infectious diseases was significantly different between urban and rural pharmacies (3.02 vs. 2.74; $p<0.05$). Rural pharmacists' self-assessed knowledge of infectious diseases was lower than urban pharmacists. Findings informed NCPA when developing an educational program for community pharmacists.

Title: Time-resolved PIV measurements of an axis-symmetric forward-facing cavity
Primary Author: Shah, Syed Hassan Raza
Additional Authors:
Department: Aerospace
College/School: Samuel Ginn College of Engineering

Abstract:
The flow field of an axis-symmetric forward-facing cavity was experimentally investigated at Reynolds Number of 5,000 and 20,000 for three different aspect ratios (length/diameter) 1, 1.5 and 2 in the water tunnel using time-resolved particle image velocimetry. The location of the primary singular point was observed to depend upon aspect ratio for a given Re. Spatial oscillations of the primary singular point were observed that influence the formation of the separation bubble at the lip of the cavity and its convection downstream. The dividing streamlines shifted towards the outer wall for aspect ratio 2 and Re 20,000, two counter structures were observed inside the cavity. These vortices started to merge at aspect ratio 1.5 and transformed into one large structure for aspect ratio 1. The POD analysis of the PIV data was performed to understand the role of eddies emanating from the face of the cavity. The wake power spectra also contain the frequency of oscillations indicating close coupling between the two flows (external and internal).

Title: Comparison of knee valgus during the single leg squat and softball pitch
Primary Author: Shaw, Regan E.
Additional Authors: Friesen, Kenzie; Brittain, Abby; Oliver, Gretchen
Department: Kinesiology
College/School: College of Sciences and Mathematics

Abstract:
The single leg squat (SLS) is often used as an assessment tool for pelvic stability. Current research has correlated poor pelvic stability to injury in softball players, but to date there is no clinical assessment for pitching-related injury. Therefore, the purpose of this study was to compare knee valgus during the SLS and softball pitch. Fifty-nine youth and high school softball pitchers (12.6 ± 2.2 years, 159.78 ± 10.92 cm, 60.58 ± 15.34 kg) participated. All participants were connected to an electromagnetic motion capture system, synced with force plates and motion analysis software. Participants were instructed to perform bilateral SLS to peak depth. The SLS was analyzed at three events: 45º knee flexion on descent (D45), peak depth (PD), and 45º knee flexion on ascent (A45). Then participants completed three fastball pitches. The pitch was analyzed across two phases: Phase 1) from start of pitch to top of backswing, and Phase 2) from foot contact to ball release. Pearson's bivariate correlations were run to examine knee valgus during SLS and the pitch. The first correlation compared push knee valgus during the SLS and pitching Phase 1, while the second correlation compared stride knee valgus during the SLS and pitching Phase 2. Results revealed push knee valgus during Phase 1 of the pitch correlated with knee valgus of the push leg at PD ($r = -.362$, $p = .005$) of the SLS. Stance knee valgus at pitching Phase 2 correlated with knee valgus of the stance leg at D45 ($r = -.290$, $p = .026$) and A45 ($r = -.266$, $p = .042$) of the SLS. Those who were considered most stable (less knee valgus) during the SLS had more bilateral knee valgus during the pitch. It is possible that indications of instability during the SLS corresponds to feelings of insecurity during the pitch, prompting a less powerful pitch with less lower-extremity demand and thus less bilateral knee valgus stress.

Title: Theoretical Radar Model of AN-TPY-2 to predict power returned
Primary Author: Sheils, Tyler M.
Additional Authors:
Department: Aerospace Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
The fundamental goal of this problem was to create a radar model of the AN-TPY-2 radar that would apply to a 6DOF model and allow theoretical radar data to be collected from the model. The theoretical radar model was created in MATLAB using certain parameters that were supplied by MSIC, while certain parameters had to be estimated using literature or known values. After preparing the parameters, the common radar range equation was produced in MATLAB. The values for radar cross section and frequency were read into MATLAB from an excel spreadsheet containing the AN-TPY-2 data. After the data was read in the only variable missing was the range. The range was found from the 6DOF model that was produced in FORTRAN. The MATLAB radar model was converted into a FORTRAN model were the model could be synced to the flyout model. As the theoretical missile flyouts took place, the range and the angles were calculated from the 6DOF. The angle calculated allowed the missile to be assigned the correct radar cross section at every instant using an interpolation routine over the radar cross section data that came as a function of angle. With the 6DOF producing range data, the model of the AN-TPY-2 could now begin to transmit and create theoretical returned power from the radar. Once the power returned was received, it could be dissected by the mathematical neural network to identify the certain missile.

Title: Assessing Dimensions of Combat Exposure among Soldiers and Implications for Mental Health
Primary Author: Sherman, Haley M.
Additional Authors: Frye, Nicky; Lucier-Greer, Mallory
Department: Human Development and Family Studies
College/School: College of Human Sciences

Abstract:
Between 2001 and 2015, there were an estimated 5.4 million deployments among approximately 2.8 million service members, and the rate at which units are activated for deployment has remained steady. Combat exposure has been systematically associated with adverse mental health outcomes such as suicide, traumatic brain injury, anxiety, and depression. As military family scientists, we recognize that deployments to combat zones encompass many complex experiences, including conducting regular patrols, engaging the enemy, and using deadly force. The complexity of combat experiences, however, has yet to be empirically examined. This gap in the literature may reflect an overreliance on measures that operationalize combat exposure as a unidimensional construct, meaning that the various aspects of combat exposure have been captured as a single experience. As a result, our current understanding of soldiers' combat experiences and its consequences for mental health may be misunderstood. An empirical investigation of these issues represents an important next in military family research; therefore, the purpose of this study was: (1) to examine the dimensionality of a frequently used combat exposure measure, the Deployment Risk and Resilience Inventory (DRRI), and (2) to understand how different aspects of deployment experiences are related to two common mental health challenges, symptoms of anxiety and depression. Secondary data were drawn from the Army Study to Assess Risk and Resilience in Servicemembers (N = 9,168 soldiers). We found evidence that the DRRI, a common combat exposure measure, is a multi-dimensional scale, such that 2 factors emerged: expected combat experiences and responsibility for non-enemy deaths. We also found positive and significant associations between both combat exposure factors and mental health symptomologies, where higher levels of expected combat experiences and responsible for non-enemy deaths were associated with more symptoms of anxiety and depression.

Title: The study of self-folding origami Femto spacecraft
Primary Author: Shi, Zixi
Additional Authors: Guzzetti, Davide; Mailen, Russell
Department: Aerospace Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
In space mission research, developing the self-folding Femto spacecraft by using the origami techniques, with shape memory material could be the way to optimizing the mass and scale of the spacecraft. However, these shape memory material would not consistently form into an anticipated design with unstable solar irradiation. Due to the lack of database and experienced research, the self-folding spacecraft prototype could fail to function in the simulation. In this study, we are going to design a high feasibility self-folding Femto spacecraft prototype, that operates in zero-gravity environment simulation without stable infrared radiation supports. We describe a series of experiments on each phase of the overall study and provide a feasible database to improve the accuracy of future experiments. We expect this new application of spacecraft design to reduce the cost of space mission gross budget without any loss of quality, and hence prove the flexibility of spacecraft design.

Title: 3D-printing of self-healing polymer composites
Primary Author: Shinde, Vinita
Additional Authors: Beckingham, Bryan
Department: Chemical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
3D-printing technologies have seen a dramatic increase in industrial applications driven by its mass customization, decreasing costs of 3D-printing equipment, low waste generation, and overall progress in ease-of-use through software improvements. 3D-printed parts have poor mechanical strength as compared to parts fabricated by traditional methods, leading to material damage during fabrication. Additionally, many of the polymer material options for 3D-printing are not intrinsically recyclable, requiring disposal if they suffer any damage or degradation which can add up environmental waste. Thus, we aim to improve the lifetimes of 3D-printed polymeric objects through the incorporation of self-healing properties. Inspired by biological self-healing, in which a damage event triggers an autonomic healing response, microcapsules containing healing agents can be embedded into a host material. During a damage event these microcapsules rupture, release the healing agent and heal the surrounding material by polymerization, entanglement or cross-linking. We aim to synthesize microcapsules and leverage microcapsule shell wall chemistry to tune their properties to both withstand high shear stresses, elevated temperatures during 3D-printing and promote the autonomic healing response after damage. 3D-printable self-healing polymers will increase product shelf life, and thereby improve material sustainability and long-term cost. Double shell wall microcapsules with both solvent and monomer core fluids are prepared to investigate both solvent-healing and monomer self-healing mechanisms. Microcapsules containing healing agents are either incorporated into the host polymer matrix or are coated onto 3D-printing polymer filaments to create 3D-printed objects capable of self-healing. Microcapsule survivability and self-healing properties of these composite materials after 3D-printing are evaluated via examination of the healing efficiency and mechanical strength of the 3D-printed parts.

Title: Microcapsule-based self-healing in HIPS composites for additive manufacturing
Primary Author: Shinde, Vinita
Additional Authors: Shelke, Shreyas; Celestine, Asha D.; Beckingham, Bryan
Department: Chemical Enginnering
College/School: Samuel Ginn College of Engineering

Abstract:
Polymer composites are widely used for various industrial applications due to their excellent mechanical properties. However, damage repair and replacement of polymer composites are costly and time-consuming. Therefore, the development of damage-resistant and durable polymer composites is necessary. Self-healing polymer composites have the ability to intrinsically heal damage. These materials are becoming increasingly popular due to their retention of mechanical properties after damage and associated cost savings. Also, with the rise of additive manufacturing technologies for polymer composite fabrication the extension of self-healing capabilities to additive manufacturing platforms is desirable. This work is focused on extending microcapsule self-healing towards additive manufacturing by demonstrating microcapsule survivability in compression molded composites. We utilize polyurethane-urea formaldehyde (PU-UF) double-walled microcapsules with ethyl phenylacetate (EPA) as the self-healing fluid and high impact polystyrene (HIPS) as the bulk polymer. Microcapsules were incorporated within compression-molded HIPS specimens and their ability to survive this harsh processing environment was investigated. Flexure and fracture tests with and without microcapsules are used to determine the impact of microcapsules on the virgin HIPS physical properties and the self-healing efficiency of the composites after a fracture.

Title: Soybean phenotypic variation under high night temperature stress
Primary Author: Shu, Tianchu
Additional Authors: Sanz-Saez, Alvaro; Chen, Charles; Koebernick, Jenny
Department: Crop, Soil, and Environmental Sciences
College/School: College of Agriculture

Abstract:
Soybean is the fourth most important commodity crop globally grown on over 83 million acres in the United States. Crop yield is required to increase by 50% to satisfy the need of population expansion on 2050. Model of higher emission scenario projected 12 ℉ temperature increase by 2100. Night temperature increased faster than the increase of day temperature. High day temperature was proved to negatively affect photosynthetic activity then decrease yield. People have developed soybean cultivars that were tolerant to high day temperature. However, there is no research exploring cultivar variation to high night temperature on soybean. Our objectives are: 1. Study physiological effects of high night temperature stress on soybean; 2. Explore if there is cultivar variation on soybean to high night temperature stress. We have finished several soybean experiments on 2019 October. Four cultivars were selected by their high day temperature tolerance. Soybean plants grown in the greenhouse were moved into two growth chambers (high night: 32.3 ℃ /32.3 ℃ day/night; control: 32.3℃/21.6℃ day/night) until flowering stage for 14 days. Measurements include: photosynthesis, respiration, Vcmax, Jmax and Chlorophyll content. Yield date were collected until soybean becoming matured in the greenhouse. We found that cultivar variation to high night temperatures exist in soybean with significant difference in Vcmax and Jmax and slightly significant difference in total seed weight. For future research, we are going to expand our experiment with 9 breeding lines of soybean in Mississippi in this summer to impact of study high night temperature stress at different developmental stages of soybean.

Title: Study of the vortex interactions in the near wake of coaxial rotors in hover
Primary Author: Silwal, Lokesh
Additional Authors: Raghav, Vrishank
Department: Aerospace Engineering
College/School: Samuel Ginn College of Engineering

Abstract:

The near wake flowfield of the rotor has direct correlation with the rotor performance, vibration, noise and structural problems. In addition, the comprehensive understanding of the flowfield is imperative for better prediction of the rotor performances under different operating conditions. Thus, for this study, an experimental investigation of the near wake of a counter-rotating coaxial rotor system has been carried out using a modular, thrust scaled experimental setup. The studies were conducted for hover conditions by varying the axial separation distance between the rotors and comparisons were also made between the isolated single rotor and coaxial rotor system. High-speed particle image velocimetry (PIV) was used to study the time averaged and instantaneous nature of the coaxial rotor flowfield. The effect of the rotor spacing on the instantaneous interactions of the rotor tip vortices and their trajectories has been explored. The mutual interactions between the rotor tip vortex structures were observed to be significant in the near wake which is further investigated across different design parameters.

Title: Cathelicidin from alligator enhances protection of channel and channel-blue hybrid catfish from *Aeromonas hydrophila* and *Edwardsiella ictaluri* infections
Primary Author: Simora, Rhoda Mae C.
Additional Authors: Li,Shangjia; Coogan, Michael; El Husseini, Nour; Wang, Wenwen; Terhune, Jeffery; Liles, Mark; Dunham, Rex
Department: Fisheries
College/School: College of Agriculture

Abstract:
Worldwide, protection of fish against infectious diseases is a major challenge in aquaculture, and economic losses due to these diseases limit profitability. The ability of antimicrobial peptides (AMPs), a class of highly conserved peptides known to possess direct antimicrobial activities against invading pathogens, was investigated for protection in channel and hybrid (channel female X blue male) catfish against infections caused by the catfish pathogens, *Aeromonas hydrophila* and *Edwardsiella ictaluri*. To identify effective peptides, the minimum inhibitory concentrations (MICs) against fish pathogens and killing kinetics against *A. hydrophila* were determined *in vitro*. *In vivo* determination involved peptide injection into fish (50 µg/ml) and simultaneously challenged through immersion with the pathogens. Cathelicidins derived from alligator and sea snake exhibited potent and rapid antimicrobial activities against the tested catfish pathogens as compared to cecropin and pleurocidin AMPs. In bacterial challenge tests, increased survival rates in channel and hybrid catfish were observed in fish injected with cathelicidin from alligator as compared to other peptides and the infected control. Moreover, serum lysozyme level, an indication of elevated immune response during bacterial infections, was found highest in channel catfish injected with cathelicidin from alligator (77.8%) as compared to other peptides and control. While highest serum lysozyme level at 89% was found in hybrid catfish injected with cathelicidin from sea snake. These results clearly show the potential of cathelicidins to protect fish against bacterial infections and demonstrates a strategy that overexpressing the peptides in transgenic fish may provide a method of decreasing bacterial disease problems in catfish.

Title: Plant growth counteracts the effect of increased water use efficiency on streamflow under elevated CO_2 in the Southeastern United States
Primary Author: Singh, Arshdeep
Additional Authors: Kumar, Sanjiv; Akula, Sathish; Lawrence, David; Lombardozzi, Danica
Department: Natural Resources
College/School: School of Forestry and Wildlife Sciences

Abstract:
Plant response to elevated CO_2 concentration is known to increase leaf-level water use efficiency through a reduction in stomatal opening. Recent studies have emphasized that increased plant water use efficiency can ameliorate the impact of drought due to climate change. However, there is a potentially counterbalancing impact due to the increased leaf area. We investigate long-term trends (1951 to 2015) of observed streamflow in the Southeastern United States (SE US) and quantify the contribution of major drivers of streamflow changes using single factor climate modeling experiments from Community Land Model version 5 (CLM5). The SE US streamflow observations do not exhibit a trend, which is in agreement with the CLM5 control experiment. Using the factorial set of CLM5 experiments, we find that increased leaf area under elevated CO_2 leads to decreased runoff and almost completely counteracts increased runoff due to water use efficiency gains under elevated CO_2 and land-use change.

Title: Estimating nitrogen loss to the environment using nitrogen budget in response to poultry litter application
Primary Author: Singh, Rajveer
Additional Authors: Prasad, Rishi; Balkcom, Kip; Guertal, Beth; Lamba, Jasmeet; Oritz, Brenda
Department: Agronomy and Soils
College/School: College of Agriculture

Abstract:
Poultry litter (PL) is considered a valuable low-cost nitrogen (N) source for row crop production especially corn (Zea mays L.). However, for effective use of PL in nutrient management, information on associated yield benefits and environmental N losses is needed. The objective of this study was to evaluate the effect of PL and urea on corn yield and environmental N losses in response to two application rates (168 and 336 kg N/ha); two timings (100% N pre-plant and 25% N pre-plant + 75% N side-dressed at V6) and two locations (central and south Alabama). A 2-yr field plot study was conducted in a randomized complete block design with four replications. Partial nitrogen budget was generated to quantify environmental N losses. N inputs included N contribution from PL or urea, initial mineral N and atmospheric N deposition. N outputs included plant N uptake, final mineral N and environmental N losses. Soil samples (0-30 cm depth) were taken before planting and at harvest for initial and final mineral N content respectively. Above-ground plant biomass was harvested at physiological maturity to determine dry matter and N uptake. Following results include 1st yr of the study. Significant interaction between N source and rate with location ($P<0.001$) was observed on corn yield. Application time of the PL and urea did not influence grain yield. On average, south Alabama yielded 13.6% greater than central Alabama. Environmental N losses increased with rate for both PL and urea. At high rate, more losses occurred from PL treatment plots. Greater losses were resulted from side-dress PL. Unlike yield, location had no effect on N losses. Combined results from the two-year study will be presented.

Title: Estimating environmental nitrogen loss in corn production system receiving two contrasting nitrogen source, rate and application timing
Primary Author: Singh, Rajveer
Additional Authors:
Department: Agronomy and Soils
College/School: College of Agriculture

Abstract:
Poultry litter (PL) is considered a valuable low-cost nitrogen (N) source for row crop production especially corn (Zea mays L.). However, for effective use of PL in nutrient management, information on associated yield benefits and environmental N loss (ENL) is needed. The objective of this study was to evaluate the effect of PL and urea on corn yield and environmental N losses in response to two application rates (168 and 336 kg N/ha); two timings (100% N pre-plant and 25% N pre-plant + 75% N side-dressed at V6) and two locations (central and south Alabama). A 2-yr field plot study was conducted in a randomized complete block design with four replications. Partial nitrogen budget was generated to quantify ENL. Nitrogen inputs included N contribution from PL or urea, background soil N contribution (calculated from the control plots) and wet atmospheric N deposition. N outputs included plant N uptake, residual soil inorganic N and ENL. Soil samples at two depths 0-15 and 15-30 cm were taken each year at harvest for final inorganic N (NH_4 + NO_3) determination. Aboveground plant biomass was harvested at physiological maturity to determine dry matter and N uptake. Averaged across years, high rate (336 kg/ha and single application of PL yielded greater than its low rate (168 kg/ha) and single application at central Alabama. Application rate and timing of urea didn't influence grain yield at either location. The reported ENL results include only one-year data. At central Alabama, low N rate irrespective of source and application time significantly reduced ENL. At south Alabama, low N rate and single application regardless of source had the least ENL.

Title: Inhibition of proteasome by kinase inhibitors
Primary Author: Smith, John G.
Additional Authors: Akintola, Olasubomi; Kisselev, Alexei
Department: Drug Discovery and Development
College/School: College of Sciences and Mathematics

Abstract:
Cancer cells produce more misfolded proteins than normal cells. This is due to mutations, aneuploidy, immunoglobulin production in some blood cancers, hypoxia, glucose deprivation, and oxidative stress in solid tumors. The proteasome is the protein recycling plant of mammalian cells and degrades these misfolded proteins. Because of their abundant protein production, cancer cells are more reliant on the proteasome. Therefore, blocking proteasome activity in these cells will result in a buildup of misfolded proteins and the cancer cells die. Inhibitors of the proteasome are currently in use for treatment of blood cancers. Another class of drugs used in cancer treatment is kinase inhibitors. These drugs block the action of proteins called kinases which activate other proteins. In cancer, some kinases are always active, driving cancer cell growth. Inhibiting these kinases will thus prevent the growth of cancer cells. Anti-cancer medications often have off-target effects when they block activity of proteins different from those they were designed to inhibit. We have now found a new off-target effect of many of these kinase inhibitors. We found that several kinase inhibitors block cleavage of peptide substrates by purified proteasomes isolated from rabbit muscle. A more detailed analysis of the data revealed that kinase inhibitors do not directly compete with substrates as FDA-approved proteasome inhibitors do but bind outside of the active sites and exert allosteric inhibition. These findings may pave the development of more potent allosteric inhibitors of the proteasome and show that kinase inhibitors should be screened for inhibition of the proteasome as a potential off-target effect.

Title: Dynamics of cortisol secretion as a response to anthropogenic noise in freshwater fish
Primary Author: Smith, Matthew G.
Additional Authors: Friebertshauser, Ryan; Johnston, Carol; Holt, Daniel; Mendonca, Mary
Department: Biomedical Sciences
College/School: College of Sciences and Mathematics

Abstract:
The dynamics of cortisol secretion in freshwater fishes are currently understudied in the literature. In order to further elucidate these dynamics, we investigated stress-induced cortisol secretion over time in order to further explain the results of a previous experiment.Water-borne cortisol was examined as part of a larger experiment wherein six metrics of stress were investigated in response to anthropogenic noise playback. Four species, representing a common, south eastern fish assemblage, were observed: Largescale Stoneroller, Redline Darter, Blacktail Shiner, and Bluegill Sunfish. The previous results that inspired this research found no significant difference in water-borne cortisol concentrations (after a 30-minute trial) when comparing noise-exposed groups to treatment groups (silence) in any of the four taxa (n=15). This work suggested the presence of negative-feedback activation, caused by an initial spike in cortisol in the treatment group, to be the cause for the counterintuitive results. To test this theory and further explain the dynamics of cortisol secretion in these taxa, we exposed Blacktail Shiner and Bluegill Sunfish (n=9) to identical trials used in the previous experiment and water-borne cortisol was subsampled at three, fixed points throughout the thirty-minute trial (5, 15, and 30 minutes). In the presence of noise, both taxa exhibited significantly higher rates of cortisol secretion at the 5-minute collection point compared to control groups, however there was no statistically significant difference in total cortisol concentration across treatments. These results support the theory of rapid cortisol secretion posed by the initial experiment and additionally document the importance of investigating the temporal dynamics of a stress response in the field of stress physiology. Most importantly, this experiment further supports the negative effects of anthropogenic noise on freshwater fish communities.

Title: *E. coli* bacteriophage PF-2 displays a reduction in infectivity following treatment with hydrogen peroxide
Primary Author: Smith, Harrison B.
Additional Authors: Bruderer, Madeleine; Landrum, John; Landrum, Archibald; Higgins, Keah; Hallowell, Haley; Roberts, Megan; Hiltbold Schwartz, Elizabeth
Department: Biomedical Sciences
College/School: College of Sciences and Mathematics

Abstract:
The intestine must maintain a delicate balance between tolerance of enteric microbiota and defence against pathogens. The enteric microbiota is composed of a variety of microorganisms, including bacteria and bacteriophage, among others. In intestinal inflammation such as IBD, the enteric microbiota can be altered by products of the immune system such as reactive chlorine species. While we have some knowledge of how inflammation affects bacteria, we understand significantly less about how inflammatory products impact the dynamics of bacteria: bacteriophage interactions. The primary objective of this study was to determine how immune system products, namely hydrogen peroxide, impact bacteriophage infectivity rates. The effect of hydrogen peroxide on the infectivity rate of bacteriophage was measured using a modified one-step growth curve, measuring growth cycle and burst size of an *Escherichia coli*-specific bacteriophage. Adsorption kinetics were performed to determine the effect of inflammatory products on ability to adsorb. Adsorption kinetics reveal a delay in adsorption in a dose-dependent manner to hydrogen peroxide. Thus, hydrogen peroxide delays reproduction of PF-2 as early as the adsorption phase. PF-2 concentrations were not reduced in the presence of inflammatory products used. Hydrogen peroxide delays the replication of the bacteriophage PF-2 by weakening the ability to adsorb, thus delaying reproduction of PF-2. However, hydrogen peroxide did not reduce overall progeny produced until higher treatments were applied.

Title: #Trending: Addressing social media use in the american psychological association (APA) ethics code
Primary Author: Smith, Kareema M.
Additional Authors:
Department: Counseling Psychology
College/School: College of Education

Abstract:
In the last 10 years, social media use has grown exponentially with over 90% of current (psychology) trainees reporting that they are active on social media (Baier, 2019). In 2013, APA published guidelines for the practice of telepsychology, a document that directly addressed the legal requirements, ethical standards and additional concerns related to telepsychology. Social media use amongst practitioners is only briefly mentioned in these guidelines. It is pertinent that the use of social media amongst psychologists and psychologists-in-training be directly addressed in the APA Ethics Code. At the time that this proposal was submitted, APA still has not published any literature related to the ethical use of social media amongst psychologists. Although the academic literature discusses the use of social media amongst psychologists along with the ethical challenges that come with this use (Baier, 2019), there is limited research on the variety of roles in which a psychologist (or one in-training) can engage in social media and how that can demand different aspects of professionalism. The author has identified three distinct ways in which social media is used amongst psychologists: A personal-only presence, a professional presence for business, and a personal-professional presence. The author will examine the variety of ways a psychologist can present themselves on social media (using case studies of current psychologists), discuss why a more explicit section of the code is needed and discuss limitations and recommendations that APA must consider when revising the code. The author believes that as APA begins to draft guidelines for social media use and/or revises the Ethics Code, the various ways practitioners might use social media must be considered. In addition, the Ethics Code should address the varied levels of professionalism that exist depending on the mode one chooses to present themselves on social media platforms.

Title: Evaluating the effects of chemotherapeutics on dopaminergic cells
Primary Author: Solomonik, Anna C.
Additional Authors: Majrashi, Mohammed; Almagrabhi, Mohammed; Abbott, Kodye; Ramesh, Sindhu; Pondugulu, Satyanarayana; Moore, Timothy; Dhanasekaran, Muralikrishnan
Department: Drug Discovery and Development
College/School: College of Sciences and Mathematics

Abstract:
Chemotherapy-induced cognitive impairment, also known as "chemo brain", is a medical complication of cancer treatment that is characterized by a general decline in cognition affecting visual and verbal memory, attention, complex problem-solving skills, and motor function. It is estimated that one-third of patients who undergo chemotherapy treatment will experience cognitive impairment. Alterations in the release and uptake of dopamine and serotonin neurotransmitters that play important roles in cognition could potentially contribute to impaired intellectual performance in those impacted by chemo brain. Chemotherapeutics can increase oxidative stress, decrease mitochondrial function, and increase apoptosis which causes dopaminergic neurodegeneration leading to motor disorders such as Parkinson's disease. This study was done to investigate *in vitro* dopaminergic neurotoxic effects of the chemotherapeutics Doxorubicin and cyclophosphamide. Rat dopaminergic neuronal cells (N27) were used for *in vitro* studies to assess the neurotoxicity. Chemotherapeutics Cyclophosphamide and doxorubicin exhibited dose-dependent and time-dependent *in vitro* dopaminergic neurotoxicity. Chemotherapeutics doxorubicin and cyclophosphamide induced oxidative stress and apoptosis (increased BAX expression) in the dopaminergic neurons without affecting the mitochondrial functions. With regards to oxidative stress, cyclophosphamide and doxorubicin increased the generation of ROS and nitrite content resulting in lipid peroxidation. Cyclophosphamide and doxorubicin depleted glutathione, decreased catalase activity, and increased glutathione peroxidase, SOD, and MAO activity. Future studies to assess the *in vivo* neurotoxic effects of cyclophosphamide and doxorubicin using a rodent animal model will be performed. Therefore, this study supports the need for additional neurochemical, behavioral, and biochemical analysis to identify the underlying mechanisms of chemotherapy-induced cognitive disorders.

Title: Additively manufactured lattice structures: an alternative to bone implants
Primary Author: Soltani-Tehrani, Arash
Additional Authors: Shamsaei, Nima
Department: Mechanical Engineering
College/School: College of Engineering

Abstract:
Lattice structures, which are formed by repeating smaller structures defined as “unit cell” are suitable bone implant alternatives due to their superior strength-to-weight ratio and the higher bone ingrowth. With the booming advances in additive manufacturing (AM) technologies, it is now feasible to fabricate these complex structures from different biocompatible materials. However, based on the natural bone characteristics, it is important to customize these lattice structures by adjusting the unit cell size. Therefore, this study aims to investigate additively manufactured lattice structures from 316L stainless steel with different unit cell sizes while the mass and volume are kept constant. The effects of altering the size on static compression and compression-compression fatigue behavior will be evaluated. In addition, the main failure mechanisms in these structures will be studied.

Title: Effect of temperature and solids content on the biocrude quality of sewage sludge-catalyzed hydrothermal liquefaction products
Primary Author: Soneye, Temitope D.
Additional Authors: Adhikari, Sushil; Fasina, Oladiran; Higgins, Brendan
Department: Biosystems Engineering
College/School: College of Agriculture

Abstract:
The International Energy Outlook estimates that the world energy consumption will approach 1,090 quadrillion British thermal units in 2050, with much of this consumption growth coming from developing nations. The carbon intensive nature of conventional fossil fuels however

provides an opportunity for renewable alternatives. The 2016 Billion-Ton Report recognized Municipal Solid Wastes (MSW) as the most feasible feedstock at $60/dry ton, with a forecasted availability of 155 million dry tons and an additional landfill gas volume of 229 billion ft3 by 2040. Research efforts in making this feedstock commercially viable should thus be accelerated. The objective of this research was to study the effect of operating parameters such as temperature and solids content on the red mud-catalyzed (25% loading) hydrothermal liquefaction of sewage sludge samples obtained from The H.C. Morgan Water Pollution Control Facility in Auburn, Alabama. Three sludge samples; namely Secondary (5% solids), Thickened (15% solids) and dried sludge were liquefied at 300°C and 325°C with a residence time of 1hour using 600g of sample in an 1.8L batch reactor in all cases. The catalyzed runs were compared with uncatalyzed runs and products were assessed using heating value, ultimate analysis, viscosity, density, chemical composition analysis using GC-MS, FTIR spectroscopy, Micro-GC, TOC/TN and COD analyses. The thickened sludge yielded the highest oil fractions of 23.30±0.22 wt.% and 28.46±0.35 wt. % at 300°C and 325°C respectively, suggesting that initial pre-drying reduces the organics in the feedstock. The heating value of all crudes were within 30 – 35MJ/kg (d.b), with the highest (34.54±1.59) MJ/kg recorded from the pre-dried feedstock. Although the catalyst did not increase the yield, there was transfer of more organic carbon from the aqueous phase to other phases while the oil viscosity also improved with a considerable increase in char formation.

Title: Enhancing heat transfer in microgravity through vapor mobility in phase-change cooling
Primary Author: Sridhar, Karthekeyan
Additional Authors: Smith, Ryan; Bhavnani, Sushil H.
Department: Mechanical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
The lack of buoyancy forces in microgravity causes vapor bubbles to remain stationary and grow to large diameters, severely inhibiting heat transfer from heated electronic sources. The current study employs an asymmetric ratcheted surface with intentional nucleation sites on the shallow slopes to induce vapor mobility in reduced gravity conditions. This terrestrial study is the initial phase in a larger effort to provide passive vapor bubble motion, culminating in an extensive study aboard the International Space Station (ISS) under prolonged microgravity conditions. The stainless steel surfaces used in the study were fabricated using an additive manufacturing technique called Powder Bed Fusion. Vapor bubble dynamics were studied across two orientations, upward-facing and downward-facing, along with high-speed imagery. The downward-facing orientation explored in this terrestrial study is the bridge between the terrestrial and microgravity experiments, as buoyancy forces do not detach vapor bubbles from the surface. The asymmetric sawtooth microstructure influenced bubble dynamics in both orientations, with vapor bubbles sliding across the microstructure in the downward-facing orientation. Distinct stages of bubble growth and motion, including nucleation, coalescence and sliding of the vapor bubble, were observed in the downward-facing configuration. A thin asymmetric liquid film, hypothesised to be an important factor in inducing motion, was explored using high-speed imagery. The discussed microstructure is a passive, pump-less and self-regulating cooling solution for electronics in microgravity and spacecraft applications. Preparations for the ISS experiments are currently underway in collaboration with implementation partner, Techshot, with a projected launch date in mid-2020.

Title: Evaluation of drug release from 3D-printed tablets
Primary Author: Steeve, Helen M.
Additional Authors: Davis, Edward
Department: Materials Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Stereolithography (SLA) 3D-printing is a prime candidate for printing drug delivery tablets due to low processing temperatures and the ability to easily customize shapes and blends of prints. To explore this potential, tablets were printed using a commercial SLA printer with resins composed of polyethylene glycol diacrylate 700 (PEGDA) and polyethylene glycol 300 (PEG), using diphenyl (2,4,6-trimethylbenzoyl) phosphine oxide (DPTPO) as a photoinitiator to crosslink the PEGDA in the resin. PEG remains uncrosslinked as a filler in the tablets. This work explores the drug release rate of aspirin from these tablets using UV-Vis spectroscopy on solutions of dissolved tablets at intervals, using tablets with no aspirin as control to eliminate the effect of PEG dissolving into solution. Depending on the mechanism of release, the ratio of PEGDA to PEG may affect how the tablets perform. To better understand the release mechanism, UV-Vis results of the tablets are compared to various multi-mechanism release models.

Title: Gut microbiota metabolite, TMAO, induces microglial activation and senescence in rodent models with memory impairment
Primary Author: Steinke, Ian M.
Additional Authors: Govindarajulu, Manoj; Rella, Robert; Das Pinky, Priyanka; Ghanei, Nila; Schaedig, Taylor; Boersma, Melissa; Smith, Forrest; Suppiramaniam, Vishnu; Amin, Rajesh
Department: Medicinal Chemistry
College/School: Harrison School of Pharmacy

Abstract:
Research has intensified in the area of the gut microbiome and how it is linked to various disease pathologies. Dysbiosis of these bacteria can occur when dietary intake influences an imbalance in healthy bacteria and has been observed in Diabetic and Alzheimer's patients. Dysbiosis metabolites are further metabolized by the liver to produce Trimethylamine-*N*-oxide (TMAO). This novel biomarker for atherosclerosis and renal fibrosis is now being investigated for its association with the development of Alzheimer's disease (AD). Neuroinflammation is a common factor associated with AD and Diabetes for the development of memory impairment and neuronal dysfunction. In the current study we will show that TMAO induces microglial activation leading to neuronal inflammation and cellular senescence. Quantification of TMAO levels from aged 3xTg-AD and diabetic (db/db) mice was accomplished by LC-MS analysis. Evidence of senescence was measured by beta gal staining in aged (8 month) 3XTg-AD mice and Diabetic mice. Microglial activation patterns by TMAO are measured by flow cytometry and western blot. Electrophysiological recordings for long term potentiation in mouse brain slices incubated with TMAO for 2 hours demonstrated altered plasticity and enhanced microglial activation. We have observed that TMAO is elevated in Diabetic and AD mice as disease progresses. TMAO also induces significant activation of microglial cells *in vitro*. Further, elevated levels of hepatic flavin-containing monooxidase 3 (FMO3), are observed in diabetic and 3xTg-AD mice. Our data is currently preliminary and further evaluation will determine the significance of TMAO to its related metabolic pathway in association with neuro-inflammation and cognitive impairment in Diabetes and AD. Second, FMO3 is central in TMAO metabolism and has been correlated to hepatic insulin resistance. This connection of TMAO with insulin sensitivity and glucose utilization is being investigated with novel FMO3 inhibitors.

Title: Malaria surveillance on paper: a cost-effective, field-adaptable *Plasmodium* circumsporozoite ELISA
Primary Author: Stephens, Haley E.
Additional Authors: Eula, Maria Andrea Camarano; Erramuspe, Iris Beatriz Vega; Maldonado, Diego Gómez; Sutcliffe, Alice; Dotson, Ellen; Peresin, Maria Soledad; Zohdy, Sarah
Department: Forestry and Wildlife Sciences
College/School: College of Sciences and Mathematics

Abstract:
Detection of malaria parasites in mosquito vectors is an essential component of malaria surveillance and evaluation of control strategies. *Plasmodium* circumsporozoite (cs) detection using a sandwich ELISA is the current gold standard for identification of infective mosquitoes. While effective, costs for establishing a laboratory with testing capabilities can easily exceed 10,000 USD, a trained staff is required to perform and interpret results, and the assay is time-consuming. In resource-limited settings where need for surveillance is greatest, obtaining lab consumables and equipment necessary for the csELISA can be difficult or impossible. Here, we aim to eliminate the need for lab supplies and equipment through the use of paper-based diagnostic devices. These devices integrate the sensitivity and accuracy of traditional ELISAs with the affordability and accessibility of paper, and to date, have not been applied to standard csELISA testing. The adaptation of the csELISA to a paper-based platform would provide an easily accessible alternative that would reduce cost and time of sample analysis and minimize the experience required to run the assay. The application of wax barriers to Whatman No. 1 chromatography paper allowed us to perform the csELISA for *P. falciparum* (Pf), *P. vivax*-210 (Pv-210) and *P. vivax*-247 (Pv-247) using recombinant positive controls and yielded detection limits similar to those of the traditional csELISA assay, while reducing reagent volumes by 80%. The detection limits are 2 pg/µL for Pf, 182 pg/µL for Pv-210, and 91 pg/µL for Pv-247. These results suggest that by adapting the csELISA to a paper-based "plate," we can increase productivity by up to ten times regarding reagents used and decrease required run time from 7-8 hours to one hour. Deployment of this technology would allow researchers to perform assays rapidly in real-time, thus increasing productivity and decreasing lag time between specimen collection and programmatic intervention.

Title: Effects of cover and forage availability on white-tailed deer use of managed forests
Primary Author: Stewart, Dylan G.
Additional Authors: Gulsby, William; Keene, Kent; Colter, Allison; Miller, Darren; Johannsen, Kristina; Miller, Karl; Martin, James
Department: Wildlife Science
College/School: School of Forestry and Wildlife Sciences

Abstract:
Both forage and cover are important predictors of white-tailed deer (*Odocoileus virginianus*) use of forested regions, however cover has received less attention in the literature. Thus, we performed an experiment to quantify the relative contribution of these factors to deer use of loblolly pine (*Pinus taeda*) stands treated with various combinations and intensities of forest management practices. We measured percent cover of preferred deer forage and visual obstruction within 5 stands thinned to 40 (low), 60 (medium), and 80 ft^2/ac (high) in central Georgia during 2017. We applied prescribed fire to half of each treatment unit during 2018. We randomly placed two camera traps (n=60) within each subplot from August 7-September 14, 2019 and used Poisson regression to analyze photo counts and provide an index of deer use of each treatment. On average, deer use was two-times greater in the 60 and 40 ft^2/ac units compared to the 80 ft^2/ac units. Compared to unburned units, deer use was 2.6 times greater in burned 80 ft^2/ac units and about 1.6 times greater in burned 40 and 60 ft^2/ac units. Because both visual obstruction and preferred deer forage increased with decreasing basal area, and were similar between burned and unburned units, we could not assess the relative contribution of cover and forage availability to deer use. However, our data suggests thinning to lower basal areas increases both forage and cover, resulting in increased deer use of loblolly pine stands.

Title: The effect of load magnitude on muscle activation during unilateral front-racked dumbbell carries

Primary Author: Stewart, Sydney N.
Additional Authors: Bordelon, Nicole; Cassidy, Molly; Gober, Peyton; Oliver, Gretchen
Department: Exercise Science
College/School: College of Education

Abstract:
Lumbo-pelvic hip complex (LPHC) and scapular stability increase kinetic chain efficiency during dynamic upper body movements. Weighted carries are a resistance exercise that may improve stability; however, load magnitude may affect muscle activation. Therefore, it was the purpose of this study to examine the effect of load magnitude on muscle activation during unilateral front-racked dumbbell carries. Eighteen resistance trained individuals (22.6 ± 2.6y, 173.3 ± 8.1cm, 74.6 ± 24.9kg) performed 3 trials of 3 load conditions while carrying a front-racked dumbbell on their dominant side across a 12m distance. Load conditions were relative to body weight: light (25%), moderate (30%), and heavy (35%). Electromyography was used to analyze the dominant upper and lower trap (UT, LT), latissimus dorsi (LD), and serratus anterior (SA) as well as bilateral external obliques (EO) and glutei medii (GM). All data were normalized to maximum voluntary isometric contraction (MVIC). A 3 (load) x 8 (muscle) repeated measures ANOVA compared %MVIC across load conditions. There was a significant load by muscle interaction [$F(3.918, 66.609) = 17.391$, $p < 0.001$]. Post hoc analysis revealed a significant difference between light and moderate loads for the LT, UT, LD, SA, non-dominant EO, and non-dominant GM (all p-values < 0.001), where moderate loads had greater activation. There was also a significant difference between the moderate and heavy loads for the LT, UT, LD, SA, dominant EO, non-dominant EO, dominant GM ($p = .001$), and non-dominant GM ($p < 0.001 – 0.13$), where heavy loads had greater activation. Lastly, there was a significant difference between light and heavy loads in all muscles ($p < 0.001 – 0.006$), where heavy loads had greater activation. Muscle activation increased with load for all measured LPHC and scapular muscles. The findings suggest programming an increase of 10% body weight will increase activation for all muscles studied during unilateral front-racked carries.

Title: Development of MATLAB trip/slip algorithms to investigate the effectiveness of treadmill-based perturbation training
Primary Author: Stotser, Jacob A.
Additional Authors: Roper, Jaimie
Department: Mechanical Engineering; Kinesiology
College/School: Samuel Ginn College of Engineering

Abstract:
Falls are the most frequent unintentional injury among older adults. Over a quarter of the population 65 or older suffers a fall each year, resulting in nearly a million hospitalizations. Treadmill-based perturbation training is growing in popularity for researchers and interventionists interested in lowering fall risk in aging and disabled populations. This type of training allows the researcher to measure an individual's ability to react to typical perturbations, such as trips and slips, in a safe environment at varying levels of user-specific intensity. Further, recent literature has indicated its effectiveness for improving central nervous system reaction to trips/slips, leading to an overall improvement of balance and increased trained reactive responses. We aimed to develop unique treadmill-based perturbation software providing more realistic fall scenarios than existing options through greater control and customization. MATLAB algorithms were developed to simulate both tripping and slipping perturbation patterns through a treadmill. In addition to selecting between those two patterns, other features include adjustable intensity, "on-click" or "on-foot-contact" delivery, an optional "stutter-step" acceleration preceding the perturbation, split-belt walking support, and gait cycle detection. These algorithms were also integrated with existing Self-Selected-Walking software, allowing the user to walk at a continuously self-selected speed while experiencing perturbations, and merged with a graphical user interface featuring an intuitive layout and various safety features. Continuing, this software will be used to examine the effects of dual-tasking paradigms on motor control adaptation during treadmill-based perturbation training. Ultimately, this software will be used to identify fall-risk and as a preventative training tool to decrease falls in the Auburn/Opelika aging community.

Title: Investigating late-stage polypeptide diversification via formation of twisted amides
Primary Author: Streety, Xavier S.
Additional Authors: Adebomi, Victor; Sriram, Mahesh; Raj, Monika
Department: Biochemistry
College/School: College of Sciences and Mathematics

Abstract:
Peptide therapy presents the unique opportunity for medicine to closely mimic natural pathways. One approach to the modern advancement of peptide therapeutics is the development of new methodologies to introduce a variety of functional groups to peptides. Synthetic means of modifying the peptide backbone have thus far been largely unexplored as the amide bonds composing the backbone have partial double bond character and thus are difficult to cleave. However, synthesis of "twisted" amides exhibiting reduced double bond character due to a restriction or change in the geometry of the nitrogen atom of the amide bond have been successful and have altered functionality. Thus, we sought to determine a method of introducing "twists" to the amides of peptide backbones and test their reactivity toward cross coupling reactions. We determined the twist angle of various modified amide backbones using density functional theory (DFT) calculations and synthesized peptides and small molecules containing the moiety with the most potential as a twisted amide. We have successfully carried out various cross coupling reactions on small molecules containing the twisted amide, including amidation, esterification, Suzuki coupling, and Friedel-Crafts reactions. Our testing on twisted peptides is ongoing but shows promising results. The success of twisted amides in cross-coupling reactions suggests that this methodology can be used for the development of peptide therapeutics by introducing new functionalities to improve cell permeability and specificity or by introducing detection moieties such as fluorescent tags.

Title: Glutathione activates autonomous reductant signaling cascades independently from oxidative stress signaling
Primary Author: Subedi, Pratima
Additional Authors: Dos Santos, Izailda; Liu, Wenshan; Park, Sang Wook
Department: Entomology and Plant Pathology
College/School: College of Agriculture

Abstract:
Glutathione (GSH; γ-L-glutamyl-L-cysteinyl-glycine) is the most abundant nonprotein thiol in plants, acting as a major reducing agent transmitting oxidative stress signaling. GSH acts as a major antioxidant that prevents damages to a variety of important cellular components. It reduces reactive oxygen species and other peroxides by donating its electron (H^+, e-), and is subsequently oxidized to a disulfide form (GSSG). 2-cysteine peroxiredoxins (2CPA) are key proteins possessed by plants that are able to detoxify hydrogen peroxide molecule. Here we demonstrate a unique, regulatory reaction of GSH that operates autonomous metabolic and signaling pathways. Our preparatory pull-down assays showed that Arabidopsis 2CPA can directly bind to GSH-agarose beads underpinning the potential S-glutathionylation of 2CP-family proteins. A series of redox mobility assays demonstrated a unique activity of GSH where it oxidizes, and directly binds to the sulfhydryl group of cysteine residues, modifying the quaternary structure of 2CPs which in turn determines and protects their structure-function against enzymatic reductions and various ecological constraints that cause pH flux and/or oxidative stresses. The GSH-binding kinetics of 2CPs is coordinated by systematic regulations of GSH synthesis and attendant reduction capacity, occurring independently of free radicals and oxidant generations. Thus, we conclude that GSH can also act as a signal activating redox and enzymatic cascades, besides a general antioxidant (electron donor).

Title: The challenges of gender perception
Primary Author: Sullivan, Jessica G.
Additional Authors:
Department: History
College/School: College of Liberal Arts

Abstract:
The launch of the Challenger Space Shuttle was a culturally significant event that ended in tragedy on January 28, 1986. However, this paper displays that The New York Times, Washington Post, and NBC News portrayed an inherent gender bias when reporting about the shuttle, differing in their portrayal of the women and men astronauts reflecting the beliefs from the space program at the time and the period as a whole. Journalists portrayed the women astronauts, Christa McAuliffe and Judith Resnik, in a societally stigmatized stereotype that emphasized their roles as mothers or daughters or downplayed the women's work, rather than equating their work to their male astronaut counterparts. This stereotype contributed to a declining national shift of young girls to aspire to work in careers in STEM, or science, technology, engineering, and math. Based on information from academic journals, there has been an absence of women in STEM fields that have hurt the tech industry as well as other industries. Therefore, it is imperative to provide young girls the same opportunities that males have to these fields, and that starts with changing the national and often worldwide typecasts of women working in STEM.

Title: Hyaluronic acid and folic acid conjugated silica nanoparticles for dual targeting of colon cancer

Primary Author: Sultana, Nayer
Additional Authors: David, Allan
Department: Biology
College/School: Samuel Ginn College of Engineering

Abstract:
Colorectal cancer is the third most diagnosed cancer and second leading cause of cancer related death in the United States for both men and women. Chemotherapy is the main therapeutic strategy which uses different drugs or drug combination to reduce the division of cancer cells but it leads to severe side effects such as non-specific toxicity. Nanoparticles with targeting abilities offer a novel approach for site-specific delivery of chemotherapeutic drugs. Apart from its therapeutic application, targeted nanoparticles can also be used for diagnostic purpose to selectively deliver the imaging agent at the disease site. So, the goal of this project is to develop a novel dual targeted nanoparticle with optimized ligand density for targeting of colorectal cancer cells and limited targeting of normal cells. More specifically, I am focusing on developing Hyaluronic Acid and Folic Acid conjugated dual targeted Silica nanoparticles which will target Colon cancer specific CD44 and Folate receptors respectively. Targeted silica nanoparticles were synthesized by the well-established EDC-NHS chemistry and the effect of ligand concentration on nanoparticle size and zeta potential were investigated. Particle size and zeta potential measurement confirmed the successful conjugation of both Hyaluronic acid and Folic acid to the silica nanoparticle.

Title: Cryopreservation of tissue and organ-on-chip system
Primary Author: Suresh, Joshita
Additional Authors: Gilbert, Ashley; Ramsey, Deborah; Pandian, Prabhakar
Department: Chemical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Due to limitations in cell divisions and the need for transportation of preserved tissues, cryopreservation techniques are pertinent in the biomedical field. There are a range of obstacles that are encountered during standard freezing processes such as ice crystal formation and cell dehydration which lead to decreased recovery rates when cells are thawed. In addition to standard cryopreservation of cell suspensions in cryovials with freezing media containing cryopreservation agents such as dimethyl sulfoxide (DMSO), additional research is needed to understand and appropriately preserve *in vitro* organ or tumor constructs. With the growing use of tissue/organ-on-a-chip platforms, traditional methods utilizing cryovials frozen within a cooling chamber are not feasible for the freezing of 3D cultures on devices. Tissue/Organ-on-a-chip platforms are novel microfluidic devices consisting of microvasculature and tissue chambers within which cells are allowed to grow and proliferate in an attempt to recapitulate *in vivo* physiological conditions. The purpose of this study was to determine an appropriate method for the freezing of microfluidic chips seeded with endothelial cells. Experiments were conducted to study the effects of DMSO concentration, freezing temperature, and freezing rates on endothelial cell viability. Human umbilical vein endothelial cells (HUVECs) suspensions and confluent monolayers of this primary cell were cryopreserved with proposed step-freeze methods to determine cell viability post thawing. Linear channels of microfluidic chip devices were also seeded with HUVECs. These devices were then frozen utilizing either a step- or snap-freeze protocol overnight. The chips were then thawed using standard thawing methods and left under dynamic flow for three days. A viability assay was conducted on Day 3 post-thaw utilizing Calcein-AM and Ethidium homodimer to stain live and dead cells, respectively.

Title: Using channel state information for estimating moisture content in woodchips via IoT Wi-Fi

Primary Author: Suthar, Kerul
Additional Authors: Wang, Jin; Jiang, Zhihua; He, Peter
Department: Chemical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
For the pulping process in a pulp & paper plant that uses wood as a raw material, it is important to have real-time knowledge about the moisture content of the woodchips so that the process can be optimized and/or controlled correspondingly to achieve satisfactory product quality while minimizing the consumption of energy and chemicals. Both destructive and non-destructive methods have been developed for estimating moisture content in woodchips, but these methods are often lab-based that cannot be implemented online, or too fragile to stand the harsh manufacturing environment. To address these limitations, we propose a non-destructive and economic approach based on IoT Wi-Fi and use channel state information (CSI) to estimate the moisture content in woodchips. In addition, we propose to use statistics pattern analysis (SPA) to extract features from raw CSI data of amplitude and phase difference. The extracted features are then used for classification model building using linear discriminant analysis (LDA) and subspace discriminant (SD) classification. The woodchip moisture classification results are validated using the oven drying method.

Title: Assessing the capability of Ecolite amended bioretention media to remove nutrients and heavy metals from stormwater
Primary Author: Sweeney, Lillie C.
Additional Authors: Brantley, Eve; Knappenberger, Thorsten; Shaw, Joey
Department: Crop, Soil, and Environmental Sciences
College/School: College of Agriculture

Abstract:
Bioretention cells are depressed landscape features filled with a permeable media designed to address stormwater toxicity in urban settings. A well designed bioretention soil media must consider aspects of both soil physics and soil chemistry to ensure proper infiltration rates are met while removing dissolved and particulate pollutants. Although traditionally composed of sand, silt, clay, and organic matter, research on the incorporation of alternative materials has gained popularity. Ecolite is an aluminosilicate and microporous soil amendment with the potential to increase the hydraulic conductivity and cation exchange capacity of soil. The purpose of this study is to determine the ability of Ecolite amended media to remove lead, zinc, copper, nitrate, ammonium, and phosphorus from water through column studies. One mixture of 85% sand, 11% fines, and 4% organic matter (by volume) was included, and three additional mixtures were created by replacing sand with zeolite at 2%, 10%, and 20% volume. A control of 100% sand was included. Each mixture was placed in four columns, resulting in a total of 20 columns randomized into four blocks. Synthetic stormwater with known concentrations of pollutants will run through the columns and the effluent will be collected. Pollutant concentrations of the effluent will be measured with inductively coupled plasma mass spectrometry and spectrophotometry. Results from five simulated storm events will be presented, including comparisons of pollutant removal and infiltration rate. These results will identify future research needs and recommendations for use of Ecolite in actual bioretention cells.

Title: Preliminary investigation of the aerodynamic response of a red-tailed hawk to a vertical gust

Primary Author: Swiney, Paul A.
Additional Authors: Gosdin, Levi; Wietstruk, Mike; Bellah, Jamie; Raghav, Vrishank
Department: Aerospace Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Recently there has been significant interest in the development of unmanned aerial vehicles (UAVs) for civilian, military, and space applications. However, one of the limitations to the widespread adoption of UAVs, is their inability to perform well in gust-laden environments. This research adopts a bio-inspired approach to improve UAV designs by studying the aerodynamic response of a red-tailed hawk exposed to vertical gusts. To study the aerodynamic response of birds in a controlled environment, a flight arena was developed by using industrial fans to produce an average velocity of 6.5 - 8.5 m/s. This gust region was introduced in the flight path of the red-tailed hawk. Hawks normally fly at 10 - 18 m/s, making the gust magnitude approximately half of the hawk's flight speed. MATLAB DLTdv7, a digitizing software, was adapted and implemented to track specific points on a flapping-wing UAV. Using this procedure and high-speed camera images, the beak and the tail of the red-tailed hawk flying through a vertical gust was tracked to study the pitching response of the hawk to vertical gusts. This presentation discusses the methodology implemented to track the kinematics of a UAV and its application to measure the hawk's response to a vertical gust that is introduced over the entire wingspan of the hawk.

Title: Association of depressive symptoms and suicidal ideation with impulsive choice: Findings from nationally representative survey
Primary Author: Tanni, Kaniz A.
Additional Authors: Garza, Kimberly B.
Department: Health Outcomes Research and Policy
College/School: Harrison School of Pharmacy

Abstract:
An increasing body of evidence suggests that serotonin dysfunction can be a trigger for depressive disorders, thoughts of self-harm, as well as impulsivity. We conducted a cross-sectional survey of a nationally representative sample of US adults over age 18 (n= 478) via Qualtrics to explore risk factors for depressive symptoms (DS) and suicidal ideation (SI). Our central hypothesis was that respondents with greater impulsivity are more likely to have self-reported DS and SI. Respondents having a total score >10 the PHQ9 scale for depression and a score >0 on the 9th item of the PHQ9 were identified as having DS and SI respectively. Impulsivity was measured using scores from both the well-established Barratt Impulsiveness Scale (BIS-11) and the newly introduced Three-option Adaptive Discount rate (ToAD) measure. Chi-squared tests were performed to determine association of DS or SI with categorical demographic variables. Logistic regression was performed to determine whether DS and SI are associated with impulsivity scores, controlling for demographics. Race, ethnicity, income level, and marital status were found to be significantly associated with SI (p= 0.037, 0.003, 0.030, 0.0002 respectively). For DS, significant associations were found with race, gender, income level and marital status (p= 0.008, <0.0001, 0.0008 and <0.0001 respectively). One point increase in the log of discount rate on ToAD scale (higher score represents higher impulsivity) was found to increase the likelihood of having SI and DS by 12% (OR = 1.12 [95% CI, 1.01 - 1.26]) and 13% (OR=1.13 [95% CI, 1.01-1.27]) respectively. Similar odds of suicidal ideation (OR= 1.05 [95% CI, 1.03-1.06]) and depressive symptoms (OR = 1.05 [95% CI, 1.04- 1.07]) were found when impulsivity was measured by BIS-11 scale. Findings from this study will have potential implications in designing future behavioral interventions.

Title: Effects of deceleration on the risk of ACL injury
Primary Author: Taylor, William A.
Additional Authors: Jacobs, Abigail; Larson, Jacob
Department: Mechanical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
The anterior cruciate ligament (ACL) is commonly ruptured in contact and non-contact sports, and it is an extremely devastating lower extremity injury. The occurrences of ACL injury are on the rise due to increasing participation in youth sports, and a single ACL injury has been estimated to cost more than $10,000 for both surgical repair and rehabilitation. ACL injury has shown to greatly diminish quality of life as the individual ages, particularly in the form of osteoarthritis, a painful deterioration of the cartilage within the knee. Osteoarthritis is a chronic, debilitating condition that characteristically results in hip and knee replacements and can cost an individual thousands of dollars a year. Most accepted literature has concluded that a majority of ACL injuries occur during said deceleration events, especially when paired with a change of direction. However, there isn't a clearly defined threshold of deceleration used in screenings to detect risk of injury. The goal of this study was to investigate the correlation between ACL-injured athletes and leg stiffness, where leg stiffness is defined as vertical ground reaction force divided by the change in distance of the center of mass displacement of the leg and the center of pressure. This study retrospectively reviewed the kinematics of run-to-cut and counter jump movements from female athletes who played at the collegiate level, taking into consideration whether or not these athletes would go on to experience an ACL rupture. After a two sided t-test was performed, a significant correlation was found between leg stiffness during deceleration and the likelihood of experiencing an ACL rupture. These results suggest that more extensive research should be performed with deceleration events to further indicate what specific patterns indicate future ACL rupture, and determine if those patterns can be effectively screened before any injury occurs.

Title: Auburn University and the United Nations' sustainable development goals
Primary Author: Terry, Hollen E.
Additional Authors: Pfister, Luisa
Department: Hunger Solutions Institute
College/School: College of Human Sciences

Abstract:
To describe Auburn University's activity related to the United Nations' sustainable development goals (SDGs), the Hunger Solutions Institute, Office of Sustainability, and Academic Sustainability Programs have developed an inventory of sustainability-related teaching, research, and outreach across every college, school, and discipline. Multi-faceted, interdisciplinary, and focused sustainability-related scholarship is essential if Auburn is to maintain its standing nationwide as an innovative, prestigious institution. The Hunger Solutions Institute analysed and coded the Association for the Achievement of Sustainability in Higher Education Sustainability Tracking, Assessment, and Rating System (STARS) data curated by Academic Sustainability Programs in order to classify each sustainability-related course, major, minor, research project, and outreach activity with regards to the appropriate SDGs. These classifications revealed which SDGs Auburn University addresses most as well as those SDGs where the university has opportunities to lend more attention. This report is intended to bring awareness of the SDGs, promote a multi-faceted approach to sustainability across the university, celebrate the work already being done by the many leaders and innovators here at Auburn, and encourage growth in underrepresented areas. This report is imperative as Auburn continues to expand its leadership in sustainability in higher education.

Title: Bio-based resins for stereolithographic 3D-printing
Primary Author: Thakkar, Vimal M.
Additional Authors: Shinde, Vinita; Beckingham, Bryan
Department: Polymer and Fiber Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
There has been a rapid increase in the improvement and application of thermosets with particular interest in their application to additive manufacturing. There are various types of thermosets resins including epoxy, acrylate, and polyester, used for different purposes in automobile, aerospace, electrical and other industries due to their particular and typically superior mechanical properties, thermal resistance, and corrosion. Additionally, resins are used for fabrication of 3D-printed parts using stereolithographic 3D-printing for rapid prototyping and for developing functional parts. Stereolithography is a 3D-printing process which use resin leading layer by layer curing using an ultraviolet light source. Despite being excellent for industrial use, there is significant interest in finding an alternative to petroleum based synthetic resins as these thermosetting cannot be readily recycled. Therefore, with increasing use of additive manufacturing techniques, there is a high demand to develop a sustainable alternative to petroleum based resins. This work is focused on the use of bio-based acrylate resins from plant sources such as soybean and corn for additive manufacturing. Different blends of these bio-resins were prepared and analysed before photopolymerization. Rheology and FTIR analysis of petroleum and bio-based resins was done to establish the chemical similarities and purity between bio-based and petroleum based acrylate resins. Resins were then UV cured into desired geometries and the resulting tensile properties of both bio-based and conventional petroleum-based resins measured and compared. Lastly, we are currently developing strategies to incorporate self-healing properties to these bio-based resin to promote healing of physical damage and thereby extend lifetimes of 3D-printed parts.

Title: Computational simulations of airflow to study the effect of different inlet velocity conditions in patient-specific healthy trachea
Primary Author: Tiwari, Bipin
Additional Authors: Kore, Tarun, E; Wei, Alan, Zhenglun; Bodduluri, Sandeep; Bhatt, Surya; Raghav, Vrishank
Department: Aerospace Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Expiratory Central Airway Collapse (ECAC), defined by greater than 50% collapse of the trachea during expiration, is a disorder associated with Chronic Obstructive Pulmonary Disease. Pathophysiology of ECAC is multifactorial and the biofluid mechanics of airflow in the trachea could be an important factor resulting in the progression of the disease. Using the computational methodology, a comprehensive investigation of the biofluid mechanics in the healthy and diseased patient-specific trachea can be conducted. One of the key considerations for setting up computations is choosing correct boundary conditions (BC). Most common BCs used by previous studies are a) flat, b) parabolic, c) Womersley, d) parabolic with an extension, and e) real, patient-specific profile. This is the first step in that direction to explore the effects of different inlet BCs for patient-specific trachea flow simulations. We test for steady and tidal flow combined with the five aforementioned inlet velocity profile conditions. Metrics such as wall shear stress and time-averaged wall shear stress were used to quantify the differences among different inlet velocity profile conditions. This will lay a solid foundation towards obtaining accurate computational results in modeling ECAC.

Title: Fatigue life prediction of additively manufactured Ti-6Al-4V using a fracture mechanics approach
Primary Author: Torries, Brian A.
Additional Authors: Suhling, Jeff; Shamsaei, Nima
Department: Mechanical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
In this study, the fatigue strength of additively manufactured titanium alloy Ti-6Al-4V is modeled via a fracture mechanics approach. Ti-6Al-4V specimens fabricated with different build orientations via laser based powder bed fusion were subjected to strain controlled fatigue testing. After testing, failure causing defects were identified using scanning electron microscope fractography. Using the $\sqrt{area}$ of these defects, an equivalent internal crack size was calculated using a method based on the Murakami model. This equivalent crack size allowed for the determination of the effective elastic-plastic energy release rate, $\Delta Jeff$, which was then related to fatigue life, Nf. Using the failure causing defect size and other factors, such as defect location, this method improved the fatigue strength predictability of the additively manufactured components. As compared to the strain–life ($\varepsilon a - Nf$) relationship, the energy release rate–life ($\Delta Jeff - Nf$) relationship appeared to better fit the fatigue data of the investigated materials and led to reduced scatter.

Title: Prenatal nicotine exposure leads to impairments in synaptic plasticity through altered hippocampal cholinergic and glutamatergic neurotransmission
Primary Author: Trish, Ayeh
Additional Authors: Buabeid, Manal; Pinky, Priyanka; Smith, Warren; Bloemer, J; Parameshwaran, Kodeeswaran; Almaghrabi, Mohammed; Dhanasekaran, Muralikrishnan, Reed, Miranda; Suppiramaniam, Vishnu
Department: Biomedical science
College/School: College of Sciences and Mathematics

Abstract:
Smoking during pregnancy is a major risk factor for neurochemical alterations leading to cognitive deficits in offspring. The mechanism that contributes to these behavioral alterations and/or cognitive deficits are largely unknown. Nicotinic acetylcholine receptors (nAChRs) are well known to modulate the physiology of CNS synapses. In this study, we investigated the role of in nAChRs and molecular mechanisms that are associated with memory encoding in the hippocampus. Pregnant Sprague-Dawley rats were implanted with osmotic mini pumps that delivered sterile physiological saline or nicotine (6 mg/kg/day) during the gestational period. Our results showed that long-term potentiation and basal synaptic transmission were significantly diminished in the hippocampus of prenatally nicotine exposed offspring. Enhancements in basal synaptic transmission and LTP by positive modulation of α7 nAChRs were observed in control slices but not in slices from prenatally nicotine exposed rats. Furthermore, single-channel activity of nACh and *N*-Methyl-D-aspartate (NMDA) receptors were also altered in rats exposed prenatally to nicotine. These changes in synaptic physiology were accompanied by significant reductions in α7 nAChR density in the hippocampus, as well as reductions in major synaptic plasticity proteins including ERK1/2, CREB, and CAMKII. Taken together, these findings suggest that alterations in nAChR expression and function may lead to modified hippocampal glutamatergic transmission in offspring prenatally exposed to nicotine.

Title: Study of inter-molecular interactions between the components of the mitochondrial DNA replisome.
Primary Author: Truong, Thinh Q.
Additional Authors: Truong Thinh Q., De Bovi Pontes Carolina, Taite Angel, Ciesielski Grzegorz L.
Department: Chemistry
College/School: College of Sciences

Abstract:
Maintenance of the mitochondrial genome is vital for all eukaryotic cells. Among maintenance processes, genome replication is especially relevant, as defects of this process are the major cause of so-called mitochondrial diseases, for which no cure is currently available. The mitochondrial replisome is composed of three key proteins, namely DNA polymerase gamma (Pol γ), mitochondrial DNA helicases (also known as Twinkle) and mitochondrial single-stranded DNA-binding protein (mtSSB). Understanding the interactions between these proteins that facilitate DNA synthesis, may help to identify molecular targets for the development of therapeutic strategies for related mitochondrial diseases. Here we present a study of inter-molecular interactions between the mitochondrial replisome components and the relevance of these interactions for the DNA synthesis process. Using primer extension assays, we have determined a functional interaction between Pol γ and mtSSB. Furthermore, by applying unwinding assays we have characterized the effects of mtSSB on the activity of mtDNA helicase. Together, our results reveal novel mechanistic aspects of the mitochondrial replisome function.

Title: The interplay between politics and law in the troubled but influential life of William Lowndes Yancey
Primary Author: Tunnell, Stephanie L.
Additional Authors:
Department: History
College/School: College of Liberal Arts

Abstract:
In 1850, the state of Alabama settled a marital dispute between husband, Albert G. Wray, and wife, Susan M. Wray. A plantation owner and a slaveholder, Albert G. Wray represented typical southern ideals of the early nineteenth century. In this Montgomery Chancery Court case, Mr. Wray's expectations were ludicrous but were also reflective of both his attorneys' and his own southern ideals. Mr. Wray, a man who presumably had sexual relations with one of his own slaves, accused his wife of adultery, deemed her mentally insane, and sought divorce without alimony (meaning that he would remain enslaver of his plantation). Spanning the 1850s, immediately before the Civil War, the timing and the subject of this case are notable. But the case is more notable because one of Mr. Wray's attorneys: William Lowndes Yancey, who was a leading secessionist. Due to the increasing debates over slavery and the controversial nature of those southern ideals, William Lowndes Yancey and his co-counsel, John Archer Elmore, shaped Mr. Wray's arguments and judicial requests. Anything that Mr. Wray argued, for example, his stance on slavery, was through the lens of his attorneys. William Lowndes Yancey's simultaneous involvement in the Wray v. Wray case and his contributions to politics (specifically, his actions supporting Alabama Secession) display: how law and politics were interwoven in the antebellum South, how Yancey emphasized politics over his legal career, and how the court system served as a political springboard for Yancey's political career.

Title: Coherent control of electron dynamics on their natural timescale
Primary Author: Unzicker, Brady N.
Additional Authors: Burrows, Spenser; Tatum, Morgan; Vaughan, John; Hart, Trevor; Arthur, Davis; Stringer, Patrick; Laurent, Guillaume
Department: Physics
College/School: College of Sciences and Mathematics

Abstract:
Simple calculations can show the “orbital period” of atomic electrons is on the order of 100 attoseconds (1 as = 10-18 s). The generation of high harmonics of an intense IR field is a nonlinear process capable of producing high intensity, ultrashort laser pulses with similar durations. By adding a low-intensity second harmonic to the fundamental infrared driving field, we can tune the temporal profile of the resulting attosecond laser pulse by varying the intensity and phase of the second harmonic. In this work, we employ this tunability to coherently control the photoemission process on the attosecond timescale. We ionize an atomic target with an attosecond pulse in the presence of a weak IR field. An asymmetric photoelectron distribution resulting from the interference between one- and two-photon transitions is produced. By carefully crafting the attosecond pulse, we are able to achieve fine control over the direction of photoemission relative to the polarization axis of the infrared driving field.

Title: Validation of the Pspan task
Primary Author: Vinson, Victoria H.
Additional Authors: Weaver, Aurora, J.; Vinson, Victoria, H.; Walsh, Hannah, E.
Department: Audiology
College/School: College of Liberal Arts

Abstract:
The aim of this study was to evaluate the validity of an adaptive spectral-temporal sequencing test that was developed in our lab (Weaver et al 2015; 2019). This task, known as the Pspan, merges psychoacoustic methods with traditional pitch pattern test formats to measure listener capacity for spectral-temporal patterns. The current study investigated how individual factors (e.g., memory capacity, domain-specific knowledge) can impact an individual's capacity. 74 participants completed a measure of non-verbal intelligence (TONI), pitch discrimination (JND at 1k Hz), short-term memory capacity (STMC; forward digit span), working memory capacity (reverse digit span), as well as, measures of music background (intake form) and sophistication (Gold-MSI) prior to competing five runs in a spectral-temporal sequencing test. The test was programmed in Matlab, and run using Tucker-Davis-Technologies psychoacoustic workstation in order to determine the best utility of an adaptive spectral-temporal measures for clinical purposes. Overall, results indicated an order effect where the first run produced significantly lowered estimates of spectral-temporal capacity after controlling for co-variates ($t = 27.04$; $SE = 0.17$, $p < .001$). Results indicated that performance on the initial run (Run 1) was influenced by music background ~24% [Equation]= .24, $F(4,70) = 14.48$, $p < .001$] with minimal variance accounted by STMC and non-verbal intelligence (~10%). The contributions of pitch discrimination were < 10%. Whereas, by the final run (Run 5) the relative contributions of music background was reduced to 12%, and STMC and non-verbal intelligence remained stable ~11%, with pitch discrimination accounting for 22% of the variance in Pspan performance [$r2 = .42$, $F(4,69) = 13.94$, $p > .001$]. Understanding the initial advantage of music background may be beneficial to understanding auditory processing in the real world when multiple attempts at a listening task are not afforded.

Title: A comparison of internalizing and externalizing disorders in general delinquent behavior and illegal sexual behavior
Primary Author: Violette, Makenzie P.
Additional Authors: Thompson, Kelli
Department: Juvenile Delinquency Lab
College/School: College of Liberal Arts

Abstract:
Delinquent adolescents are more likely to be diagnosed with a mental or behavioral disorder when compared to non-offending adolescents. Prior research has shown that not all adolescent offenders present with the same pattern of psychopathology. Adolescents who have been adjudicated for general delinquent behavior (AGDB) express higher externalizing disorders such as ADHD, presenting with behavioral symptoms of impulsivity. Adolescents who have been adjudicated for illegal sexual behavior (AISB) tend to show more internalizing symptoms associated with disorders like anxiety and depression. AISB display lower rates of substance abuse and less criminal histories in comparison to AGDB. However, some self-report studies found both groups view themselves similarly in regards to their own antisocial behavior. The current study seeks to shed light on the discrepancy between clinical and self-report using data that was pulled from a 20-year study investigating treatment outcomes of adolescents at the Mt. Meigs juvenile correctional facility in Alabama. In the current study, differences between clinician-reported and self-reported rates of internalizing and externalizing symptomology were compared in a large sample of AISB (n = 858) and AGDB (n = 482). AGDB self-reported higher rates of externalizing symptoms, such as impulsivity and delinquent predisposition (i.e., antisocial attitudes), and AISB self-reported higher rates of inhibition and internalizing symptoms associated with anxiety and depression. Clinician-reported rates of subthreshold and threshold symptoms of ADHD on a DSM-screener were higher for the AGDB group. Likewise AISB were more likely to present with symptoms of anxiety and depression on the clinician-reported screener. Results of the current study demonstrate that not all juvenile offenders are the same, showing the importance of thorough assessment procedures and the need for individualized treatment plans when working with juvenile offending populations.

Title: A method of containing floating plastic waste using vortices shedding via a cylindrically shaped device.
Primary Author: Wadzinski, Zachary J.
Additional Authors: Wadzinski, Zachary J.
Department: Biosystems Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Every year 8 million tons of plastic finds its way into the ocean. A recent modelling study has shown that between 0.41 and 4 million tons of plastic is sent to the ocean via rivers annually. Isolating and capturing plastic waste before it reaches the ocean was the end goal of this research study. In this study, we proposed the use of a cylindrically shaped obstruction in a stream to create a vortex via vortices shedding that directs plastic to a surface in-stream collection device. In order to obtain a range of aspect ratios, the diameter of the cylinder will be 1 ft, 2 ft, 5 ft, and 10 ft which results in aspect ratios of AR=2.40,1.20,0.48,0.24. The objective is to find whether a vortex can capture surface plastic for a continued period. Wake circulation occurs at approximately 2.8 m/s in water, thus only rivers that fit this average velocity will fit the criteria for capture capability. Three Alabama rivers of varying size and characteristics were chosen for this study; the Chewacla, Flint, and Alabama rivers. Using the values given from that river, i.e. velocity, area, discharge rate, the characteristics of vortex generation were determined for that particular river. Computational modeling of the river, cylinder, and recirculation vortex were then be quantified using Ansys Fluent. The vortex recirculation Γ, recirculation length l_c, and efficiency of particles captured η_p, were then measured. Particles were modeled using the ten most common plastic items found in the ocean circa 2016. Vortex recirculation and length were calculated in Ansys Fluent while efficiency of particles captured is done using a water tunnel.

Title: Modeling geochemical reactions by applications of additive manufacturing
Primary Author: Wales, Shelby D.
Additional Authors:
Department: Civil Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Additive manufacturing provides the opportunity to model geochemical reactions by integrating reactive materials into polymer filaments. XCT images of a rock sample from the Paluxy formation in Mississippi were used to recreate a stack of images that could be used as a template for 3D-printing. By recreating the actual rock structure, the geochemical reactions between calcite and an acidified brine solution in the case of carbon sequestration could be studied. While previous experimentation has established that calcite can be implanted onto the surface of a structure, the percentage of the surface that is exposed calcite is relatively small. To maximize the surface area of the 3D-printed structure occupied by calcite, two methods have been explored in detail. The first method involves mixing calcite particles with HIPS pellets and extruding filament to use for printing. The second method utilizes calcite dispersed in THF; the resultant mixture is used to coat a HIPS filament which is used to 3D-print the rock structure. The relative success of each method is quantitatively evaluated using optical microscopes, SEM images, and XCT in pursuit of a solution that provides the greatest surface area of exposed calcite.

Title: Biomimetic cancer cell membrane coated copper diethyldithiocarbamate nanoparticles for cancer treatment
Primary Author: Wang, Junwei
Additional Authors: Chen, Wu; Huang, Chung-hui; Wang, Qi; Kang, Xuejia; Li, Feng
Department: Pharmaceutics
College/School: Harrison School of Pharmacy

Abstract:
Cell membrane coated biomimetic nanoparticles (NPs) is a novel drug delivery systems which have a great potential to enhance targeted delivery of drugs into tumor tissues and reduce toxic side effects. In our previous study, we developed a SMILE (stabilized metal ion ligand complex) method to prepare nanoparticle formulations for disulfiram-based cancer therapy. In this study, we propose to develop cell membrane coated biomimetic copper diethyldithiocarbamate [$Cu(DDC)_2$] NPs to achieve tumor-targeted delivery of $Cu(DDC)_2$ NPs prepared with the SMILE method. We hypothesized that the decoration of $Cu(DDC)_2$ NPs with 4T1 cancer cell membranes and its associated proteins could facilitate the cellular uptake of $Cu(DDC)_2$ NPs by 4T1 cancer cells through the function of tumor-specific binding proteins such as CD47, CD44, EpCAM/CD326, Thomsen–Friedenreich (TF) antigen and E-cadherin. Cell membrane coated $Cu(DDC)_2$ NPs were prepared with the SMILE method and using mixed stabilizers containing cell membranes. We optimized the formulation by adjusting the percentage of the cell membrane in the formulation. We also tested the effect of cell membrane decoration on the cellular uptake and anticancer efficacy of $Cu(DDC)_2$ NPs with cultured 4T1 cells in vitro. Our preliminary results indicated that cell membrane decoration significantly enhanced cellular uptake of $Cu(DDC)_2$ NPs by 4T1 cells and demonstrated improved anticancer efficacy than control $Cu(DDC)_2$ NPs without cell membranes. In conclusion, we have successfully developed a method to prepare cell membrane coated biomimetic $Cu(DDC)_2$ NPs which have a great promise for tumor-targeted drug delivery. We will further evaluate the performance of the developed NP formulations with additional in vitro and preclinical *in vivo* studies.

Title: Development of a biodegradable irriverabe thermosensitive hydrogel for drug
Primary Author: Wang, Qi
Additional Authors: Chen, Wu; Huang, Chonghui; Kang, Xuejia; Wang, Junwei; Li, Feng
Department: Pharmaceutical Sciences
College/School: Harrison School of Pharmacy

Abstract:
Biodegradable injectable thermosensitive hydrogels have a lot of potentials for biomedical or pharmaceutical applications, such as in tissue engineering and drug delivery systems. These thermo-gelation systems exhibit a sol-gel transition in response to temperature changes. However, they are likely to revert to sol state after in situ injection due to a large number of existing body fluids. To address this issue, we proposed to develop a temperature-triggered irreversible gelation system. In our work, we first synthesized a biodegradable polymer based on Poly(ε-caprolactone)-b-poly(ethylene glycol)-b-poly(ε-caprolactone) (PCL-PEG-PCL) modified with acryloyl groups on both termini (acryl-PCL-PEG-PCL-acryl) and prepared its micelle solution. Then, we prepared PCL-PEG-PCL micelle solution containing dipentaerythritolhexakis(3-mercaptopropionate) (DPMP) with thiol groups as a chemical cross-linker (PCL-PEG-PCL/DPMP). After mixing these two solutions, acryloyl groups and DPMP stayed separately in their micelle hydrophobic cores at room temperature. The mixture became a gel within 10 minutes after increasing the temperature to body temperature (37 ºC). Once the temperature increased, these micelles underwent structure changes and their hydrophobic cores were exposed. The thiol groups in DPMP then could react with acryloyl groups on the termini of acryl-PCL-PEG-PCL-acryl. This chemical reaction is irreversible and can maintain the hydrogel integrity. The formed hydrogel exhibited a longer duration time than uncrosslinked counterparts. Also, this injectable hydrogel system is easy to prepare and can stay in sol state before injection, which makes it very convenient for clinical use.

Title: Using Chinese ink painting elements to design modern tableware.
Primary Author: Wang, Tianyao
Additional Authors:
Department: Industrial Design
College/School: College of Architecture, Design & Construction

Abstract:
With the development of the Internet, mass cultural media and international tourism, we can understand the culture of different regions, but it is also the main embodiment of cultural globalization. In the context of globalization, cultural diversity is extremely important. It is of great significance to design culturally unique products. As early as 1940, the cultural and creative industry was put forward. The concept of cultural industries was first used in the early 1940s by Theodor W. Adorno, a member of the influential Frankfurt School, composed of scholarly refugees from Nazi Germany. Policies and strategies for developing cultural and creative industries are generally related to expanding the market for cultural goods and services. Cultural industries provide cultural goods and services, which are products for consumption. As Chris Smith, state many industries rely on creativity and imaginative intellectual property, are becoming the fastest growing part of our national economy. This study investigates how to apply Chinese ink painting elements to modern tableware design from the perspective of cultural inheritance. Specifically, this research seeks to understand two-dimensional elements extracted from culturally significant Chinese ink painting and applied to modern tableware.

Title: Preparation of printable electroactive soft robotics actuators
Primary Author: Wang, Yuyang
Additional Authors: Barde, Mehul; Alizadeh, Nima; Auad, Maria
Department: Polymer and Fiber Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Electroactive polymers that exhibit controlled deformation under applied electric field in liquid or air phase have great potential in the soft robotics actuators. Soft robotics present challenges in responsive abilities and morphology under traditional manufacturing process. The current electroactive soft actuator still present challenges in electro-mechanic performance. In this work, we developed new polymeric materials for stereolithography (SLA) for the design of 3D-printing structures. The polymer samples were synthesized using acrylic acid as a monomer, trimethylolpropane trimethacrylate as a cross-linker, and 2 wt% of phenyl bis (2,4,6-trimethylbenzoyl) phosphine oxide as a photoinitiator. Ionic liquids are introduced into the polymeric network to functionalize soft actuator that can bend in air. Zwitterion is introduced to improve ions flow in the ionic channel in the polymer. A Stereolithography 3D-printer "Anycubic Photon" was utilized to fabricate the electroactive polymer samples. Finally, they were tested using a cyclic volumetric machine (10V) to test the bending properties. A laser displacement meter to record the bending motion precisely. The polymer samples were able to bend due to volume intercalation in both electrodes induced by the different sizes of ionic liquid.

Title: Elucidating the immunomodulatory mechanism of growth-promoting biodegradable microparticles using RNA sequencing in mouse macrophages
Primary Author: Wang, Haolong
Additional Authors: Kaltenboeck, Ludmilla; Wang, Xu; Kaltenboeck, Bernhard
Department: Biomedical Science
College/School: College of Veterinary Medicine

Abstract:
Feed constitutes 70% of costs in animal agriculture. Reducing feed required per unit of weight gain (feed conversion rate, FCR) is highly effective in reducing cost in animal production. Asymptomatic infections stimulate inflammatory responses which consume energy and inhibit growth. To promote growth and reduce FCR, antibiotics are globally administered at subtherapeutic doses, with 67% increased usage predicted by 2030. Due to induction of antibiotic resistance, consumers and regulatory agencies demand elimination of antibiotics. Dr. Kaltenboeck's laboratory developed and patented biodegradable microparticles (MP) as non-antibiotic feed additive that stimulates innate immunity, but reduces inflammatory responses. In chickens and pigs these MP dramatically improved feed efficiency (saving up to 34.7% of feed) and accelerated growth, presumably by reducing the immune stress caused by persistent asymptomatic infections common in livestock. MP can thus replace antibiotics as growth-promoting feed additives. To investigate the underlying mechanism of the MP, J774A.1 macrophages from BALB/c mice were treated by MP, LPS or both compounds (MP+LPS). LPS is lipopolysaccharide, the major component of the outer membrane of Gram-negative bacteria triggering Toll-like receptor 4 and innate immune response. We conducted RNA-seq experiments with three biological replicates in each group and performed transcriptome analyses to identified differentially expressed genes (DEGs). At adjusted P-value < 0.05 level, 2,215 genes were induced by at least 2-fold under LPS treatment, whereas only 518 DEGs were found in MP treated samples. In addition, the expression of extremely upregulated genes in the LPS treatment group was attenuated by adding MP in the MP+LPS group. Our preliminary results suggest the MP can fine tune the immune system by slightly boosting specific immune pathways and significantly reducing the global anti-inflammatory response caused by bacterial stimulants.

Title: Imaging and analysis of LVNC engineered cardiac tissue
Primary Author: Wang, Eric M.
Additional Authors: Ellis, Morgan; Lipke, Elizabeth
Department: Chemical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Cardiovascular disease remains the leading cause of death worldwide, continuing the need for research in cardiac tissue engineering. One particular cardiomyopathy is left ventricular non-compaction (LVNC) in which the muscle tissue in the lower left chamber of the heart does not develop properly, remaining spongy instead of compacting into smooth and firm muscle. The Lipke Lab is interested in studying LVNC *in vitro* by producing 3D-engineered cardiac tissues (ECTs) using both LVNC patient and genetically corrected stem cell lines. The aim of this study is to characterize these LVNC and control ECTs using phase contrast and fluorescent imaging. To monitor the development of these tissues, imaging and analysis is performed throughout cardiac differentiation. Phase contrast and FITC images of all encapsulations are taken at specific timepoints (Day -2, -1, 0, 2, 4, and 7) and analyzed using ImageJ to calculate area, perimeter, aspect ratio, and circularity. This data is recorded and compared to other tissue characteristics including cell population, gene expression, and mechanical stiffness at the same differentiation timepoints. Based on the disease phenotype, we expect LVNC tissues to be larger in size compared to the control tissues after differentiation, representing a lack of ventricular compaction. Upon completing this study, we will gain knowledge about LVNC disease progression and cardiac development to contribute to the advancement of cardiac research.

Title: Redescription of *Cardicola cardiocola* (Digenea: Aporocotylidae) infecting jolthead porgy (*Calamus bajonado*) and a new species of *Cardicola* infecting yellowedge grouper (*Hyporthodus flavolimbatus*) in the Gulf of Mexico.

Primary Author: Warren, Micah B.
Additional Authors: Bullard, Stephen
Department: Fisheries, Aquauculture, and Aquatic Sciences
College/School: College of Agriculture

Abstract:
Fish blood flukes (Digenea: Aporocotylidae) are parasitic flatworms that collectively infect freshwater, marine, and estuarine fishes, occasionally kill fishes in aquaculture, and are the ancestor to the human-pathogenic blood flukes (schistosomes) that debilitate > 218 million people annually. There are a total of 162 nominal species with the most specious genus (*Cardicola* Short, 1953) having 31 (19%) nominal species. Species of *Cardicola* primarily infect actinopterygians (bony fishes) and in a single case, a dugong (Sirenia: Dugongidae). Our objective was to morphologically redescribe the type species, *Cardicola cardiocola* (Manter, 1947) Short, 1953 for the genus *Cardicola* (described 73 years ago) and morpholigcally and genetically characterize a new species infecting a grouper (*Serranidae*). During 2017, several jolthead porgies (*Sparidae*) from Florida were infected with 7 adults of *C. cardiocola*. Morphologically *C. cardiocola* is differentiated from all species of *Cardicola* by the combination of having a male genital pore posterior to all genitalia, number of spines in a spine rows, ascending uterus that is without convolution or loops, and a descending portion of the uterus with a single loop. From August – September 2017, the heart of 2 of 5 (40%) yellowedge grouper (*Serranidae*) were infected by adults of the new species from the northern Gulf of Mexico. The new species is most similar to species of *Cardicola* that have a uterus posterior to all genitalia. Further it is differentiated by having shorter anterior cecae compared to posterior cecae and by lacking a convoluted or looped intestine. Further still, the new species is different from all species of *Cardicola* by infecting serranid. Sequences of the large subunit rDNA from the new species were used in a phylogenetic analysis resulting in a stand-alone lineage sister to all species that have a uterus posterior to all genitalia.

Title: Effect of plasticizers in mechanical properties of Polylactic acid and lignin filaments for 3D-printing.

Primary Author: Wasti, Sanjita
Additional Authors: Auad, Maria; Triggs, Eldon; Adhikari, Sushil; Bajwa, Dilpreet; Via,Brian
Department: Biosystems Engineering
College/School: College of Agriculture

Abstract:
Petroleum-based plastics, which are excessively used, are non-biodegradable, and lead to environmental pollution and creating plastics plague. Plant-based materials, on the other hand, are abundantly present renewable sources but are less exploited and valued. Lignin, the second most abundant plant-based polymer, is obtained relatively in a large amount as by-product from pulp-paper industry and possibly from 2nd generation ethanol production that have low market value. Additive manufacturing, also known as 3D-printing, is rapidly growing manufacturing technology where a three-dimensional object is created by the application of material layer by layer. Blending lignin with polylactic acid (PLA), a bio-based plastic, to form a feedstock for 3D-printing can definitely be an alternative to petroleum-based feedstock which will address the issues of environmental pollution and limited resources. The main objective of this research was to develop PLA/organosolv lignin-based composite filament having better mechanical properties with good printability. PLA, organosolv lignin and two different plasticizers (PEG 2000 and Struktol TR 451) were mixed in different ratios and were extruded using twin extruder to obtain filaments for 3D-printing. Samples were then printed by fused deposition modeling (FDM) process and thermal, mechanical and structural properties of samples were measured. Adding PEG 2000 in PLA/lignin (80/20 wt%) significantly improved filament's mechanical properties whereas there was not much improvement in mechanical properties of PLA/lignin (20wt%) filament with the addition of varying concentration of Struktol TR451.

Title: MRI-based quantification of tibiofemoral alignment of female athletes
Primary Author: Weathers, Christopher R.
Additional Authors: Oldfather, Taylor; Zabala, Michael
Department: Mechanical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Precise mathematical methods have been developed to quantify lower limb kinematics in anatomically meaningful ways. In both imaging (particularly magnetic resonance imaging, MRI) and movement analysis, knee valgus angle (KVA) has been measured to determine risk factors and measure chronic conditions, such as knee osteoarthritis. The purpose of this study is to determine whether multiple angles measured with motion capture are related to one another and angles measured in MRI. A 10-camera Vicon motion capture system (Vicon, Vantage V5 Wide Optics cameras with 22 high-powered IR LED strobe at 85 nm) was used to collect the biomechanics of 23 female student-athletes from Auburn University (height = 171.2 +/- 8.9 cm, weight = 66.3 +/- 8.6, kg age = 19.8 +/- 1.9 yr). The athletes were not excluded based on prior injuries or surgeries. Out of the 23 athletes, two had bilateral ACL injuries, nine had unilateral ACL injuries, and 12 had no previous ACL reconstructions or ruptures. The subjects performed a drop jump from a 12 inch box to a distance one half their height. The marker data was filtered using a 15 Hz lowpass butterworth filter, and Visual 3D was used to calculate abduction (Grood and Suntay, 1985), KVA measured using a global reference frame in 2D and 3D (KVA 2G, 3G), and KVA was measured using a pelvis coordinate system in 2D (KVA 2P), each at maximum knee flexion. Additionally, a 7-T MRI was used to image both right and left knees of eight of those same athletes. True fast imaging (TRUFI) images were segmented in Amira. The point cloud data was used to apply a local reference frame on the femur and tibia using Blender. The angles were analyzed using a two-tailed Pearson Correlation test. The KVA 2G, 3G, and 2P were found to be significantly related to one another. It is the intention of the author to compare the abduction angle measured in the MRI to determine whether the MRI angles are significantly related to the motion capture data.

Title: Urban impacts on shifting algal communities along a reservoir cascade through time
Primary Author: Webster, Benjamin C.
Additional Authors: Waters, Mathew
Department: Crop, Soils, and Environmental Science
College/School: College of Agriculture

Abstract:
With ongoing global human population growth, there has been a linked growth in global nutrient loading from both point and non-point sources. This is equally true in the South Eastern United States where before the 1970s there were minimal regulations on both the private and public sectors allowing potentially harmful nutrient loading into streams and rivers. This was changed by the Clean Water Act in 1972 where limitations were placed on groups like wastewater treatment plants regarding the nutrient and elemental concentrations in the water they released back into lakes and streams. The metro Atlanta area underwent an enormous population boom in the 1960s – 1980s, growing nearly 1 million people almost doubling in size. The metro Atlanta area only fully reached the Clean Water Act regulations in the early 1990s. Because of this, there was a 30-year pulse of nutrients, notably phosphorus and nitrogen, that was loaded into the Chattahoochee River. Downstream from Atlanta, along the Chattahoochee River, West Point Lake was documented to have experienced eutrophication events, or large algal blooms, while after the implementation of the Clean Water Act the eutrophication events immediately subsided. However, West Point Lake is only one of six reservoirs downstream this large metro area and the question remains, how did those other systems react? Here I will reconstruct the pigment history of all six of these reservoirs and determine how they were impacted by the metro area as well as impacted each other.

Title: Effects of heat to females on egg shape of zebra finches
Primary Author: Weeks, Victoria B.
Additional Authors: Hoffman, Alexander; Wada, Haruka
Department: Biomedical Sciences
College/School: College of Sciences and Mathematics

Abstract:
An environmental stressor has a capacity to modify various traits of an organism and its offspring through developmental and phenotypic plasticity. Heat is one stressor that can induce physiological and morphological adjustment in organisms that experienced high ambient temperature. We hypothesized that when female zebra finches are exposed to heat as juveniles or as adults, they will produce eggs with a shape and volume that are better adapted to a warm temperature. To test this, zebra finch females were divided into four groups based on the amount of heat received as juveniles and as adults in a 2x2 factorial fashion. As juveniles, birds were exposed to either a control temperature (22°C) or moderately high temperature (38°C). In the adult stage, each group of birds was divided into a control group (22°C) or high heat group (42°C). Images of 205 freshly laid zebra finch eggs were collected, then the length, width, breadth, and half-way point were analysed using an image analysis software. We predict that the eggs from the heated females are longer and narrower than females that never experienced heat to maximize heat dissipation. Furthermore, we predict that females that experienced different thermal environments in two stages (control-heat and heat-control groups) will produce eggs with a higher coefficient of variation in egg shape and volume compared to females that experienced similar thermal environments at those two stages.

Title: How to increase the destination attractiveness from vlogs posting on Chinese social media: A comparison between the posting from internet celebrities and DMOs
Primary Author: Wei, Chunhao
Additional Authors: Baker, Ayoun
Department: Hospitality Management
College/School: College of Human Sciences

Abstract:
Today more than 3.5 billion people use social media. China, the largest outbound tourism market, has a different culture and uses different social media commonly used in Western countries. Thus, the importance of the impact of Chinese social media intensifies for foreign destination marketing organizations (DMOs) who want to increase the local business by attracting Chinese tourists. The tourist's decision-making process of selecting a destination is a planned behavior based on a long-term image of the destination created by social media. The images comprise the perceptions created by postings that are related to the destination from different sources. Previous studies on source credibility related to tourism have failed to distinguish the long-term destination decision from other travel products. When designing a vacation plan, the traveler will review information from multiple sources instead of a single source. Thus, which component is more critical for impacting the attractiveness of the posting, "source" or "content" has become a critical question. The proposed study will recruit DMOs in Florida, as well as internet celebrities, to create the same topic videos independently. All videos will post across individual channels held by internet celebrities compared to the official channels by local DMOs. After calculating the engagement rate, which will be operationalized by the number of "likes," "comments," and "views," ANOVA will be employed to determine whether significant differences exist across "sources" and "contents." The result of this research will verify the theory of source credibility as applied in the long-term decision-making process. Moreover, the finding will assist the DMOs in adjusting their cooperation strategies with individuals, especially those internet celebrities, in the marketing of destination events.

Title: Examining differences in turnover risk factors between supervisors and non-supervisors
Primary Author: Welch, Ella F.
Additional Authors: Fogelberg, Sammi; Willits, Taylor
Department: Psychology
College/School: College of Liberal Arts

Abstract:
Turnover continues to be a hot topic in industrial and organizational psychology. High turnover rates are detrimental for organizations because it creates the continuous responsibility of having to onboard and train new employees, which creates extra workload for other employees and costs the organization significant resources such as time and money. Research has found that job fit, availability of tools/resources, perceptions of safety, communication, teamwork, and senior leadership are all related to engagement, which in turn reduces turnover. However, it is less well known if the importance of these factors differ between employees and supervisors within the same organization. In order to examine this question, we analyzed survey data from 5,000 employees in a large healthcare organization. For non-supervisors, we found that all six variables were significant predictors of engagement. Notably, perceptions of senior leadership were found to be the largest driver of engagement, with perceptions of safety being the least important for non-supervisors. However, for supervisors, communication and safety were not significant predictors of engagement. Job fit and senior leadership were key drivers of engagement for supervisors. These findings suggest that senior leadership, job fit, and teamwork are important for increasing engagement across all employees. However, results also suggest that there is a difference in the factors that drive engagement between supervisors and non-supervisors, specifically regarding communication and safety. Based on these differences, organizations should be aware that the engagement experience may not be the same across all employees. Organizations may want to consider implementing both employee-wide and supervisor-specific engagement programs in order to best increase engagement and decrease turnover.

Title: Physical activity in young adults predicts internalizing, but not externalizing, behaviors
Primary Author: White, Tatiana A.
Additional Authors: Murrah, William; Neely, Kristina
Department: Kinesiology
College/School: College of Education

Abstract:
Previous work demonstrates a small-to-moderate cross-sectional association between physical activity and internalizing disorders, such as depression and anxiety. However, few studies have examined the association between physical activity and externalizing disorders. The goal of the current study was to evaluate whether self-reported internalizing and/or externalizing behaviors are predictive of self-reported physical activity in young adults. A total of 969 participants (519 women), ages 18 - 25, completed the International Physical Activity Questionnaire (IPAQ) short form and the Achenbach Adult Self Report (ASR). We calculated total physical activity (MET-minutes/week) and ASR t-scores for internalizing and externalizing behaviors. We used hierarchical regression to determine whether internalizing and externalizing contribute to the prediction of physical activity. Internalizing was entered at Stage one and Externalizing was entered at Stage two. The results revealed that at Stage one, internalizing contributed significantly to the regression model, and accounted for 10% of the variance in self-reported physical activity. Adding externalizing to the model explained less than 1% of the variance and the R^2 change was not significant. Next, we reversed the order of the predictors in the model. The regression revealed that at Stage one, externalizing did not contribute to the regression model and accounted for 1% of the variability in physical activity. Adding internalizing to the model explained an additional 10% of the variance and the R^2 change was significant.The current work suggests that internalizing, but not externalizing, predicts physical activity. Notably however, internalizing only explained a small percent of the variance, which suggests that other health and lifestyle factors influence total physical activity.

Title: Analysis of critical factors in the development of streambank soil integrity
Primary Author: Wichmann, Madison E.
Additional Authors: Knappenberger, Thorsten; Brantley, Eve
Department: Biosystems Engineering
College/School: College of Agriculture

Abstract:
Stream restoration and mitigation projects have become increasingly necessary in today's rapidly developing society due to negative impacts of urbanization, agriculture, mining and other land uses. Stream enhancement and restoration projects may be backed by local grassroots groups, invested in by communities seeking to improve natural infrastructure and protect gray infrastructure, required by federal and state regulations, or a combination of these motivations. Riparian vegetation is cleared to provide construction space and vehicle site access. Due to this disruption, soils that comprise these floodplains and streambanks become unstable and unconsolidated, therefore leading to a high risk of erosion and structural failure in the cases of flooding, extreme weather events, drought, or other minor natural disasters, especially following construction. Soils typically stabilize as the project site matures. Increased soil stability may be due to vegetation and root growth or could also be largely a soil physical effect driven by wetting and drying cycles. The objective of this study is to determine which physical factor plays the most critical role in the development of streambank integrity through time. Stream restoration sites ranging from months to a decade since restoration were identified. At each site, disturbed and undisturbed soil samples were taken. The disturbed samples were analyzed for aggregate stability, root mass, soil texture, pH, and color. The undisturbed samples were analyzed for saturated hydraulic conductivity, shear stress under saturation and at field capacity (~-30kPa), bulk density, and water retention characteristics. Findings from this study inform stream restoration professionals to improve restoration site risk assessment and ameliorate stream restoration design.

Title: Up-conversion luminescence of Naphthylsalophen Lanthanide(III) Complexes
Primary Author: Wilkinson, Grant R.
Additional Authors: Hiti, Ethan; Monteiro, Jorge; Hardy, Emily; de Bettencourt-Dias, Ana; Gorden, Anne
Department: Chemistry/Physics
College/School: College of Sciences and Mathematics

Abstract:
Luminescent lanthanide complexes are of interest due to their long-lived and pure emissions. Compounds capable of two photon up-conversion are currently being characterized for possible applications in solar cells, photodynamic therapy, bio-imaging, and electronic displays as means of enhancing energy conversion. These applications take advantage of lanthanide complexes, nanocrystals, metal-organic frameworks (MOF) and discrete single-molecule upconverters. We have reported lanthanide and actinide complexes of naphthylsalophen with interesting fluorescence properties, which prompted further examination of ligand variations and the properties of the corresponding metal complexes. The synthesis of a substituted naphthylsalophen ligand and characterization of selected LnIII metal complexes are described. These triple-decker sandwich-type complexes display two-photon absorption and up-conversion luminescence using 980 nm excitation and emission spectra. The data presented here shows that these discrete complexes can be excited with low intensity lasers with good emission quantum yields. Thus, these compounds show promise for applications in solar cells, bio-imaging and energy conversion.

Title: Biocidal properties of Europa Lander solid rocket motor adhesive, Loctite® EA9394, against *Hypsibius dujardini*
Primary Author: Williams, Natalie R.
Additional Authors: Sisk, Morgan; Liles, Mark; Lampton, Patrick
Department: Microbiology
College/School: College of Sciences and Mathematics

Abstract:
The NASA Europa Lander Mission launch criteria involves spacecraft decontamination of terrestrial microorganisms so as to limit the probability of contaminating the surface of Europa, an ice-covered moon of Jupiter that is a prime candidate in the search for extraterrestrial life. These standards include reducing microorganisms present by at least 10e-6 and a final Europan contamination probability of 10e-4 %. In order for the mission to be a success, the microbiome of certain spacecraft problem areas must be quantified, and the inherent antimicrobial or biocidal properties of native rocket motor materials must be characterized. It was found that a frequently used rocket motor adhesive, Loctite® EA9394, exhibits significant sporicidal properties and is capable of exceeding a 10e7 CFU reduction of Bacillus atrophaeus spores. Though spore-forming bacteria have traditionally been the primary targets of planetary protection efforts, eukaryotic *Hypsibius dujardini* (i.e. tardigrades, or "water bears") pose a risk to extraterrestrial bodies given their demonstrated resistance to radiation, desiccation, and space environments. After incubation with Loctite® EA9394 for 24 hours, active *H. dujardini* were found to be 100% nonviable. Additionally, active *H. dujardini* were exposed to water-soluble extracts of EA9394 for 24 hours and were again found to be 100% nonviable. Consequently, the risk posed by eukaryotic *H. dujardini* could be mitigated through the biocidal activity of rocket motor materials. These results will be communicated to other members of the Planetary Protection team for the Europa Lander mission to enhance the probability of reducing microbial contamination associated with spacecraft materials.

Title: Parent caregiver perceptions of Type 1 Diabetes management burden: Implications for pharmacists
Primary Author: Wilson, NeCall
Additional Authors: Kavookjian, Jan; Hohmann, Natalie
Department: Health Outcomes Research and Policy
College/School: Harrison School of Pharmacy

Abstract:
Pharmacists have a role in communicating with parents of child with type 1 diabetes (T1D) about insulin treatment challenges and responsibilities. Parent/caregiver reported preferences, perceptions, and concerns for insulin use may inform pharmacist of support strategies and content for interactions to improve child and family outcomes. The objective is to report results from a pilot study of parent-reported preferences, challenges, and family impact during their role as primary caregiver of a child with T1D. Ten parents who were enrolled in a larger study to enhance parent communication about self-management behaviors with their child responded to recruitment from a hospital-based endocrinology clinic (with $50 incentive) to complete a cross-sectional, paper-based survey. Seven parents completed the survey and were 57% female, 71% White/29% Black, all married, with a mean 2.57 children, and with mean age of 34.43 (+/- 14.46). Their children with T1D were 5/7 female, with mean age of 12.57 (+/- 3.51), duration of disease of 6.14 (+/-2.41), and 5/7 on an insulin pump. Highlights for variables showing most significant impact on parent, child and/or family included parent/caregiver feeling overwhelmed (n = 4), frustrated (n = 3), depressed (n = 2), stressed about the diabetes management responsibilities (n = 5), worried about complications (n = 7), or concerned about impact on other family members (n = 4). All agreed that managing T1D is expensive. Parent/caregiver perceptions in this pilot study illustrate potential topics that pharmacists are equipped to provide information/education for with a burdened caregiver parent. Pharmacists informed with knowledge about these psychosocial and humanistic impacts can provide patient-/person-centered perspectives to help optimize treatment outcomes for the child with T1D while also helping support a burdened parent/caregiver.

Title: Geographic variation in scatterhoarding behavior of eastern gray squirrels (*Sciurus caroliniana*)
Primary Author: Wilson, Sarah B.
Additional Authors: Dobson, Steve; Steury, Todd
Department: Biological Sciences
College/School: College of Sciences and Mathematics

Abstract:
Scatterhoarding, burying food to eat later, is a strategy animals use to survive when food is scarce. Scatterhoarders are known to increase their hoarding efforts in winters with less food available. Populations can experience different local winter conditions which should result in varying amounts of food available during winter across the species' range. Researchers previously assumed that time spent hoarding and amounts of food buried during the scatterhoarding season (fall-early spring) were similar for all individuals of a species. However, scatterhoarding should be more beneficial during harsh winters, so animals further north should scatterhoard more food. The purpose of our study was to determine if scatterhoarders have adapted their hoarding habits to local environmental conditions during winter, resulting in geographic variation in scatterhoarding behavior. We used a citizen science approach to observe eastern gray squirrels (*Sciurus caroliniana*) throughout the eastern US. September-December 2020, 48 people from 14 states recorded all behaviors and instances of scatterhoarding for 421 squirrels for 10 minutes each. We used Poisson regression to see if the number of seeds buried by squirrels increased with latitude and linear regression to determine if the percent of time squirrels spent scatterhoarding increased with latitude. We supported our idea that there is geographic variation in scatterhoarding behavior of squirrels experiencing different local environmental conditions. More food was scatterhoarded ($P<0.05$, $t=4.87$, $\beta=0.59$) and more time was devoted to scatterhoarding behavior ($P<0.05$, $t=4.87$, $\beta=0.59$) the further north the animals were observed. Our results suggest that scatterhoarding populations are able adapt their hoarding habits to changing local conditions, rather than spending more energy than would be beneficial. This is important knowledge about the role of costs and benefits in the evolution and adaptive value of scatterhoarding behavior.

Title: High levels of moderate-to-vigorous physical activity reduce sleep problems in children and adolescents with Autism Spectrum Disorder
Primary Author: Wilson, Carley S.
Additional Authors: Pangelinan, Melissa
Department: Physical Activity and Health
College/School: College of Education

Abstract:
Daytime physical activity and regular exercise has been associated with improved sleep efficiency (Kredlow et al., 2015). Children and adolescents with Autism Spectrum Disorder (ASD) are less physically active than typically-developing peers. In addition, sleep problems have been reported in 40-80% of children and adolescents with ASD and may exacerbate core behavioral symptoms in this population (Richdale & Schreck, 2009). Yet, only a few studies have examined the relationship between physical activity and sleep efficiency in individuals with ASD (children or adults). To address this knowledge gap, accelerometry data (Actigraph GT3X) were acquired from 15 children and adolescents with ASD (12 males/3 females, mean age: 9.72, sd: 2.52) and 15 matched controls (12 males/3 females, mean age: 9.42, sd: 2.04) during participation in a 3-week summer program (9am-3pm) aimed at increasing motor skills and physical activity. Daytime moderate-to-vigorous physical activity (MVPA) and sleep efficiency were examined over a minimum of 3 days per week for each of the 3 weeks of the summer camp program. During the summer camp (9-3pm), all participants achieved between 55-120 minutes of MVPA. In the afternoons/evenings following the summer camp (4-10pm), participants achieved an additional 20-115 minutes of MVPA. There were no significant group differences in the total amount of daytime MVPA achieved and there were no significant differences across the three weeks for either group. Interestingly, there were also no significant group differences in sleep efficiency or differences across the three weeks for either group. These data suggest that achieving high levels of MVPA (at least the recommended daily amount of MVPA) may have an immediate and consistent effect on sleep efficiency in children and adolescents with and without ASD. Future studies are needed to determine if a similar physical activity intervention would improve sleep, behavioral outcomes, etc.

Title: Compressed energy storage: Understanding water–rock–working fluid phase properties and interactions in porous formations.
Primary Author: Winningham, Lauren A.
Additional Authors:
Department: Civil Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
As populations and infrastructure increase, scientists are challenged with finding ways to store excess energy that can be extracted in times of high demand. Compressed Energy Storage (CES) systems are a promising means of large capacity, long-term storage below Earth's surface. Porous formations demonstrate qualities that make them a promising choice for compressed energy storage formations because they are naturally expansive and readily available for engineers to use. The challenge that arises when studying these porous formations are the complex interactions between the rocks that make up the formations, the saltwater brine that naturally occurs there, and the working gases being injected into these formations to store energy. This work focuses on studying the properties of potential working gases in porous compressed energy storage systems. As working gases are injected deep into the surface of the earth, the conditions become much different than those at Earth's surface, and the gases are subject to extremely high temperatures and pressures, which cause them to behave differently. In this work, Equations of State (EoS) are applied to calculate and observe the new properties of the gases under these extreme conditions. The prospective working gases being studied include carbon dioxide, methane, air, hydrogen, and nitrogen. The physical properties of interest include density, thermal conductivity, and viscosity, and how these vary with increasing depth.

Title: Role of genetic and epigenetic changes in ERBB4 in Triple Negative Breast Cancer
Primary Author: Woods, John A.
Additional Authors: Lucas, Lauren; Riese II, David
Department: Pharmacy
College/School: Harrison School of Pharmacy

Abstract:
Breast cancers that exhibit expression of the estrogen receptor (ER) and progesterone receptor (PR) or over expression of the HER2 receptor tyrosine kinase are treated using well-established targeted therapeutics. In contrast, highly effective targeted therapies are not available to treat triple negative breast cancers (TNBCs), which lack ER, PR, and HER2 expression. TNBC patients have increased relapse rates and lower 5-year survivability compared to other breast cancer subtypes (77% vs. 85%). TNBC comprises 10-20% of all breast cancer diagnoses; therefore, it is imperative to identify novel biomarkers and targets for therapeutic intervention in TNBC. ERBB4 is a receptor tyrosine kinase that is closely related to the epidermal growth factor receptor (EGFR/ERBB1), ERBB2 (HER2), and ERBB3 (HER3). EGFR and ERBB2 are well-validated targets for therapeutic intervention in a number of human malignancies. We hypothesize that genetic and/or epigenetic changes in ERBB4 function may drive human malignancies. Indeed, ongoing work indicates that ERBB4 mutations are tumor drivers in a significant fraction of metastatic melanomas. Similarly, we hypothesize that genetic and epigenetic changes in ERBB4 function are drivers in a significant fraction of TNBCs. The Cancer Genome Atlas (TCGA) breast cancer case repository (BRCA) contains 1,098 cases. Approximately 10% of these breast cancer cases (115 cases) are classified as TNBC. We present the results from our in silico analysis of these cases. We analyzed both ERBB4 and EGFR mutations, copy number variation, and transcription. We compared these results as genetic and/or epigenetic changes in EGFR function may also function as tumor drivers in TNBC. We use patient survival data to evaluate the potential significance of the genetic/epigenetic changes. We use the primary literature to predict the functional significance of the ERBB4 and EGFR mutant alleles found in our analyses.

Title: Theoretical insights into selective ethylene oxide formation on Ag catalysts
Primary Author: Wu, SIyuan
Additional Authors: Tatarchuk, Bruce J.; Adamczyk, Andrew J.
Department: Chemical Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Chemical conversions in catalytic partial oxidation processes of light hydrocarbons are responsible for the production of many industrial chemicals, plastics, and intermediates, and the large-scale usage of mentioned products. These processes are relatively expensive to perform, and are typically operated at high thermodynamic inefficiency, so the development of novel high-efficiency catalysts would prove to be vital. In this study, we focused on surface catalytic mechanisms of ethylene oxide formation process. DFT methods were used to analyze related reaction mechanisms on the Ag(111) surface facet with low coverage. Energy changes of related species and pathways were calculated. DFT analysis was discussed in the context of microkinetic modeling techniques which provided detailed information on surface coverage and gas-phase species concentrations as a function of reactor process conditions and feed ratios. Key surface species in branching process of ethylene to ethylene oxide and acetaldehyde through oxametallacycle were identified to show the determining factors of the selectivity of ethylene epoxidation. Our results were consistent with previous kinetic modeling efforts in the literature which did not employ DFT analysis. Lastly, our study demonstrated how fundamental theoretical investigations and multi-scale modeling techniques are currently impacting the advancement rational catalysts design and light hydrocarbon industry.

Title: Water production rates and activity of interstellar comet 2I/Borisov
Primary Author: Xing, Zexi
Additional Authors: Bodewits, Dennis; Noonan, John; Bannister, Michele T.
Department: Astrophysics
College/School: College of Sciences and Mathematics

Abstract:
We observed the interstellar comet 2I/Borisov using the Neil Gehrels-Swift Observatory's Ultraviolet/Optical Telescope. We obtained images of the OH gas and dust surrounding the nucleus at four epochs spaced before and just after perihelion (-2.56 AU to 2.03 AU). Water production rates increased steadily before perihelion from (7.0±1.5)×1E26 molecules/s on Nov. 1, 2019 to (10.7±1.2)×1E26 molecules/s on Dec. 1. This rate of increase in water production rate is slower than that of most Jupiter-family comets and quicker than most dynamically new comets. After perihelion, the water production rate decreased rapidly to (4.9±0.9)×1E26 molecules s−1 on Dec. 21. Our sublimation model constrains the minimum radius of the nucleus to 0.37 km, and indicates an active fraction of at least 55% of the surface. $A(0)f\rho$ calculations show variation between 90 and 106 cm with a slight trend peaking before the perihelion, lower than previous and concurrent published values. The observations confirm that 2I/Borisov is carbon-chain depleted and enriched in NH_2 relative to water.

Title: Genome assembly of the *Wolbachia* in *Nasonia vitripennis* Using Linked-Reads Technology
Primary Author: Xiong, Xiao
Additional Authors: Wang, Jinbin; Tang, Xueming; Zhang, Chao; Werren, Jack; Wang, Xu
Department: Biomedical Science
College/School: College of Veterinary Medicine

Abstract:
Wolbachia is an obligate endosymbiont which infects about 50% of arthropods. The parasitoid wasp genus Nasonia has been an ideal model for *Wolbachia* genomic studies because of multiple infections within four species. Due to its intracellular life style and inability of media culture, the difficulty in purifying *Wolbachia* DNA from the host is the limiting factor for the genomic studies of *Wolbachia*. It is quite challenging to obtain sufficient quantity without contamination from the host nuclear and mitochondrial genomes. In this study, we used the 10X Genomics linked reads technology for genome assembly of *Wolbachia* from two *Nasonia vitripennis* (Nv) strains, based on the coverage differences in the hosts and the bacterium. 10X genomic sequencing provides high read depth which enables the detection of intracellular bacteria with low concentrations. High molecular weight genomic DNA was isolated from female adults of two Nv strains, labii and v12. The 10X Genomic libraries were constructed and sequenced on an Illumina HiSeqX lane. We performed the following two strategies to identify *Wolbachia* reads and assemble them into genome. 1) all 10X reads were aligned to an existing *Wolbachia* free Nv PacBio assembly with BWA and then extracted the unmapped reads for de novo *Wolbachia* genome assembly with MegaHIT; 2) The labii and v12 assemblies were generated from all 10X genomic sequencing reads using Supernova 2.1.1 assembler. The scaffolds were aligned to the bacterial sequence database and identified as *Wolbachia* scaffolds based on the median coverage around 60X and the minimum of 20% sequence identity to bacteria sequences. This method does not require prior knowledge about the presence of specific microbe species. Therefore, it has the potential of identifying other intracellular symbionts, as well as characterizing bacterial species in insect gut microbiota at the whole-genome level.

Title: Shallow slope failure simulation and remediation strategies for fat clay at Alabama Highway
Primary Author: Xuan, Mengwei
Additional Authors:
Department: Civil Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Soil slope failures occur globally, which can happen over a period long time or can even take place without any warnings. Various slope repair methods are used to stabilize slope failures. While designing suitable remediation, engineers need to consider several factors, such as technical constraints, site constraints, environmental constraints, and budget availability. The research gives various stabilization methods that can be used for improving slope stability. Based on the specialties and the various conditions of the case histories, retaining walls and anchors are considered suitable remediations for the case history. And the numerical model is given by R.S. 2018 shows these two methods are suitable for the area. The geometry and construction details are not specialized in the research which needs further researchers' analysis. This is practiced by choosing different case histories from the database which would be able to be investigated to recognize possible remediation procedures that can address the failure mechanism at that site. Some case histories where shallow slide failure has been brought about by rutting from mowing exercises along slopes are included as well. A prioritizing organizing plan is recommended to permit the diverse remediation methods to be contrasted and the ideal strategy with be chosen. Suggestions are given with respect to the most promising remediation systems and regions where changes could be made to plan or activities to improve slope stability along parkways. Topics identified with this examination that could profit by future research are additionally recognized.

Title: Regular cannabis use is associated with poorer pain outcomes inside and outside the laboratory: Results from experimental and naturalistic assessments
Primary Author: Yanes, Julio A.
Additional Authors: Reid, Meredith A.; Atlas, Lauren Y.; Younger, Jared W.; Gonzalez, Raul; Robinson, Jennifer L.
Department: Cognitive and Behavioral Sciences
College/School: College of Liberal Arts

Abstract:
Substantial efforts have been directed toward understanding the complex relationship between cannabis and pain, yet we have many (often conflicting) theories regarding cannabinoid analgesia. Critically, although cannabis's acute effects on pain have received considerable attention, long-term effects have been severely understudied. Here, we leveraged experimental and naturalistic approaches to provide enhanced understanding about regular cannabis use and pain. Two, inter-related studies were conducted: a laboratory study and an internet study. During the laboratory study, we measured acute pain in recreational cannabis users and cannabis non-users to test two hypotheses: (i) that subjective pain ratings are lower among users and (ii) that maximum pain tolerance is greater among users. During the internet study, we retested observed associations using more ecologically-relevant endpoints in a separate sample. When taken together, our results support the following conclusions: (i) recreational cannabis is associated with lower maximum pain tolerance and (ii) users report greater pain-related impairment outside the laboratory. Despite meta-analytic evidence that cannabis treatments reduce experimental pain and clinical pain in individuals without cannabis use histories, our findings are consistent with recent reports documenting poorer post-operative pain outcomes among chronic users. Given recent advancements in medical, political, and societal attitudes toward cannabis, it has become increasingly important to consider potential motivations (e.g., self-medication) or unintended consequences (e.g., hyperalgesia) associated with regular, long-term use.

Title: Blood-brain barrier disruption in aged and cerebral amyloid angiopathy mouse models
Primary Author: Yang, Euitaek
Additional Authors: Kaddoumi, Amal
Department: Pharmaceutics
College/School: Harrison School of Pharmacy

Abstract:
Alzheimer's disease (AD) is a neurodegenerative disorder with progressive hippocampal and cortical neuronal degeneration with dementia. Hippocampus and cortex are responsible for long- and short-term memorization, and thus neuronal degeneration in these regions could cause cognitive impairment. Aging is one of the risk factors to trigger blood-brain barrier (BBB) dysfunction. BBB plays a critical role in the clearance of brain waste products including Amyloid-β (Aβ); BBB disruption could alter these products clearance and allow entry of neurotoxic molecules to the brain at the same time. Reduced clearance of Aβ could result in its accumulation in the brain, which could trigger hippocampal and cortical neuronal degeneration. The purpose of this project is to compare the BBB integrity in young wild type, and 10 months old wild-type and CAA (cerebral amyloid angiopathy) mice. For this, we used immunostaining to monitor and compare BBB leakage by IgG extravasation assay. Our findings demonstrated the BBB leakage was highest in CAA mice brains compared to wild-type mice.

Title: Census and reassessment of the critically endangered Alabama Canebrake Pitcher Plant, *Sarracenia alabamensis*, 25 years later
Primary Author: Yawn, Noah D.
Additional Authors: Determann, Ron O.; Thompson, Patrick; Folkerts, Debbie R.; Stephens, Jessica D.
Department: Integrative Biology
College/School: College of Sciences and Mathematics

Abstract:
The Alabama Canebrake Pitcher Plant, *Sarracenia alabamensis*, is an extremely endangered species extant at only eleven total occurrences in two counties in central Alabama. This Alabama longleaf pine hills endemic species is notable for its current and historic rarity, as well as unique soil composition and habitat, occurring predominantly on nutrient-poor sandy and gravelly permanent seepage slopes within the Tuscaloosa Formation. Though many sites are monitored and managed to a degree, recent population data across the species range has been scarce, with the last census having occurred in 1995. The main objective of this study was to collect comprehensive population data on all existing populations, record detailed floristic inventories, conduct soil analysis, and develop an updated, thorough, and consistent survey methodology for the species. This methodology includes determining genet size class and quantity, flowering ability, sexual reproduction, and successful seedling recruitment. These data were then compared to the last population census (1995) to examine how populations, their associate plant communities, soil composition, and health has changed over the past twenty-five years. This study provides much clearer insight into the species' current habitat and is extremely relevant to its conservation. Results from this work will be used to determine extirpated site quality and reestablishment potential, existing population augmentation, establishment of new sites, and long-term monitoring and management objectives. This methodology can be used for other endangered and threatened *Sarracenia* populations, including *Sarracenia oreophila* and *Sarracenia jonesii*, due to their similar scarcity and unique nature.

Title: Evaluation of the efficiency and accuracy of Weka on segmenting mineral phases in scanning electron microscopy images
Primary Author: Zeng, Zhuoyi
Additional Authors: Beckingham, Lauren E.; Qin, Fanqi
Department: Civil engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Imaging has emerged as a promising way to facilitate quantitative analyses of geological samples. Identifying and segmenting mineral phases through image processing techniques is enables estimating mineral properties including mineral porosity, abundances, accessibilities and accessible surface areas. However, image processing can be time-consuming and high computational costs are expected when dealing with high resolution images. An alternative way of processing images with higher efficiency and less computational cost is needed. The objective of this work is to evaluate the accuracy of Weka (Waikato Environment for Knowledge Analysis) for segmenting mineral phases in scanning electron microscopy (SEM) backscatter electron (BSE) images. Weka is a program in ImageJ which combines a collection of machine learning algorithms with a set of selected image features to produce pixel-based segmentations. It contains a collection of visualization tools and algorithms for data analysis and predictive modeling, together with graphical user interfaces for easy access to this functionality. BSE images from Qin and Beckingham (2019) are used in this work where six mineral phases have been identified in addition to the porosity, mineral abundances, mineral accessibilities and accessible surface areas. In this work, the same BSE image will be used and processed through Weka and mineral properties including porosity, accessibility and accessible surface area will be estimated. The results will be compared with data reported in Qin and Beckingham (2019) to evaluate the accuracy of Weka on processing BSE images. Preliminary work has been able to segment majority of the mineral phases well with high efficiency; however, the accuracy of the segmentation needs to be improved. The ultimate goal here is to use Weka to improve the image processing efficiency and accurately segmenting different mineral phases in the BSE images.

Title: Minimally invasive tenotomy of the semitendinosus muscle: an *ex vivo* study in horses
Primary Author: Zetterstrom, Sandra M.
Additional Authors: Weatherall, Kathleen; Boone, Lindsey; Caldwell, Fred
Department: Clinical Science, Veterinary Medicine, Equine Surgery Resident
College/School: College of Veterinary Medicine

Abstract:
Fibrotic myopathy is a mechanical hind limb gait abnormality that develops with fibrosis and adhesions of the semitendinosus, semimembranosus, biceps femoris or gracilis muscles. Chronic cases may require a semitendinosus tenotomy procedure. Traditional approaches describe a long incision for isolation of the tibial insertion of the semitendinosus tendon for tenotomy. Using a minimally invasive technique for semitendinosus tenotomy would decrease soft tissue dissection, decreasing complication risk. The study objective was to describe a minimally invasive technique for semitendinosus tenotomy using ultrasound guidance and evaluate procedural complications Sixteen hind limbs from eight equine cadavers were included in the study. Horses were positioned in dorsal recumbency. Ultrasound was used to identify the tibial insertion of the semitendinosus tendon. A stab incision was made distal to tendon's insertion. A retrograde knife was placed in a distal to proximal direction, isolating the tendon and confirming correct isolation with ultrasound. After transection, the tendon edges immediately retracted and ultrasonography was repeated to confirm complete transection. All cadaver limbs were then dissected to confirm complete transection of the tendon and identify iatrogenic trauma to the surrounding soft tissue structures. Tenotomy of the tibial insertion of the semitendinosus tendon was complete in all limbs. Ultrasonography was helpful in confirming isolation of the semitendonosus tendon prior to transection. Complete transection of the tendon resulted in a palpable gap forming between the tendon edges and this was confirmed using ultrasonography. Iatrogenic injury to the underlying popliteal muscle was apparent in 3 out of 16 limbs. The trauma was superficial in nature and only included the fascia in 1/3 limbs. Findings of the cadaver study support use of a minimally invasive semitendinosus tenotomy technique as a safe alternative to the traditional invasive approach.

Title: A novel approach for real-time detection of fake news
Primary Author: Zhang, Chaowei
Additional Authors: Gupta, Ashish; Qin, Xiao; Bhattacharya, Tathagata; Peng, Xiaopu.
Department: Computer Science
College/School: Samuel Ginn College of Engineering

Abstract:
Fake news is a rampant societal and organizational problem with various social media outlets further aggravating its spread. There is a pressing demand to assist people to identify misinformation from a massive amount of news data in a timely manner. Detecting fake news in a timely manner is critical for mitigating its impact. In this research, we propose a novel approach for detecting fake news in real time, RT-FEND (Real Time- Fake News Detection), which relies on distributed computing paradigm. The proposed methodology utilizes event and topic extraction techniques along with a topic- merging mechanism to process real time news data and reduce the number of topics for managing the curse of dimensionality. One of the important features of our methodology is the inclusion of a two-stage procedure for improved memory management using a streaming framework. We report the findings from several experiments to compare RT-FEND with other systems to benchmark in different system settings. RT FEND approach is more time-efficient in detecting fake news while also leading to a 19.76% reduction in the number of topics and 26.92% reduction in the numbers of data clusters when compared to other fake news detection systems.

Title: Sentiment analysis by text mining of tweets
Primary Author: Zhang, Linyuan
Additional Authors:
Department: Computer Science and Software Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Sentiment analysis is a growing and promising research field, especially when applied in social media since people's sentiments embody their opinions which further influence the social development. Twitter, an American online news and social networking service on which users post and interact via messages known as “tweets", is the most popular one. Statistics show that there are more than 319 million monthly active users posting 340 million tweets per day, and the service handles an average of 1.6 billion search queries per day. It is a powerful platform to collect and analyze people's sentiments because of the diversity of its topics and the sheer amount of opinionated messages. This report examines one domain dealing with the data retrieved from Twitter using the language of R, which contains lot of useful packages in the linguistic field. The domain focuses on the group opinion analysis for one public event: Brexit. Brexit, merging two words of Britain and exit, is a new and popular word used as a shorthand of the United Kingdoms (UK) leaving the European Union (EU). Three sentiment approaches are employed in this research, which are based on unigram analysis, 2-gram analysis, and whole sentence analysis.

Title: Influence of dopants on the electrochemical properties of conducting polymers as electrodes for supercapacitors
Primary Author: Zhang, Miaomiao
Additional Authors: Zhang, Miaomiao; Nautiyal,Amit; Du, Haishun; Zhang, Xinyu
Department: Polymer and fiber engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Conducting polymers are class of functional polymers having conjugated chain structures. Among them, polyaniline (PAni) and polypyrrole (PPy) are well known for their excellent electrochemical properties as electrode materials of supercapacitors. To achieve high conductivity in conducting polymers, doping is necessary. In conducting polymers, dopants tend to be randomly distributed within the conjugated polymer affecting the structural and electrical properties of conducting polymers and as a result the electrochemical performance are strongly affected by the resulting structural and electronic disorder. In this paper, the influence of dopants: hydrochloric acid (HCl), perchloric acid (PrA), sulfuric acid (SA), p-toluene sulfonic acid (p-TSA), phosphoric acid (PhAc) and phytic acid (PA), on electrochemical performance of PAni and PPy were evaluated, respectively. For better comparation and understanding of the effect of dopants on the electrochemical properties of conducting polymers, the morphologies and structures of PAni and PPy obtained by using different dopants were characterized by SEM, TEM, XRD, etc. Their electrochemical performance as electrode materials for supercapacitors were evaluated by using cyclic voltammetry (CV), galvanostatic charge-discharge (GCD), electrochemical impedance spectroscopy (EIS). Results showed that, for both PAni and PPy, a smaller size of dopants helps to form a more compact coating with better conductivity in which ions could easily diffuse in and out of the conducting polymers. Thus, better electrochemical performance and higher capacitance could be obtained. However, during charge-discharge process the conducting polymers with smaller dopants were much easier to swell and shrink that makes their degradation faster. On the other hand, bigger size dopants showed better stability at higher scan rates and current densities.

Title: Habitual interaction: User experience with audio device
Primary Author: Zhang, Yunfan
Additional Authors:
Department: Industrial Design
College/School: College of Architecture, Design & Construction

Abstract:
Music is a natural instinct of human beings, which drives us to build millions of audio devices and they have absolutely surrounded us. Most people perhaps have been accustomed to the semantic language of physical or virtual control buttons inside of audio related devices. But how deep is the impression in people's minds? This research is designed to discover the level of the habit when users are interacting with audio device control buttons in different forms, dimensions or positions. Through building progressive experiments, and processing the observation of users' reaction of experiments, this research explores whether overall aspects of physical interaction and semantic language in audio devices triggers users to habitually interact with them. This research also considers whether some aspects of physical interaction and semantic language are redundant or misinterpreted.

Title: Peanut physiological response to drought in different growth stages
Primary Author: Zhang, Qiong
Additional Authors: Chen, Charles; Sanz-Saez, Alvaro; Zhen, Xiaoxing; Batchelor, William
Department: Crop Physiology
College/School: College of Agriculture

Abstract:
90% peanuts in Alabama grows under rain fed conditions, which makes the crops sensitive to drought stress during the pod filling stage. Under these conditions, achievement of high peanut productivity is mainly based on whether or not that cultivar is drought tolerant. Although breeders and farmers have been selecting for drought tolerant peanuts for years, the physiological characteristics responsible of drought tolerance are still unknown. In other crops, some drought tolerant cultivars are able to maintain a higher photosynthetic activity for longer at the expense of higher water use that they obtain thanks to deeper roots. By the contrary, other drought tolerant cultivars shut down the stomata and perform a lower photosynthesis in order to save water. The objective of this experiment was to test which of these two strategies are more prevalent in drought tolerant cultivars developed at Auburn University Breeding Program. With that aim four different peanut cultivars, two selected for being drought tolerant, one selected as drought sensitive, and a commercial check (G06G) were planted at two locations under irrigation and rainfed conditions. After the first flower, 5 sampling times were performed until maturity including physiological measurements such as photosynthesis, LAI, fluorescence, SPAD, and soil moisture. In those same times biomass samples were performed to study the C allocation in the different aboveground organs. Aboveground biomass was separated by different parts and weighted. The results indicated that photosynthesis, LAI and seed biomass was lower in rain-fed conditions.

Title: TGA: An oracle-less and topology-guided attack on logic locking
Primary Author: Zhang, Yuqiao
Additional Authors: Cui, Pinchen; Zhou, Ziqi; Guin, Ujjwal
Department: Electirical and Computer Engineering
College/School: Samuel Ginn College of Engineering

Abstract:
Due to the outsourcing of semiconductor design and manufacturing, a number of threats have emerged in recent years, and they are overproduction of integrated circuits (ICs), illegal sale of defective ICs, and piracy of intellectual properties (IPs). Logic locking is one method to enable trust in this complex IC design and manufacturing processes, where a design is obfuscated by inserting a lock to modify the underlying functionality so that an adversary cannot make a chip to function properly. A locked chip will only work properly once it is activated by programming with a secret key into its tamper-proof memory. Over the years, researchers have proposed different locking mechanisms primarily to prevent Boolean satisfiability (SAT)-based attacks, and successfully preserve the security of a locked design. However, an untrusted foundry, the adversary, can use many other effective means to find out the secret key. In this paper, we present a novel oracle-less and topology-guided attack denoted as TGA. The attack relies on identifying repeated functions for determining the value of a key bit. The proposed attack does not require any data from an unlocked chip, and eliminates the need for an oracle. The attack is based on self-referencing, i.e., it compares the internal netlist to find the key. The proposed graph search algorithm efficiently finds a duplicate function of the locked part of the circuit. Our proposed attack correctly estimates a key bit very efficiently, and it only takes few seconds to determine the key bit. We also present a solution to thwart TGA and make logic locking secure.

Title: Time-restricted feeding ameliorates high fat sugar diet induced skeletal muscle degeneration
Primary Author: Zhang, Yuxian
Additional Authors: Rasool, Suhail; Woodie, Lauren; Greene, Michael; Miller, E. Michael; Thangiah, Geetha; Jeganathan, Ramesh
Department: Nutrition
College/School: College of Human Sciences

Abstract:
Obesity is a major risk factor associated with several chronic diseases such as diabetes and musculoskeletal disorders. Consumption of a high-fat diet with sugar (HFS) contributes to the development of obesity. Previously our lab demonstrated that HFS induces skeletal muscle degeneration in mice. The objective of this study was to determine whether time-restricted feeding (TRF) for 9 h during the active phase could ameliorate the skeletal muscle degeneration caused by HFS. We found TRF reversed the statistically increased inflammatory markers, apoptosis pathway and the aggregation of myostatin in the skeletal muscle of mice fed with HFS. The skeletal muscle of HFS diet-fed mice showed significant deposition of amyloid-β and hyper-phosphorylated tau as compared to control diet-fed mice. Interestingly, the TRF reduced these abnormal protein levels. TRF also ameliorated the accumulation of ubiquitinated proteins observed in the skeletal muscle of mice fed with HFS diet as compared to the control group. In conclusion, our studies suggest that TRF could help reverse HFS diet-induced skeletal muscle degeneration in mice.

Title: Immunization practices: A survey of community pharmacy personnel
Primary Author: Zhao, Yi
Additional Authors: Fish, Hannah; Ha, David; Beckner, John; Westrick, Salisa C.
Department: Health Outcomes Research and Policy
College/School: Harrison School of Pharmacy

Abstract:
Pharmacists have been increasingly accepted by patients as immunization providers. To engage in immunization practices and be part of the Immunization neighborhood, pharmacists are required to adhere to the Standards for Immunization Practices, Advisory Committee on Immunization Practices (ACIP) guidelines and recommendations. This cross-sectional study used a self-administered online survey to determine pharmacy personnel's knowledge of ACIP immunization standards, their immunization practices, and their experience in emergency preparedness among the members of the National Community Pharmacists Association (NCPA). In total, 283 participants completed the survey, representing 37 states. The average age (standard deviation) of the study participants was 45.58 (±12.60) years. The majority were female (58.9%), White (93.4%) and non-Hispanic (99.3%). Most of respondents evaluated themselves as "very knowledgeable" about vaccines for adults and pregnant women, compared with "somewhat knowledgeable" about vaccines for adolescents and children. 89.60% of participants' pharmacies provided immunization services in 2018, with influenza vaccine being the most common vaccine provided. Regarding the current immunization practices, the majority verbally discussed the vaccine needs with patients (94.9%) and used phone calls as a way to remind patients about upcoming immunization needs (60.3%). In terms of immunization documentation, 75.7% reported enrolling in Immunization Information Systems (IIS) and 66.7% used IIS to retrieve patients immunization history. Finally, the majority have not participated in emergency drill (77.5%) nor actual emergency response (90.1%) but they expressed high willingness to obtain relevant training. This study described pharmacy personnel self-reported knowledge of immunizations and current immunization practices and identified several practice gaps. Findings will be used to tailor subsequent advanced training for community pharmacists.

Title: *In vitro* Effect of Trifluoromethylphenyl (TFMPP) derivatives on Amyloid-Beta (Aβ) secreting cells

Primary Author: Zhao, Mingliu
Additional Authors: Harshan, Aisha; Alturki, Mansour; Almaghrabi, Mohammed; Ramesh, Sindhu; Govindarajulu, Manoj; Alghenaim, Fada; Smith, Forrest; Deruiter, Jack; Clark, Randall; Dhanasekaran, Muralikrishnan
Department: Pharmacology
College/School: Harrison School of Pharmacy

Abstract:
In the United States, 1 out of every 20 deaths is associated to substances of abuse. Furthermore, drug abuse has become a huge global problem. Trifluoromethylphenyl (TFMPP) derivatives (2, 3, 4) belong to class of Piperazine designer drug and it is abused as an alternate to the illicit drug-MDMA. Designer drugs have shown to induce cognitive impairment and dopaminergic neurotoxicity. Production and deposition of the amyloid beta (Aβ) plays a vital role in neurodegeneration associated with cognitive decline. Nevertheless, the effect and mechanisms of 2, 3, 4-TFMPP derivatives in amyloidogenic pathway have not been studied. This study investigated the effect of 2, 3, 4-TFMPP derivatives on Amyloid-Beta (Aβ) secreting cells (PS70). PS70 cells are Chinese Hamster Ovarian (CHO) cells that carry the amyloid precursor protein-APP and Presenilin PS1 mutation thereby producing Aβ. MTT cell viability assay was used to assess the effect of 2-TFMPP, 3-TFMPP and 4-TFMPP on PS70 cells. We also characterized the morphological changes induced by the designer drugs. 2-TFMPP, 3-TFMPP and 4-TFMPP dose-dependently and time-dependently decreased the cell viability significantly. Our future study is to evaluate the effect of these designer drugs on Aβ production.

Title: The sexually dimorphic response of the mouse adrenal inner cortex to thyroid hormone treatment
Primary Author: Zheng, Huifei S.
Additional Authors: Lyu, Qiongxia; Kang, Yuan; Wang, Hui; Huang, Chen-Che Jeff
Department: Biomedical Sciences
College/School: College of Veterinary Medicine

Abstract:
The gender bias in adrenal diseases has been noticed for a long time. However, the mechanism behind the high prevalence of adrenal diseases in females is unclear. Mouse studies have shown that the adrenal gland is sexually dimorphic at different levels such as transcriptome, histology, and cell renewal. Here, we used RNA-seq to demonstrate how male and female adrenals respond differently to the same external cue, the thyroid hormone (T3) treatment, which directly elicits its function on the adrenal inner cortex by changing the cell fate of this population. Through the comparison of the adrenal gland transcriptomes from males and females with T3 or saline treatment, we found that more genes in female adrenals were responsive to the T3 treatment, whereas the fold change of the gene expressions was higher in male adrenals. Statistical analysis identified 104 sexually dimorphic T3-responsive genes. Immunostaining results showed that many of these genes were expressed in the adrenal gland inner cortex, which contains a unique cell population called X-zone (20αHSD-positive). Previous studies showed that T3 treatment leads to the expansion of the 20αHSD-positive zone both in males and in females. Here we found that the top sexually dimorphic T3-responsive gene was expressed in the adrenal inner cortex partially colocalized with X-zone. Under T3 treatment, this unique cell population that surrounds the 20αHSD-positive X-zone became obvious only in females but not in males. Our findings not only identified several novel marker genes for the adrenal inner cortex but also highlighted the sex-specific response of thyroid hormone action in the mouse adrenal gland.

Title: Rapid evolution of novel telomeric repeat units and telomere binding proteins in parasitoid wasps

Primary Author: Zhou, Yihang
Additional Authors: Wang, Yi; Xiong, Xiao; Appel, Arthur; Zhang, Chao; Wang, Xu
Department: Biological Sciences
College/School: College of Veterinary Medicine

Abstract:
As an essential structure to maintain the integrity of linear chromosome ends and regulate cell proliferation, telomeres consist of highly conserved G-rich simple tandem telomeric repeats (TR). Vertebrate telomeres have 6bp TR unit (TTAGGG)n and most insect species have 5bp TR unit (TTAGG)n. These repeats are synthesized using the telomerase RNA component (TERC) as a template. (TTAGG)n was characterized as the TR unit of ants and bees, but this sequence was not found in parasitoid wasps. To characterize the TR unit in parasitoids, we developed RepeatMaster, a pipeline for fast identification of simple tandem repeats using Illumina sequencing data. We identified (TTATTGGG)n as the TR unit in six jewel wasp species. Surprisingly, this 8bp unit is longer than canonical TR and it is not complementary to the template region of known TERC. A 6-fold increase of TR total length per haploid was found in *Nasonia vitripennis* compared to *N. oneida*, suggesting rapid evolution through recent expansion in the Nasonia genus. In hymenopterans, we found that the elongated TR unit is restricted in wasp-wrist parasitoids and tend to evolve rapidly at multiple evolutionary scales in terms of both the TR unit pattern and the unit length. We identified 5 novel TR units, including two 9bp TR units. Within Chalcid wasps, two different longer TR units were found in Agaonidae and Trichogrammatidae at family level, indicating an independent TR unit turnover. In addition, we examined the phylogeny of telomere-binding proteins, which physically interact with TR units at the molecular level. The protein evolution tallies with novel TR units, instead of species, indicating concerted evolution, presumably due to the rapid radiation during parasitoids evolution history. Whether the longer TR or the fast unit turnover is associated with the parasitoid life history and functions in host-parasitoids interaction remains an open question for further investigation.

Title: Determining how images of different exercise contexts are spontaneously registered in brains of non-exercisers via electroencephalography (EEG)
Primary Author: Zona, Victoria A.
Additional Authors: Parma, Juliana O.
Department: Neuroscience
College/School: College of Liberal Arts

Abstract:
Physical inactivity continues to be an issue in our world today. Regular participation in physical activity decreases the risk of obesity, heart disease, depression, and many other diseases that result from physical inactivity. In the field of exercise psychology, the use of exercise images is commonly used to evaluate how participants perceive and evaluate exercise and can be used to promote exercise behavior and future well-being. People's spontaneous evaluations of exercise can influence their likelihood of engaging in physical exercise; thus, it is important to determine what kind of exercise stimuli are spontaneously evaluated as positive so that such stimuli can be used to promote exercise. In recent studies, automatic (implicit) processing of exercise images have been shown to differ from explicit ratings in regular exercisers and non-exercisers alike. The automatic processing of images as a function of type and setting is still yet to be determined. To address this, we have used an electroencephalographic oddball paradigm in order to evaluate whether non-exercisers implicitly prefer certain exercise contexts over others. The types of exercise contexts used in this study include indoor gym-type exercise, indoor sport-type exercise, outdoor gym-type exercise, and outdoor sport-type exercise. Results suggest the non-exerciser participants had similar automatic and explicit affective associations with the different types of images, but the participants allocated more neural resources to processing gym-type and outdoor images. In conclusion, the context of exercise images may influence the magnitude of cognitive processing of the images, but not the valence of affective processing of the images.

Title: Analysis of safety adverse reporting events of essure medical device: The end road of essure

Primary Author: Zou, Chenyu
Additional Authors: Wigle, Patricia R.; Hincapie, Ana; Guo, Jeff Jianfei
Department: Health Outcomes Research and Policy
College/School: Harrison School of Pharmacy

Abstract:
Since the introduction of the implantable medical device Essure for sterilization in 2002, more than 30,000 women worldwide have suffered from severe side effects from the device, including pelvic pain, allergic reaction, and bleeding. Essure was withdrawn from the marketplace in December 2018. This research analyzed the post-marketing Essure safety event reports and assessed the surveillance policies of both the pharmaceutical company and the FDA. The primary data source was the FDA MAUDE (Manufacturer and User Facility Device Experience) database. This study included all Essure reports to FDA MAUDE from January to October 2018. Using the NVivo® software, a qualitative data analysis program, Essure safety reports from the United States were examined and analyzed. Safety reports were categorized and analyzed by their event type, device problem, patients' symptoms, and the level of harm. Of those, 10% were randomly selected and analyzed in further detail. A total of 4982 available reports were analyzed. The main themes of safety reports were bleeding, pain, surgery, and infection. Quantitative analysis of a random sample of 500 reports showed that operation and pain were both contained in greater than 80% of the reports. Hemorrhage, hysterectomy, and menorrhagia were each mentioned in great than 30% of the reports. There were seven reported deaths, including two infant deaths. According to the study result, Essure had significant safety issues. More safety report processes should be utilized to notify consumers of potential side effects. In light of this severely problematic issue in medical device safety reporting and regulation, this study suggests that health care providers, the medical device industry, and the FDA need to work together and implement stricter control of medical device post-marketing surveillance to better protect patient safety.