Welcome to the Annual Graduate Research and Discovery Symposium (GRADS)! This year’s event will showcase a variety of research and service by graduate students from each of the colleges in the University’s Graduate School. The event serves as an opportunity for Clemson’s graduate students to exhibit their work as well as an opportunity for our graduate community to learn what their peers in other fields are researching, creating and producing. The GRADS Event Committee would like to thank all of the sponsors for this year’s event, those who have generously donated their time, effort, and resources toward funding and publicity as well judging, and most importantly, we would like to thank our graduate presenters for their hard work and dedication! We also would like to thank our guests who have graciously joined the graduate students to participate in the form of judges and speakers. We hope you enjoy the graduate presentations and please feel free to stick around for the awards ceremony and social immediately following the symposium!

- The GRADS Event Team

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Schedule

Friday, April 07, 2017

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POSTERS

GRADS: MORNING POSTER SESSION (10.00 A.M. - 12.00 P.M.)

College of Agriculture, Forestry, and Humanities

Animal and Veterinary Sciences

The effects of age at weaning and length of lipid supplementation on carcass quality of young steers
Authors: Jessi E. Tipton, Linda K. Lewis, Nathan M. Long
Advisor: Nathan M. Long

Marbling content is associated with improved flavor and tenderness as well as increased value of beef products. The objective of this study was to determine how weaning age and length of lipid supplementation affected carcass quality of young steers. Calves were early-weaned (EW, n = 24) at 150 ± 11 d of age or traditionally weaned (TW, n = 24) at 210 ± 11 d of age. Following a two-wk adaptation period, steers were assigned to control (CON, n = 12/group) or treatments (n = 12/group) and then fed for either 45 (45d; n = 6/treatment) or 90 (90d; n = 6/treatment) days. After treatment, steers were harvested at a commercial processing plant. The longissimus dorsi from RB steers had an increased EE compared to CON steers (3.6 ± 0.2 vs 2.4 ± 0.2 % on a wet basis, P < 0.0001). Also, longissimus dorsi from 90d steers had greater (P < 0.02) concentration (3.3 ± 0.2 %) of lipid than those fed for 45 d (2.7 ± 0.2 %). These data show RB supplementation as well as a longer period of supplementation increases marbling content of the longissimus dorsi in young steers.

Food, Nutrition, and Culinary Science

Optimization of HPLC detection of PMP derivatives of carbohydrates
Authors: Weizheng Wang, Feng Chen, Lina Wang, Haiyan Fu
Advisor: Feng Chen

Detection of carbohydrates has always been a big challenge in the world, which is still attracting numerous researchers to develop different methods to overcome various difficulties. Reducing sugars, a special group of carbohydrates containing a reducing end, have provided a possibility to combine one or more chromophores to facilitate the carbohydrate detection in spite of the lack of chromophoric group in original carbohydrates. After such kind of chemical derivatizations, the sugar derivatives can be analyzed by high performance liquid chromatography (HPLC) with ultraviolet detector (UV) and diode array detector (DAD), which have been the most common methods for the carbohydrate detection. In order to optimize the sugar detection via the HPLC-UV and/or DAD, this study applied the chemical derivatization to add an extra luminescence into carbohydrates molecules, for which 1-phenyl-3-methyl-5-pyrazolone (PMP) was used in this experiment. The optimal conditions for derivatizations of glucose and glucosamine with PMP were obtained through the response surface methodology (RSM) experimental design, which suggested the optimal conditions, under a fixed value at pH 13 of the buffer solution, for the glucose-PMP and glucosamine-PMP derivatizations at 71 °C for 134 min and 73 °C for 96 minutes, respectively. The delicate difference among the optimal conditions might result from the difference of the inner-structure and inner environmental pH values of the carbohydrates. Nevertheless, this method has been proven to be a feasible and practical method with high sensitivity to determine the most monosaccharides except fructose, and disaccharides such as lactose and maltose, as well as oligosaccharides which contain the reducing end. In addition to the effect of inner pH environment, multiple sugar rings and optical isomerism of carbohydrates might also play important roles in the yield of sugar-PMP derivatives. Furthermore, this research involved the study of the detective power in terms of the detective sensitivity, accuracy and linearity of two common detectors, i.e., DAD and evaporative light scattering detector (ELSD), on the sugar-PMP derivatives, and the efficiency in terms of the separation capability of two common HPLC columns, i.e., C18 column and amide column. Because of different principles of DAD and ELSD in chemical detection, both popular detectors have different sensitivities and selectivities for carbohydrates. DAD is able to analyze the sugar-PMP derivatives, while ELSD is good at detecting both the PMP free sugars, sugar PMP derivatives and other sugar derivatives such as sugar alcohols, etc. Moreover, the results have demonstrated that the amide column could efficiently separate the PMP free carbohydrates rather than the sugar-PMP derivatives, and on the contrary, the C18 column was able to separate the sugar-PMP derivatives rather than the sugar themselves.

Plant and Environmental Sciences

Early thinning of peach fruit influences expression of cell growth and expansion genes
Advisor: Ksenija Gais

Peach fruit development can be influenced by crop load, cultivar genetics, and temperature during the Phase 1 growth stage after fruit set. Four peach cultivars, Carored, Summerprince, Scarletprince, and Redhaven, were thinned to determine the influence of crop load on peach fruit growth. Trees of each cultivar were thinned either one week or four weeks after petal fall. Fructlets from each tree were sampled every 5 days from week 2 to week 5 post-bloom, then transversely sectioned equatorially and measured for average cell size, cell count, and overall fruit size. Early thinning of all cultivars correlated with increased mesocarp cell number, cell size, and fruit size compared to the late-thinned trees. Gene expression analyses of five growth-regulatory genes, FW2.2, CNR12, TAGL1, SIM, and ANT, were used to evaluate genetic response to thinning. FW2.2 expression was 12.8 and 4.5-fold higher in the early-thinned ‘Carored’ and ‘Scarletprince’, respectively, compared to the late-thinned trees. Early-thinned ‘Carored’ showed lower expression of CNR12, TAGL1, ANT, and SIM compared to the late-thinned group. The early-thinned fruits of ‘Scarletprince’ showed higher expression of all analyzed genes compared to the late-thinned trees. The comprehensive mechanisms through which the timing of thinning influences fruit development are being further investigated.

College of Architecture, Arts and Humanities

Architecture

Understanding the Built Environment of Shelter Homes for Survivors of Domestic Violence
Authors: Natali Eirdi
Advisor: Dr. Anjali Joseph

Across the world, 20-25% of all women are victims of domestic violence or abused by their partners. Survivors are abused where they should be the most secure - their own homes. In such situations, they turn to shelter homes for safety and security. There are around 1,800 shelter homes across the entire United States (National Network to End Domestic Violence, 2015) but are often crowded, involve communal living and offer little or no privacy. The spatial qualities and setting of shelter homes should have a positive impact on health, recovery and well-being of the survivor, but it is clearly evident in the literature that the existing facilities do not promote healing. The aim of this study is to explore qualities of the physical environment of shelters that influence and support the survivors to recover from this traumatic experience with dignity. For this purpose, a framework was created based on the literature review and tools (built environment assessment, resident surveys and staff interview protocols) were developed to aid in the comparative study of 4 identified facilities. Each facility was analyzed spatially using concepts of space syntax and assessed based on the design objectives of the framework (safety and security, privacy and control, and comfort). This was crucial in understanding the needs and perceptions of residents and what psychological and design factors aid in helping them to be competent and self-sufficient once again. In conclusion, the programmatic needs of such facilities were listed along with a set of design suggestions based on the framework.

College of Behavioral, Social, and Health Sciences

Applied Health Research and Evaluation

Elucidating the Endocrine Therapy (ET) Experiences of South Carolina Breast Cancer Survivors
Authors: Julie Summey

Literature consistently shows high discontinuation and non-adherence rates for patients taking endocrine therapy. Particularly vulnerable groups include minority race/ethnicity groups and younger women. The aims of this mixed methods study are 1) to describe ET discontinuation and non-adherence rates in South Carolina since 2000, 2) to identify subgroups with the highest ET discontinuation and non-adherence rates, and 3) to understand from the patient perspective which modifiable aspects have the greatest impact on the likelihood of ET continuation and adherence. Inclusion criteria for both the
quantitative and qualitative study aims are that women are Medicaid recipients who have completed treatment for hormone receptor-positive breast cancer and have been prescribed endocrine therapy. The quantitative arm of the study will use South Carolina Central Cancer Registry incidence data from 2000-2013 linked with Medicaid claims and administrative data from 2000 through September 2016. Chi-Square tests will be used to compare the proportion of patients who continued ET in each cohort. Bivariate and multivariate Cox proportional hazards regression models will be built to explore the impact of demographic, clinical, health services, and time factors on continuation and adherence rates, with the overall goal of identifying which subgroups have the lowest continuation and adherence rates. The qualitative study will employ three focus groups with approximately 20 women recruited from the Greenville Health System and the South Carolina Witness Project. Participants will be probed about their experiences with endocrine therapy based on constructs in the Health Belief Model, with particular emphasis given to cues to action and support preferences that would support a future intervention. A team of breast cancer patients will be involved in designing the focus group topic guide and in interpreting the results. Knowledge gained through the quantitative and qualitative arms of this study will be synthesized to inform the development of future patient-centered interventions to enhance the ET experience for South Carolina breast cancer survivors.

Parks, Recreation, and Tourism Management

Rural Latino Health and the Build Environment
Authors:Garrett Stowers
Co-Authors: Marciela Fernandez (Advisor) and Alondra DeSanctis
Latinos have historically experienced poorer health outcomes when compared to non-Hispanic Whites. Moreover, in recent years, Latinos have been displaced to rural areas where health disparities are likely to increase. However, little is known about the health status of rural Latinos and the determinants of Latino health in rural areas. The objective of this study was to understand the influence of the built environment (e.g., man-made surroundings) on rural Latino health. Researchers systematically reviewed literature linking Latino health to the rural built environment. Scientific databases were searched using variations of the keywords Latino, rural, and health. Abstracts and titles were screened and articles included in the study if they investigated rural Latino health and some aspect of the built environment. Approximately 160 articles met the inclusion criteria. Articles described physical (n = 78), mental (n = 26), and behavioral (n = 43) health, or some combination of the three (n = 11). The built environment acted as either a barrier or facilitator to rural Latino health. Major themes related to community infrastructure (n = 91), workplace conditions (n = 49), and neighborhood assets (n = 19). Recommendations to address deficiencies in the rural built environment are discussed.

College of Education

Educational Leadership and Organizational Development

Paint This Picture: Infusing Creativity Through Divergent Thinking Across All Content Areas
Authors: Courtney Allen & Melanie Lewis
Paint This Picture: Infusing Creativity Through Divergent Thinking Across All Content Areas relates to the first strand. Academic Achievement and School Leadership, through providing classroom teachers and after school program coordinators with helpful information on how to incorporate creativity across the curriculum. This proposal highlights how creativity and divergent thinking can empower students to use their creative skills academically to help them improve in all subject areas. Divergent thinking techniques help students to open their minds to all possibilities and creates alternative understanding to help them solve academic challenges in the classroom. This presentation will give teachers the tools to understand and implement divergent thinking and creative ways for their students to connect to content.

Black Woman’s Perception of Sexual Assault Policies and Practices at Predominantly White Institutions
Authors: Jimmy L. Howard, Jr.
The Office of Civil Rights’(OCR) regulations on sexual misconduct include the Dear Colleague Letter of 2011, has created broad national changes in campus policy and practice as it relates to sexual violence. The government’s regulations and laws are doing little to disrupt systemic sexual violence, and more narrowly, are doing very little to protect Black womyn. Current literature on the sexual violence epidemic on college campuses rarely focus on, or provides data that are disaggregated by race. Thus, Black womyn are grossly underrepresented in college sexual assault literature. While underrepresented in the literature, researchers who study Black womyn a vulnerable with regard sexual violence in the U.S. Black womyn know this, and have written about their vulnerability and erasure of the sexual violence they faced during every period of U.S. history. This poster will provide an overview of this study to date including, literature review, framework, methodology and methods. Framed in Critical Race Feminism and Black Feminist Thought, this study explores where Black womyn find support when they experience sexual violence, and to what extent they feel protected by campus sexual misconduct policies and practices at predominantly white institutions in the southeast.

Special Education

A Systematic Review of Self-Regulated Strategies to Improve Academic Outcomes of Students with EBD
Authors: Jennifer Counts & Michelle Popham
The purpose of this review is to report on the effectiveness and focus of academic self-regulated interventions for students with emotional and behavioral disorders (EBD). Historically students identified with EBD experience a host of poor academic and post school outcomes including lower academic achievement and graduation rates, exclusionary discipline, placement in more restrictive educational settings, higher levels of criminal justice involvement, and greater levels of unemployment/underemployment. Thirty-six studies published in 35 articles involving 189 participants met inclusion criteria. Overall self-regulated interventions showed moderate/medium ES gains (PND 74%; SMD 2.25; Tau-U 0.80) across academic subject areas, indicating effects were generally educationally meaningful. When assessing the effectiveness of self-regulated interventions for addressing specific academic content areas, the largest ES gains were observed in reading (PND 93%; SMD 2.13; Tau-U 0.94), while math (PND 71%; SMD 2.08; Tau-U 0.70) and writing (PND 81%; SMD 2.55; Tau-U 0.89) resulted moderate/ES gains. There was evidence to support a claim of the generalization and maintenance of findings. Implications, limitations, and areas for future research are discussed. This meta-analysis was presented at the 2017 Teacher Educators for Children with Behavioral Disorders (TECBID) conference and is currently in submission to Education and Treatment of Children.

The Impact of Adlerian Play Therapy on Externalizing Behaviors of At-Risk Preschool Children
Authors: Diane Staton, Michelle Dunn, Jill Shelton, Joe Ryan
African American children experience higher levels of poverty rates than other children. According to the National Center for Children in Poverty (NCCP, 2014), not only does poverty contribute to poor physical and mental health of children, it can also impede children’s learning abilities and contribute to problems socially, emotionally, and behaviorally. In this single case design study, four at-risk African American preschool children ages 3-5 participated in seven weeks of Adlerian individual play therapy following by seven weeks of Adlerian group play therapy. This intervention was chosen to address the participants’ problematic classroom behaviors of calling out and maintaining boundaries. Findings showed individual Adlerian play therapy demonstrated questionable to moderate effect size gains, while Adlerian group play therapy demonstrated questionable to moderate effect size gains. In conclusion, this study working with African American preschool children living in poverty, interventions for addressing externalizing behaviors, and recommendations for future research are discussed.

Literacy, Language, and Culture

Boys and Book Clubs: Increasing Reading Motivation
Authors: Leslie Roberts, Kori Hubbard & Dr. Linda Gambrell
Prior research suggests that there is a gender difference in students’ reading motivation, particularly focused on low motivation for male students. In a previous study, the authors utilized the motivational assessment tool Me and My Reading Profile (MMRP) for students enrolled in an after-school reading program. It was found that male students in Kindergarten through 3rd grade had significantly lower reading motivation; however, interview data revealed that the male participants enjoyed talking about books in groups. Therefore, increasing students’ social engagement with their reading could increase the opportunity for discussion, thus increasing their overall reading motivation. This study employs a formative design utilizing both quantitative and qualitative analysis to measure the effectiveness of a Book Club intervention implemented in the after-school program to increase the reading motivation of boys. Participants in the study were five 1st and 2nd grade male students who were identified based on low motivation scores on the MMRP and their interview responses. Findings from the initial data collection suggest that Book Clubs increase enthusiasm for participation in discussion and amplified the want for participants to read.

College of Engineering, Computing, and Applied Sciences

Biosystems Engineering

Thermodynamic Analysis of Otto Cycle engine considering the mass of exhaust residual gases in the working fluid
Authors: Ali Mohammad Nadif, Rahim Ebrahimi
PI/Advisor/Mentor: Rahim Ebrahimi
In this study, effort was focused on optimizing the air standard cycles. Many researchers have been conducted to analyze air standard cycles, for optimization and by releasing their performance. In these investigations, many researchers have tried to make a new approach to optimize work fluids assumed to be the mass of air or air-fuel mixture, but in real air standard cycles, mass of the working fluid is mass of air-fuel mixture plus the mass of residual exhaust gases trapped in the clearance volume of the cylinder. To obtain a real and practical model for air standard cycle, mass of these exhaust residual gases was calculated and taken into account as a portion of working fluid. Performance analysis and optimization of the cycle have been deliberated with consideration of mass of these exhaust residual gases. In the proposed model the frictional behavior of the specific materials of the working fluid was considered. The variation of exhaust residual with compression ratio, the relations between cycle temperatures and compression ratio, between power output and compression ratio, and also power output interactions with thermal efficiency of the cycle are indicated by numerical patterns. The results obtained in this research work can provide guidance for more close to real modeling, performance simulation and improved of the applied internal combustion engines.

Chemical and Biomolecular Engineering

Development of Anti-fouling membranes for water treatment

Authors: Steven T. Weiman, Eric Fierce, Maria Buss, Moshe Herzberg, Vutcheslav Fieger, Scott M. Husson

Over 780 million people lack access to clean drinking water. Developing new technology that can provide clean water from contaminated sources would be a great benefit to human health and well-being. Membranes have been developed for over 60 years to purify water. Membranes are selective barriers that allow certain components to pass through (permeate) and that restrict other components from passing through (retentate). Reverse osmosis membranes are an example that allows water to permeate through and that rejects salts. Current membrane fouling is a process where particles (salt, bacteria, biomolecules, etc.) deposit on the membrane surface or in the membrane pores causing the membrane's performance to degrade. Two methods have been effective towards reducing membrane fouling. One is through chemical modification of the membrane surface, and the other is patterning the membrane surface. The focus of this poster will be demonstrating the work we have done in both of these areas.

Using oleaginous yeasts to convert trash to treasure

Authors: Allison Yaguchi, Alana Robinson, and Mark Blenner

PI/Advisor/Mentor: Mark A. Blenner

Oleaginous yeasts have long been a target for developing industrial-scale biochemical processes due to their ability to accumulate high amounts of lipids on a per cell basis, synthesize complex chemicals and proteins, and robustly metabolize diverse feedstocks. In parallel, interest in lignocellulosic biomass as a feedstock has gained traction. Unfortunately, metabolism of lignin and lignin-derived aromatics is slow, and phenolic compounds are often toxic. Trichosporon oleaginosus, previously known as Cryptococcus curvatus, is a non-model, non-conventional, oleaginous yeast that we have discovered both tolerate and metabolize phenolic compounds derived from lignin. BLAST analysis suggests a potential putative pathway for metabolism of aromatic compounds, but qPCR results show the mechanism could involve a cryptic pathway or an alternative mechanism of aromatic metabolism. We have characterized biomass accumulation, lipid profiles, and gene expression patterns for T. oleaginosus on both model monoaromatics and sugars under different nitrogen conditions. Together our data suggest that T. oleaginosus may be a good model oleaginous system for aromatic metabolism.

Sustainable Plastics from yeast

Authors: Michael Spagnuolo, Mark Blenner

PI/Advisor/Mentor: Mark A. Blenner

The allure of sustainable production practices has sent researchers seeking alternative means of producing existing products. This has led to an increased interest in using biological systems to make commodity goods. Many of us are familiar with how yeast can be used to make bread or alcohol. Yeast can also be modified to make certain types of plastics. These plastics, called polyhydroxyalkanoates (PHAs), are a type of natural polymer that can be obtained in this research work can provide guidance for more close to real modeling, performance simulation and improved of the applied internal combustion engines.

Materials Science and Engineering

Composition-Dependent Self-Healing Poly(Methyl Methacrylate-Butyl Acrylate) and Poly(MMA/BA) Copolymers

Authors: Dmitry Davydovich, Marek W. Urban

PI/Advisor/Mentor: Marek W. Urban

These studies elucidate molecular origins of intriguing self-healing behavior of poly(methyl methacrylate-butyl acrylate) (pMMA/BA) copolymers which occurs when MMA/BA monomers are copolymerized at 55/45-45/55 molar ratios and form random/alternating morphologies. In contrast, block pHBA/BnBA copolymers do not exhibit this behavior. Spectroscopic measurements revealed that within this compositional range, the chains exhibited extended helical conformations resulting from van der Waals (vdW) inter-chain molecular interactions. Macromolecular chain flexibility calculations indicate that the helical conformations are able to facilitate self-repair by shifting the entropic energy generated upon mechanical damage as a result of chain deformation to the energy during repair, leading to recovery to their initial extended helical conformations. Molecular dynamics simulations also indicated that in order for self-healing to occur, the estimated number of MMA/BA repeating units per block should be 10 as seen from the increase in cohesive energy density (CED). Furthermore, chain cleavage during mechanical damage is manifested by the presence of free radicals, but their contributions to self-healing are not fully understood.

Quantitative Predictions of Shape Memory Effects (SME) in Polymers

Authors: Christopher Hornat, Ying Yang, and Marek W. Urban

PI/Advisor/Mentor: Marek W. Urban

Shape memory polymers are materials capable of recovering stored shapes from temporary geometrical arrangements upon application of stimuli. Among chemical and physical stimuli that trigger shape memory effects (SME) in polymers, the most common is thermal energy. These studies elucidate the origin of Tg-based shape memory behavior in thermosetting and thermoplastic polymers by utilizing dynamic mechanical analysis (DMA), which shows unique shape memory transitions. These transitions are macroscopically manifested by directional extensional and subsequent retraction of polymer networks back to their original shapes due to the release of stored energy. The extension is a result of viscous behavior of the network at the onset of the Tg, while the retraction is driven by conformational entropy. This behavior is quantified in terms of stored and released energy densities and the shape memory efficiency. Using this approach, shape memory in polymers can be predicted in single DMA experiments.

Nanotechnology

Nanocarrier based on propargyl acrylate and poloxamer complex as an effective drug delivery mechanism

Authors: Oleksandr Klep, Mark A. Blenner

PI/Advisor/Mentor: Dr. Steven Folger

Nano carrier based on propargyl acrylate and poloxamer complex as an effective drug delivery mechanism is proposed. The majority of highly potent drugs that were recently developed share one common impotence – hydrophobicity. Thus there is a need for a carrier that can stabilize these drugs in the aqueous environment of the human body. In recent years, a lot of poloxamer based carriers have been developed. We propose a simple scheme of synthesis and characterization of the carrier based on propargyl acrylate nanoparticles coated with poloxamer copolymer. Carrier stability is greatly enhanced in our system by the use of hydrophobic propargyl acrylate groups being chemically bound to the hydrophilic coating. The ability to select various sizes of nanoparticles and any of the commercially available poloxamer copolymers provide the possibility to fine tune properties of the final carrier to the needs of the consumer. Grab and release effectiveness of model drugs is correlated to the nano carrier’s composition.

Freeze spray coating: a promising fabrication technique for high energy density electrodes for Li-ion batteries

Authors: Milad Arazian Ghadikolai, Stephen Creager, and Rajendra K. Bordia

PI/Advisor/Mentor: Mark A. Blenner
Rechargeable batteries are important components of many systems and devices and a high capacity battery that can be rapidly charged remains a top research and development priority. Important performance factors like capacity, energy density, and power density strongly depend on chemical nature and the microstructure of the porous electrodes. Highly tortuous porous electrodes and long lithium ion pathway due to pore blockage by inactive material are detrimental to the energy and power density. Our goal is to investigate the potential of fabricating low tortuosity, controlled porosity Li-ion battery electrodes by taking advantage of the hierarchically ordered porous microstructure, which can be obtained using freeze tape casting technique. For this research, Li$_2$TiO$_3$ (LTO) cathode material was modified with Molybdenum (Mo) dopant to enhance its electronic/ionic conductivity. A slurry of the synthesized Mo doped LTO powder, graphite additive and binder was tape cast followed by unidirectional freezing of the solvent and subsequent sublimation of the solvents. The obtained microstructure contains hierarchical aligned porosity, leading to easy migration of electrolyte through the entire electrode. We show that these engineered porous cathodes have improved energy and power density compared with randomly oriented uniform porosity cathodes – feature of the current generation of battery cathodes.

**Mechanical Engineering**

Optimal Routes for Cables, Harnesses, and Hoses in Automotive Systems

Authors: Nafish Masoudi, Georges Fadel

The objective of this research is to design an automatic cable layout algorithm for automobiles in order to minimize the total weight of cable harnesses through minimizing their lengths and maximizing their commonality. In other words, we plan on finding the shortest paths with minimum links to connect multiple components while giving any interference with other components on the way. Routing cable harnesses and pipes in an optimal way can benefit automotive, aircraft, and ship industries in significantly minimizing the total weight of the vehicle which has a direct effect on their fuel consumption. This will help manufacturers produce more fuel efficient products and save customers’ money. When it comes to aircraft, the weight would be more critical and even 1% weight minimization would improve its performance significantly.

Human-centered control of robots in hybrid manufacturing cells

Authors: Behzad Sadrfaridpour, Yue Wang

PI/Advisor/Mentor: Yue Wang

The recent emergence of safe, lightweight, and human-friendly robots has opened a new realm for human-robot collaboration (HRC) in manufacturing. For such robots with the new human-robot interaction (HRI) functionalities to interact closely and effectively with a human coworker, new HRI-based control criteria are demanded. Our goal is to integrate HRI factors into the robot motion controller for human-robot collaborative assembly tasks in a manufacturing hybrid cell First, dynamics of the HRC system is modeled and verified through a series of human-in-the-loop experiments. Then, an HRI-based framework is developed for controlling the speed of a robot performing pick and place tasks alongside a human. Another HRI-based framework is developed for planning and controlling the robot motion in performing hand-over tasks to the human. Series of human-in-the-loop experimental studies are conducted to evaluate the impact of implementation of the frameworks on overall efficiency and HRI criteria such human workload and trust and robot usability. The results show that integrating HRI in the robot controller leads to lower human workload while it does not degrade human trust in robot, robot usability, or average working velocity.

**Computer Science**

MOLIERE: Automatic Biomedical Hypothesis Generation System

Authors: Justin Sybrandt

PI/Advisor/Mentor: Ilya Safro

Hypothesis generation is becoming a crucial time-saving technique which allows biomedical researchers to quickly discover implicit connections between important concepts. Typically, these systems operate on domain-specific fractions of public medical data. MOLIERE, in contrast, utilizes information from over 24.5 million documents. At the heart of our approach lies a multi-modal and multi-relational network of biomedical objects extracted from several heterogeneous datasets from the National Center for Biotechnology Information (NCBI). These objects include but are not limited to scientific papers, keywords, genes, proteins, diseases, and diagnoses. We model hypotheses using Latent Dirichlet Allocation applied on abstracts found near shortest paths discovered within this network, and demonstrate the effectiveness of MOLIERE by performing hypothesis generation on historical data. Our network, implementation, and resulting data are all publicly available for the broad scientific community.

**Civil Engineering**

Random field-based liquefaction mapping – data inference and model verification using a synthetic digital soil field

Authors: Mengfen Shen, Qiushi Chen, Chaofeng Wang, and C. Heinz Huang

PI/Advisor/Mentor: Qiushi Chen

Soil liquefaction is one of the most common hazards triggered by earthquake. With the help of geostatistical tools and random field models, a regional liquefaction hazard map has been increasingly used to evaluate soil liquefaction. The random field-based approaches found in the literature including averaged index approach, two-dimensional and three-dimensional local soil property approaches. Verification of these three approaches is challenging and rarely addressed in current literature due to the limitation of soil data and liquefaction observations. In this study, we propose a synthetic digital soil field through novel numerical models providing extreme detailed soil properties and corresponding benchmark liquefaction potential field. Different virtual field investigation plans are designed by using three information theory-based measures. By verifying the random fields generated by the three approaches to the benchmark liquefaction potential field, we found that with sufficient test samples, average index approach is preferred due to the tradeoff between computation efficiency and prediction accuracy. And the three-dimensional local soil property approach is recommended under the scenario of insufficient test samples. The results can be applied to guide the inference of model parameters and understanding the performance of random field-based liquefaction hazard mapping.

**College of Science**

**Biology**

Living with Giants

Authors: Christie Sampson, David Tonkyn

PI/Advisor/Mentor: David Tonkyn

Wild elephant populations in Myanmar have dropped from as many as 10,000 animals in the 1940s to as few as 2,000 today. As elephant habitat is increasingly developed for agriculture and other uses, human-elephant conflict (HEC) rates rise, with detrimental consequences for both species. These activities can lead to the local extinctions of elephant and broad-scale population declines across the range. Current HEC mitigation strategies in Myanmar, such as elephant drives and translocation, are ineffective at reducing or preventing conflict. As a result, communities still suffer high rates of crop loss and threats to personal safety. Increasing animosity in communities towards elephants exacerbated by habitat loss could lead to further dramatic declines in Myanmar’s wild elephant population. We are developing a framework to identify areas where management can best reduce HEC, while minimally impacting elephant population health. Our research explores three elements: 1. assessing local communities’ conservation attitudes and risk perception towards elephants; 2. using fecal DNA to determine what proportion of the local elephant population engages in conflict activities and identifying common characteristics to focus HEC mitigation strategies; and 3. investigating changes in elephant movement and habitat use during different climatic and agricultural seasons to improve our knowledge of how elephants use the landscape. We are combining the results of these investigations to inform mitigation policies in Myanmar. Pilot studies at our field site have already revealed startling levels of elephant poaching, and shown mitigation methods such as seasonal electric fencing and educational outreach to be successful in the area. The ultimate goal of this research is to provide recommendations to the Myanmar government and local NGOs that can improve elephant conservation policies and better utilize the limited resources available to reduce HEC in Myanmar.

**Chemistry**

Synthesis of Ce/Y/YSO and Ce/Y/LSO nanophosphors for Application in Optogenetics

Authors: Ashley Dickey, Eric Zhang, Stephen Foulger, Joseph Kolis

PI/Advisor/Mentor: Joseph Kolis

Optogenetics is a field that merges optics and genetics to control living tissue under the direction of light. Our group is interested in developing a sophisticated, multifunctional nanophosphor in a single, inoffensive means to manipulating specific neurons in living tissue. There are a number of different steps to creating such a particle that would meet all the necessary targeted requirements of a targeted, inoffensive molecule to manipulate specific neurons in living tissue. In order to achieve this, our particles will combine small-molecule imaging agents and polymers for delivery. Present work is focused on optimizing the scintillating core to meet the desired emission condition. Thus far we have been able to manufacture Ce/Y/YSO/SiO$_2$ and Ce/Y/LSO/SiO$_2$ nanophosphors via a core-shell synthetic approach. Careful monitoring of the particle characteristics to optically activated applications was accomplished by using powder X-ray diffraction to identify the core-shell reaction pathway, crystallinity, phase purity, and crystal domain size. SEM (scanning electron microscopy) was used to study morphology and particle size and coupled with EDS (energy-dispersive X-ray spectroscopy) to monitor dopant ratios and distribution. Photoluminescence and X-ray excited optical luminescence data was also collected as preliminary measurements of the particles’ scintillating ability.

Thick Silica Shell used as a Scaffold for Modification of Silver Nanoparticles

Authors: Dallas Roe Estep

PI/Advisor/Mentor: George Chumanov

Silver nanoparticles are used for many imaging techniques. Stability of these silver nanoparticles, which results from its nanospheres' scintillating ability. Many imaging applications require long-term stability for these silver nanoparticles, which results from its nanospheres' scintillating ability. Many imaging applications require long-term stability for these silver nanoparticles. However, these applications require using an array of imaging techniques to fully understand and characterize these nanoparticles. In this study, we focus on the modification of silver nanoparticles to create a stable, long-term imaging agent for use in biological applications. We use a thick silica shell as a scaffold for modifying silver nanoparticles. The thick silica shell around the nanoparticles acts as a scaffold for further modifications including with other
Interfacing the Liquid Sampling-Atmospheric Pressure Glow Discharge Ion Source with Orbitrap Mass Spectrometers for Highly Accurate and Precise Isotope Ratio Measurements

Authors: Edward Hoegg, R. Kenneth Marcus, David Koppelman, George Hager, Garrett Hart

PI/Advisor/Mentor: R. Kenneth Marcus

The development of a field portable mass spectrometer capable of highly accurate and precise isotope ratio measurements is presented. The field of isotope ratio analysis is currently dominated by thermal ionization mass spectrometers and inductively coupled plasma multi collector mass spectrometers (ICP-MC-MS). While the benefits of these instruments are numerous, their size, complexity, and large operational overhead limit their deployment to laboratory settings. To this end, this research has interfaced the liquid sample - atmospheric pressure glow discharge (LS-APGD) with Orbitrap mass spectrometers, in a potential paradigm shift for the field of isotope ratio analysis. Initial results have shown the LS-APGD / Orbitrap system has been capable of meeting a number of targets set by the JAEA for the destructive analysis of uranium. This poster will highlight the major achievements thus far and will compare the LS-APGD / Orbitrap system with industry standard ICP-MC-MS. Ultimately, a relative standard deviation of 0.04% for a low enriched uranium sample will be presented.

A Novel Miniaturized Electrochemical Cell for Electrolysis and Fuel Cells Applications

Authors: Sahed Bukola and Stephen E. Creager

PI/Advisor/Mentor: Stephen E. Creager

The platform for both proton-exchange membrane (PEM) electrolysis cells and fuel cells is often constrained to be time consuming and inaccurate as a result of membrane electrode assembly on a large active and total membrane areas. Existing test protocol, such as rotating disc electrode, that utilizes small membranes is often conducted in an environment that differs significantly from the real application testing. We present here a miniature PEM fuel cell test platform that may be used to conduct tests on catalyst layers containing just a few tens of micrometers of supported catalyst over an area less than 0.1 cm².

Bipolymer Strips for Organic Vapor Sensing

Authors: Yiming Wen, Bogdan Oly and George Chumanov

PI/Advisor/Mentor: George Chumanov

Bimetallic strips are used to convert temperature changes into mechanical deformation since eighteenth century. Two metals with different thermal expansion coefficients are fused together and, when being heated, reversibly bend in the direction of the smaller coefficient. It has been widely used in mechanical clock, thermostats, electrical devices, etc. Inspired by this concept, we are developing bipolymer films consisting of one polymer on one side and another polymer on the other side. These two polymers swell to a different degree when exposed to organic vapors resulting in bending. Combinations of different polymers such as Polyisoprene, polybutyl methacrylate, polyvinyl acetate, poly(4-vinylpyridine), formvar and others were investigated as the polymer substrates. Morphology of bipolymer strips were tested under atomic force microscopy. Possible applications of these bipolymer strips are acetone, ethanol, toluene and other vapor sensor, or humidity indicator were discussed. The developments of a low cost versatile “electronic nose” system will open doors for clinical assay, explosive detection, and hazard monitoring.

Mathematics

Some new results in Leray-Alpha discretization

Authors: Monica Morelos-Hernandez, Leo G. Rebholz

PI/Advisor/Mentor: Leo G. Rebholz

I investigate the Leray-alpha model of incompressible fluid flow, I made use of a finite element discretization in space, a Crank-Nicolson method in time for the linear term, and Adams-Bashforth for the inertial term. Our purpose was to numerically investigate the stability time step restriction of the scheme. In the literature it is discussed that Leray-alpha does not conserve helicity in the traditional sense. However we show that it does conserve a slightly different definition for helicity that we believe is appropriate for the Leray-alpha model.

A proportional hazards model for interval-censored subject to instantaneous failures

Authors: Prabhashi W. Withana Gamage, Monica Chaudari, Christopher S. McMahan, and Michael R. Kosorok

PI/Advisor/Mentor: Christopher S. McMahan

The proportional hazards (PH) model is arguably one of the most popular models used to analyze time to event data arising from clinical trials and longitudinal studies, among many others. In many such studies, the event time of interest is not directly observed but is known relative to periodic examination times; i.e., practitioners observe either current status or interval-censored data. The analysis of data of this structure is often fraught with many difficulties. Further exacerbating this issue, in some such studies the observed data also consists of instantaneous failures; i.e., the event times for several study units coincide exactly with the time at which the study begins. In light of these difficulties, this work focuses on developing a mixture model, under the PH assumption, which can be used to analyze interval-censored data subject to instantaneous failures. To allow for modeling flexibility, two methods of estimating the unknown cumulative baseline hazard function are proposed, a fully parametric and a monotone spline representation are considered. Through a novel data augmentation procedure involving latent Poisson random variables, an expectation-maximization (EM) algorithm was developed to complete model fitting. The resulting EM algorithm is easy to implement and is computationally efficient. Moreover, through extensive simulation studies the proposed approach is shown to provide both reliable estimation and inference. The motivation for this work arises from an ongoing randomized clinical trial funded by the National Institutes of Allergy and Infectious Diseases, aimed at assessing the effectiveness of a new peanut allergen treatment with respect to desensitization in children.

GRADS: AFTERNOON POSTER SESSION (1:00-3:00 P.M.)

College of Agriculture, Arts and Humanities

Architecture

Landscape in Motion

Authors: Chris Sandhulder, Jimmy Woods, and Elizabeth Walidani

PI/Advisor/Mentor: Dr. Ulrike Heine, Dr. David Franco, Dr. Henrique Houayek, and Dr. Ulrik Ersoy

Landscape in Motion is a design project to revitalize public green spaces, establish cohesive transportation networks, and optimize urban functions. A civic center offers the city a much needed gathering space for conferences and exhibitions and a bus terminal acts as a transportation hub for the region while offering free bus services. This allows people of all socioeconomic backgrounds and lifestyles to access the downtown and the various workplaces in the region. The redesigned city block extends a designed green space from the city park’s waterfall through the center of the site, terminating it at the site’s northwest corridor. This creates an opportunity to educate the public on the landscape of the area and how to bring sustainability into their lives. The project also inspires activity, offering a myriad of pedestrian paths, biking routes, and a connection to the trails of the park. Landscape in Motion is about finding inspiration in the natural movement of our surroundings from nature to city. Ultimately, the goal is to encourage people to live healthier, more sustainable lives helping both themselves and the community.

Pre-Operative and Post-Operative Prototype Room Research Project

Authors: Caroline Wyck, Wenz Tuttle, and Shabroz Bibbby

PI/Advisor/Mentor: BYRON EDWARDS, DR. ANJALI JOSEPH, DEBORAH WINGLER, DAVID ALLISON

The pre-operative and post-operative prototype room research project is a further study of a previous design for the Medical University of South Carolina’s ambulatory surgery center. The research goals are to improve the experience of the patient and care partner and increase efficiency for the clinicians. The main aspects we investigated were the shape of the room, the position of the patient bed, and the location and flexibility of the clinician’s workstation. The project exposes the ergonomic issues associated with using the current models of workstations on wheels and wall mounted stations. We combined research of surgical boom with the surveyed needs of a nurse’s workstation to create an adaptable ceiling-mounted workstation boom. We were then able to address issues related to maintenance, ergonomics, and accessibility while maximizing floor space for a 140 square foot room. Other main concepts of this prototype design were creating sight lines for the patient, care partner, and clinician and providing daylight and views to nature to all members in the room.

College of Agriculture, Forestry and Life Science

Wildlife and Fisheries Biology

Root Network of Southeastern Myotis in an Old-Growth Bottomland Hardwood Forest

Authors: S. P. Kimpel* and S. C. Loeb

PI/Advisor/Mentor: Susan Loeb

Little is known about the roosting habits of southeastern myotis, Myotis aterrimariparum, in Coastal Plain forests. Our objective was to quantitify roost habits of southeastern myotis in Congaree National Park, an old-growth bottomland hardwood forest in the Upper Coastal Plain of South Carolina during winter (November-December) 2015 and Summer (May-August) 2015 and 2016. We located roosts through opportunistic cavity searches and by tracking radio-
tagged bats, and counted bats in roosts using a light and mirror or during roost emergence counts. To examine roost network structure, we calculated the number of primary connections between which we defined as the number of bat-trips between two roosts. Roost occupancy ranged from 1 to 310 individuals. We radio-tagged 47 bats and located 52 ≥ 1 times. Of the 36 roots used by radio-tagged bats, 27% were located in upper bole cavities, 36.1% were located in the branches of trees (canopy roots), and 63.8% were located in basal cavity roots. All but one of the canopy roots were located during Winter. Of roots used by transmitted bats, 77.8% were used only during one season, 19.4% were used during two seasons, and 2.7% were used during all three seasons. Single-season roots had an average of 2.4 ± 0.3 primary connections to other roots, two-season roots had an average of 5.2 ± 2.3 connections to other roots, and the three-season root had 9 primary connections to other roots. An interconnectivity of roots used in Congaree National Park suggest that one large colony occupies the western section of the park, rather than several smaller colonies, and that certain trees may be more important to the colony.

Long-term survival patterns in South Carolina's top predator: the American alligator
Authors: Abigail J. Lawson and P.M. Wilkinson
PI/Advisor/Mentor: Dr. Patrick Jodice and Dr. Clint Moore

The American alligator (Alligator mississippiensis) is an iconic species of the southeastern U.S. of cultural and ecological importance. Alligators have consumptive and non-consumptive effects on prey communities, which promote cascading effects on ecosystem structure and function. Following a long history of unregulated harvest and poisoning, alligators were removed from the Endangered Species Act in 1986. In South Carolina (SC), alligator populations are now managed as a renewable natural resource under multiple programs, including private and public lands harvest, and nuisance alligator removal. However, knowledge of SC alligator demographic structure, vital rates, and population trends is acutely lacking. Here we present alligator survival estimates for all age classes ( hatchlings, juveniles, adults) derived from the longest-running crocodilian mark-recapture study in the world (1979-present), based in Georgetown, SC. We will further discuss potential variation in survivorship among age classes, including climate effects (precipitation, drought), harvest pressure, and their trends over time. These survival rates will be used to develop a population model that will be used to inform harvest decisions to maintain a viable alligator population, and maintain their role as a top predator in SC’s coastal ecosystems.

Food, Nutrition, and Packaging Sciences

The Difference of Reducing Sugars in 15 Cultivars of Jujube Fruits
Authors: Qin Yang, Linda Wang, Jian Fu, Weizhong Wang, and Feng Chen
PI/Advisor/Mentor: Dr. Feng Chen

Ziziphus jujuba Mill. belongs to the family Rhamnaceae, which is considered as a functional food due to its rich amounts of nutrients. It is rich in phenolic acids, flavonoids, anthocyanins, and amino acids. Sugars are the basic nutrients which are generated via photosynthesis in plants. In this paper, 1-phenyl-3-methyl-5-pyrazolyl (PMP) was used to derivatise the reducing sugars that include arabinose, galactose, glucose, mannose, rhamnose and xylose, and detected by HPLC. According to the result, the concentrations of these sugars among the 15 cultivars were significantly different. Rhamnose, arabinose and glucose were detected in all cultivars, of which the concentrations varied from 1.42 mg/100g FW to 5.48 mg/100g FW, 2.30 mg/100g FW to 16.76 mg/100g FW, and 1004.95 mg/100g to 85 mg/100g FW, respectively. Xylose and mannose were only detected in some cultivars, and galactose was detected in all cultivars except Z. jujuba cv. YL. Based on principle component analysis (PCA) and cluster analysis of sugar concentrations of jujubes, the 15 jujube cultivars can be classified into 6 clusters, for which the PCI and PC2 of PCA can explain 85.6% variance. Z. jujuba cv. YZ, LB, XZ, JB were clustered together, Z. jujuba cv. YL, LS, HP, ED, BJ belonged to the same cluster, Z. jujuba cv. DP and PJZ were in another cluster, Z. jujuba cv. NP and LZ were clustered together, Z. jujuba cv. PB and BZ were not in the same cluster but they were close to each other. All the other aforementioned clusters did not overlap, which means the studied jujube cultivars had significant differences based on sugars.

College of Science

Environmental Toxicology

Are Faulty Mitochondria Involved in Autism Spectrum Disorder?
Authors: Charles M. Mansfield, W. Tyler Boswell, Pei-Ching Lin, Charles Schwartz, William S. Baldwin
PI: William S. Baldwin

Autism spectrum disorders (ASD) represent a collection of neurodevelopmental disorders, with similar symptoms such as impaired social interactions, communication issues, and repetitive behaviors. Over the past decade, there has been a 10X rise in the prevalence of ASDs from 0.2% to 2% of the U.S. population of school age children. The Organization for Economic Co-operation and Development (OECD) lists ASD as one of the three diseases and industrial protocols for coating LFP and takes us many steps closer to the commercial deployment of LIBs in HEVs and EVs. Previously, we demonstrated two roll-to-roll-coating processes for coating AI foils withCNTs: (i) a CVD-based process for directly growing vertically aligned CNTs (VACNTs) on bare kitchen metal hydride battery. To enable cost-effective and long-life storage, EVs, and HEVs, the performance of present battery systems must be improved by at least four times without increasing the cost. LiFePO4 (LFP) emerged as a competitive cathode material for next-generation LIBs due to its remarkable stability and non-toxicity but they suffer from low electrical conductivity. While the addition of carbon improves the in-plane electrical conductivity, it fails to provide a conformal coating interface between the LFP/CNTs film and the current collector. This interfacial resistance at the current collector and active material interface (CCAMI) is critical for achieving high power density and rate capability but is often neglected. We addressed this issue by engineering the CCAMI with carbon nanotubes (CNTs). Previously, we demonstrated two roll-to-roll-coating processes for coating AI foils with CNTs: (i) a CVD-based process for directly growing vertically aligned CNTs (VACNTs) on bare kitchen grade AI foils, and (ii) a spray coating process for coating industrial-grade AI foils with randomly oriented CNTs. The above mentioned processes eliminate the need for a binder and thereby reduce both the dead weight of the inactive material and the CCAMI resistance. Specifically, we found that the CCAMI of CNTs-oriented CNTs-coated AI foils obtained via our roll-to-roll processes enhance the areal (gravimetric) capacity of LIBs by <65% (>50%) at low C-rates (<2C), and by <85% (>70%) at high C-rates (≥2C). Moreover, the improved CCAMI resulted in gravimetric energy densities up to 360 Wh/kg and power densities up to 200 W/kg with much higher power capability (increased charge capacity at high discharge rates). Thus, this study describes an attractive approach for improved CCAMI, which is scalable and compatible with existing industrial protocols for coating LFP and takes many steps closer to the commercial deployment of LIBs in HEVs and EVs.

Microbiology

A gut feeling: are probiotics good for you? A study from a worm's perspective
Authors: Miranda Kles, Yuqing Dong, and Min Cao

World health organization has declared that over 600 million adults are obese around the world. There is a dire need to develop new strategies to tackling the increasing obesity numbers because the current treatment regimes of healthier food choices and active lifestyle changes are not successful. We are exposed to growing number of chemicals, which are metabolized and cleared from our body by specific liver enzymes. “Cytochrome P450 (CYP)” and earlier studies in obese patients have shown significant changes in CYP genes. Consequently, we developed a mouse model that lacks certain CYP genes and compare their responses to mice that have all genes (wild type mice) to demonstrate if the absence of CYP genes could increase the progression of obesity. We also test these mice with a diet rich in 60% fat for 10 weeks to study the interactions between diet and the missing CYP genes. We evaluate physiological, metabolic and molecular level changes. Data from our research has shown that mice lacking CYP genes gain 13% more weight and were accumulating 50% more fat tissue compared to the wild type mice. Consequently, mice lacking CYP genes store more fat in liver that can perturb body’s ability to metabolize, utilize and distribute fat. Additionally, our results also indicate gender-based preferences in compensating for missing CYP gene-induced changes. Overall our data indicate that lack of certain CYP genes affect fat metabolism and induce obesity.

Baby Behavior: Explorations of Personality in Infant Common Marmosets (Callithrix jacchus)
Author: Brett Frye
PI/Advisor/Mentor: Dr. Lisa Rapaport

The ecological and evolutionary implications of animal personality have received much attention, but few studies have explored how personality develops. Even fewer have investigated the neonatal period, which often represents a critical window of behavioral development. Here we used the Primate Postnatal Neonatal Assessment Test (PPNAT) to study personality in 29 (13 males and 16 females) infants. This method employs a Likert-type scale to rate general state, quality of responses, and self-calming behaviors. We used the Wilcoxon exact signed rank test to compare behavioral measurements between days 15 and 30 of age and linear regressions to examine relationships between morphology and behavior. We found that infants exhibited consistent behavioral traits, with some traits showing greater temporal stability than others. Physical measurements, however, did not predict behavioral traits. Our results suggest that simple behavioral patterns, such as early behavioral profiles in captive marmosets. This project therefore serves as a preliminary step in understanding the development of personality across the life course.

Chemistry

Engineered Current Collector Interface for High Energy Density Li-Ion Batteries
Author: Lakshman Venkappagoda
PI/Advisor/Mentor: Dr. Ramakrishna Podila and Dr. Apparao M. Rao

Li-ion rechargeable batteries (LIBs) are the most promising candidates for use in electric and hybrid electric vehicles (EVs and HEVs) due to their high operating voltage and superior energy density compared to other conventional batteries such as the Ni-metal hydride battery. To enable cost-effective and long-life storage, EVs, and HEVs, the performance of present battery systems must be improved by at least four times without increasing the cost. LiFePO4 (LFP) emerged as a competitive cathode material for next-generation LIBs due to its remarkable stability and non-toxicity but they suffer from low electrical conductivity. While the addition of carbon improves the in-plane electrical conductivity, it fails to provide a conformal coating interface between the LFP/CNTs film and the current collector. This interfacial resistance at the current collector and active material interface (CCAMI) is critical for achieving high power density and rate capability but is often neglected. We addressed this issue by engineering the CCAMI with carbon nanotubes (CNTs). Previously, we demonstrated two roll-to-roll-coating processes for coating AI foils with CNTs: (i) a CVD-based process for directly growing vertically aligned CNTs (VACNTs) on bare kitchen grade AI foils, and (ii) a spray coating process for coating industrial-grade AI foils with randomly oriented CNTs. The above mentioned processes eliminate the need for a binder and thereby reduce both the dead weight of the inactive material and the CCAMI resistance. Specifically, we found that the CCAMI of CNTs-oriented CNTs-coated AI foils obtained via our roll-to-roll processes enhance the areal (gravimetric) capacity of LIBs by <65% (>50%) at low C-rates (<2C), and by <85% (>70%) at high C-rates (≥2C). Moreover, the improved CCAMI resulted in gravimetric energy densities up to 360 Wh/kg and power densities up to 200 W/kg with much higher power capability (increased charge capacity at high discharge rates). Thus, this study describes an attractive approach for improved CCAMI, which is scalable and compatible with existing industrial protocols for coating LFP and takes many steps closer to the commercial deployment of LIBs in HEVs and EVs.
Probiotic supplementation and diet effects on the microbiome are topics of interest in current research. Little is known about the effects of shifts in the microbiome on human health, however, the human microbiome project has shed light into the suspicion that many different factors could result in a shift in the bacterial presence in the gut. This shift could also be beneficial or detrimental to the host, depending on which bacteria are present. In this project, we surveyed 7 suspected probiotic strains and the ability of these strains to reverse the detrimental effects of a high glucose diet, often experienced in the Western society. These strains include Lactobacillus plantarum, Lactobacillus fermentum, Lactobacillus delbrueckii, Lactobacillus acidophilus, Lactobacillus rhamnosus, Bacillus subtilis, and Bacillus coagulans were fed to Caenorhabditis elegans with and without glucose to determine: 1) the bacteria’s ability to alleviate the decrease in lifespan experienced from a 2% glucose diet and 2) the bacteria’s ability to establish in the gut of C. elegans. Consistent with previous research, 2% glucose supplementation into the worm diet significantly decreases lifespan. Each probiotic when supplemented without glucose have the propensity to increase the worm lifespan. When supplemented together, some probiotic strains alleviate the effects of lifespan reduction induced by a high glucose diet. Interestingly, L. plantarum significantly worsen the detrimental effects of the glucose-induced phenotype. Future directions include identifying the mechanism L. plantarum further shortens lifespan of C. elegans when supplemented with glucose. Because of the 50% homology between C. elegans and humans in pathways that would be influenced by this system, it is our hope to better understand host-probiotic interaction.

College of Education

Educational Leadership

Reflections of Identity Development as a Student Leader: A Look into the African American woman student leader and identity development at PWIs

Author: Courtney Allen

The identity development of African American women is critical, but there isn’t much literature or research on this topic. My research interest for my dissertation is how the identity development of traditional aged African American women influences their student engagement experience while attending PWIs. The gap in the literature and research, about the identity development of African American college women is a failure the population and to higher education. It’s important to provide the support needed for all students, but there is vital call to help enhance the college experience of African American women in academia.

My poster will connect the following: (a) Traditional aged undergraduate students, (b) African American women, (c) understanding the identity development needed for African American women to be successful at PWIs. My theoretical foundation for my topic will be Chiong’s Student Development Theory, Black Feminist Thought and Erikson’s Identity Development Theory. The poster will provide prior literature on this particular student population, methodology, and future research implications for student affairs professionals. My poster will also explore the support networks needed for this population of students.

Changing the Game: Experiences of Student-Athletes as Campus Leaders on a Historically Black College and University Campus

Author: Ari L. Hall

The fabric of historically Black colleges and universities (HBCUs) is its rich history and the contributions by its students, faculty, staff, and its surrounding community. In my study, I use the historically Black college and university, which is a unique institutional context, to understand the phenomenon student-athletes’ leadership experiences. Institutional culture and environment influences student engagement (Astin, 1999), however, research pertaining to the engagement of student-athletes within the HBCU environment is seldom. The irreplaceable culture of these institutions within higher education offers an inviting opportunity to encapsulate student experiences within this unique institutional culture. I conceptualize and frame this study using two theories, student involvement theory (Astin, 1999) and organizational culture theory (Tiemeyer, 1988). The purpose of this study is two-fold: (1) to understand the experiences of college student-athletes who are involved in NCA, Division I sports and campus student leadership, and (2) to use the HBCU as an instrument to display the cultural impact it has on these student-athletes. Utilizing Astin’s (1999) student involvement theory in conjunction with the distinctive, nurturing environment of the HBCU culture I will continue to explore the student-athlete experience and the HBCU’s culture’s impact on these experiences. I will use interpretative phenomenological analysis to draw upon the common experiences of student-athletes within a HBCU campus environment. This research gives insight into the complex student-athlete identity and their experiences in the HBCU environment. Exploration of this topic will give current and future researchers and administrators a more in-depth understanding of how to cultivate the experience for college athletes as student-athletes and campus leaders. Specifically, highlighting the student-athlete (leadership) experience within the historically Black college and university offers innovative insight into two minimal research areas within higher education.

Industrial Organizational Psychology

Empathy as a Moderator of Sexual Violence Perpetration Risk Factors among College Males

Authors: Matthew D. Hudson-Fligler*, Holly M. Grover, Merita H. Meşe, and Athena K. Ramos

Objective: This study examined if empathy was a significant moderator of several empirically established risk factors for sexual violence perpetration among college males.

Participants: Data are from 544 college males who participated in a longitudinal study from 2008 to 2011 at a large, public university.

Methods: Participants completed a self-report survey in March or April of their first through fourth years in college. A series of generalized linear models were conducted using sexual violence risk factors and empathy during the sophomore year as predictors of sexual violence perpetration frequency during junior year.

Results: Empathy was found to be a significant moderator of six out of the ten sexual violence risk factors tested, such that high levels of empathy were associated with lower sexual violence perpetration rates among high-risk males.

Conclusions: Empathy should be integrated into college sexual violence prevention and intervention efforts.
Employee turnover is of particular concern to organizations. In the present study we examine multiple dimensions of job resources (role, manager, and team) as predictors of objective turnover. The study participants were employees from a large medical device company. An online survey was emailed to employees from a third-party source. Turnover was assessed by company documentation of employees who voluntarily quit. After a factor analysis supported the three proposed resource domains representing unique factors, we found that role, manager, and team resources were negatively related with turnover. Each of the dimensions were positively correlated with one another. We conducted a series of logistic regressions and found that all three resource domains were associated with a lower likelihood of turnover, after controlling for gender and tenure. A final logistic regression was conducted, but only job resources remained a significant predictor of voluntary turnover. Results show that employees who perceive high availability of resources for their role, manager, and team, were less likely to leave the organization, however certain resources may have a greater impact on turnover than others. These findings should encourage organizations to make efforts to ensure that resources are readily available and clearly recognizable in order to reduce turnover.

**Psychology**

**The Moderating Effects of Savoring Positive Life Experiences on the Relationship Between Combat Exposure and Mental Health Symptoms**

Authors: Anton Sytine, Dr. Thomas W. Britt, Dr. Cynthia Pury, and Dr. Patrick Rosopa

Research has shown that varying latency occurs in head-tracked head mounted displays (HMD) and can create simulator sickness. While research has studied history of sickness and sickness in HMDs, the relationship between the two has not been examined thoroughly. This is important because virtual environments are becoming more common and questionnaires are used to gauge whether or not a user will get sick. We hypothesized that those with a history of motion sickness would report more simulator sickness when experiencing varying latency in an HMD. Subjects were drawn from three studies in which they were exposed to varying latency in an HMD. Subjects completed the Motion Sickness History questionnaire (MSHQ) before the task and the Simulator Sickness Questionnaire (SSQ) after each trial during the HMD task. Median MSHQ score was used to define a “high history of motion sickness” group and a “low history of motion sickness” group for analysis. There was no significant difference in volume of growth between the two groups. Subjects were randomly assigned to varying latency or constant latency conditions. The most important findings will focus on what type of media framing is most effective in communicating HPV vaccine to the public.

**Health Care Genetics**

**Utilizing infant growth to predict the incidence of obesity in early childhood**

Authors: JuliSu DiMuccio-Ward

Purpose: To report differences in the body mass index (BMI) trajectories of early life growth patterns that predict normal, overweight, obese, and morbidly obese young children. Summary: The Health Sciences North Carolina (HSSC) Clinical Data Warehouse (CDW) will be used to conduct a retrospective longitudinal analysis looking at patterns of growth from birth to 5 years of age to identify markers of an abnormal weight pattern predicting obesity. This study will identify a clinically important pattern which could be addressed by primary care clinicians.

Background: In the past 20 years there has been a dramatic rise in obesity among infants as well as the general pediatric population (Kim et al., 2006; Ogden et al., 2014). Previous research and the studies in our review have clearly shown that accelerated weight gain in the first 6 months of life predicts later obesity. It is concerning that even as young as 3 years, obese children have elevated inflammatory markers for cardiac disease and high blood pressure (Bellfelt, Rifas-Shiman, Rich-Edwards, Kleinman, & Gillman, 2007; Rocha-Goldberg et al., 2010; Singh et al., 2008). We must be able to identify the incidence of obesity more accurately. Research had shown that upward crossing of 2 or more weight percentile centiles in the first 6 months of life is associated with obesity at 5 and 30 years of age (Bottom et al., 2008; Taveras et al., 2011). Growth is a continuous process from birth to adulthood and the quality of growth is greatly impacted by a child’s nutritional intake. Growth is routinely measured at pediatric well visits and can be used to determine whether performance differences are due to varying latency or an underlying causal influence such as simulator sickness. It is possible that the performance task lessened subjects’ experience of sickness, and more research is needed to explore whether a performance task can mitigate sickness.
A Gesture Is Worth a Thousand Touches: Mapping Gestural Inputs to Traditional Touchscreen Interface Designs Authors: Katherina Juriewicz and Dr. David M. Neyens PI/Advisor/Mentor: Dr. David M. Neyens

Gestures are a natural means of everyday human-human communication, and with the introduction of gestural input technology, there is an opportunity to investigate the application of gestures as a means of communicating with computers and other devices. The primary benefit of gestural input technology is that it facilitates a touchless interaction, so the ideal market demand for this technology is an environment where touch needs to be minimized. The perfect example of such an environment that discourages touch is sterile environments, such as operating rooms. Healthcare-associated infections are a great burden to the healthcare system, and gestural input technology can decrease the number of surfaces, computers, and other devices that a healthcare provider comes in contact with. Gestural input technology has been investigated extensively in the operating room for surgeons manipulating radiological images but an application for anesthesia providers has not been investigated. The objective of this research was to map 3D gestural inputs to traditional touchscreen interface designs within the context of anesthesiaology, and an experimental study was conducted to elicit intuitive gestures from users and assess the cognitive complexity of ten typical functions of anesthesia providers. Intuitive gestures were observed in six out of the ten functions without any cognitive complexity concerns. Two functions, the remaining four, demonstrated a higher level gesture mapping with no cognitive complexity concerns. Overall, gestural input technology demonstrated promise for the ten typical functions of anesthesia providers in the operating room, and future research will continue investigating the application of gestural input technology for anesthesiaology in the operating room.

How to increase immunization coverage: A case study in Bangladesh Authors: Zabra Azadi PI/Advisor/Mentor: Dr. Sandra Eksioglu

Vaccination has helped to completely eradicate or significantly reduce the spread of a number of infectious diseases in the last century. Adequate evidence indicates low vaccination coverage in developing countries due to vaccine stock-out, and simultaneously, high vaccine wastage. Wastage incurs when doses are discarded from open vials after their safe use time. These facts suggest that there is a need for inventory replenishment and vaccine utilization plans to minimize costs and wastage while achieving greater coverage level. Organizations managing immunization programs in developing countries typically make vaccination replenishment decisions at the national level, for a single vial size. Vaccines are then distributed to clinics based on information about patient arrivals. We solve the model using an extension of the stochastic Benders decomposition algorithm (L-shaped method). Experimental results on instances built using data from Bangladesh indicate that using a mix of vials of different sizes results in reductions of vaccine wastage as compared to the current practice of using vials of a single size. Experimental results also point to simple and economic vaccine administration policies usable by health care administrators to minimize vaccine wastage. Computational results reveal that our solution approach outperforms the standard L-shaped method.

Mechanical Engineering

Studying the Effects of Heparin Coated Magnetic Nanoparticles on the Formation of Neointimal Hyperplasia Authors: Faraz Ashraf, Nicholas Haydon, and Dr. Randy Hutchison PI/Advisor/Mentor: Dr. Ardaan Vahidi

Deriving an explicit mathematical equation to predict muscle power (force) generation capacity during a fixed effort. The application of this work will be optimal control of an electric bicycle. From a personal experience, I did not find current electric bicycles in the market as practical as one expects. You don’t know when the electric motor will come to your assistance and when it comes, a part of the resistance that the rider should overcome will decrease suddenly by which rider can harm his knees. In order to prevent this problem, electric motor should be optimally controlled with respect to rider’s ability to generate power (force). We are trying to develop a predictive model which is able to predict biker’s maximum power generation capacity during cycling. We have promising power prediction results from performing multiple tests on different subjects. We can use this constraint to control the motor, so rider will have a much more comfortable experience.
devices introduce new complications such as, restenosis. Two of the main causes of restenosis are neointimal hyperplasia and thrombosis. Neointimal hyperplasia is mainly caused by the proliferation of vascular smooth muscle cells (VSMCs) when they come in contact with blood after an injury to the endothelial layer. The risks associated with systemic delivery of antiproliferation drugs call for the use of targeted local drug delivery. Heparin is a naturally occurring anti-coagulation glycosaminoglycan, which also decreases VSMC proliferation. Therefore, we have designed a heparin-coated magnetic nanoparticle that can deliver localized anti-coagulation and anti-proliferative effects using a magnetic stent. We have studied some of the effects of these particles on the phenotype of vascular cells, in addition to their toxicity and uptake.

PRESENTATIONS POWERED BY PECHAKUCHA

Guest Speakers:
Clinton Colmenares, Director of Research Communications
Todd Anderson, Assistant Professor of Art

Graduate Student Presenters:
Engage First, Plan Together
Presenter: Shakira Hobbs

The goal of this research is to demonstrate how waste to energy solutions can be utilized in developing communities, and specifically rural areas. The research for this study was conducted in Sittee River, which is a small rural community in Belize. In order to address our specific research questions, we first needed to understand the role of various factors - environmental, social, and legal – on a community’s decision to adopt and maintain sustainable energy solutions. Last summer, we spent two weeks in Sittee River collecting data related to these factors. We first met with the village council to get their approval for the project. We then completed a census of the community and conducted a waste audit with several households and businesses to determine the type and amount of organic waste produced by the community. We used the EPA’s waste reduction model to calculate the amount of greenhouse gases produced by the current and proposed waste management (WM) solutions based on the data collected from the waste audit. We conducted interviews to learn about the communities’ views on sustainability and their current WM practices. Based on these interviews we learned that the community was open to sustainable WM solutions and could benefit from education on the harmful effects of burning and burying trash. Because community engagement is important to us, we also spent time with members of the community by playing basketball, visiting the local school, and taking part in various community events.

What’s in Our Waters: A stream health and conservation outreach project
Presenter: Lauren Garcia Chance

The What’s in Our Waters (WOW) program was designed by graduate students from the Biology and Environmental Toxicology programs at Clemson University (CU) in June 2013. The goals of the program are to introduce high school students to monitoring and reporting on the conditions of local streams thus teaching students the importance of responsible citizen science, conducting water quality research using the scientific method, and the relevance of science communication with the public. WOW has established a successfully running model with the AP Environmental Science class of a local high school in Central, SC and grown from there. Students learn about water quality indices, sample and analyze data from a local stream, and report findings at a local symposium. The programs’ success and the collected data are useful for both educators working to evolve environmental education and as well as researchers working to increase interest in citizen science. The structure of this program brings attention to South Carolina’s water resources and alters students’ perceptions of science and scientists.

Love gives and forgives.
Presenter: Lakshman Ventrapragada

An eye-for-eye will leave the whole world blind. If we think the whole world is our family, our Love will become unconditional towards fellow beings. It is the role of Education to plant these seeds of Love in the hearts of our youngsters. Well-rounded Education shapes not only the minds but also the hearts of individuals. Today you will see the effect of these beautiful hearts and minds transformed by that Education when their Love is expressed as Service.

Clemson Action Research Collective (ARC),

Clemson Action Research Collective (ARC) is a partnership with the Clemson University Graduate School and Dr. Robin Phelps-Ward, Assistant Professor of Higher Education and Student Affairs. ARC centers the knowledge, creativity, and expertise of student leaders and scholars to produce information needed to advance support and success for underrepresented students at Clemson University. Foremost, ARC aims to expand professional development opportunities for underrepresented students and demystify the graduate school pipeline. ARC focuses on the ways in which we can assist underrepresented students within our communities to persist to graduate school. In this presentation, members of ARC will give an overview of our research project, which problematizes the graduate school access barriers experienced by underrepresented students. We discuss how we use our research to reduce precipitating barriers, in hopes of increasing access to graduate education for underrepresented students.

Sculpture Studio Work & Process
Presenter: Kimberly Day

I’m sharing the development of my sculpture work as I approach a thesis, my material process, contextual subtexts, and influencers.

The Invisible You
Presenter: Dalia Delanuez

I’m interested in the relationship between the visible reality orchestrated by the phenomena of the senses and the invisible reality within our body affected by the senses.” Through art I’m constructing the attributes of the invisible instead of building them literally. In this Grad symposium 2017, I am using the social sense, the taste, to elaborate a community performance firing up some mirror neurons.

Performers:
Khushi Patel: Performing Kathak, an Indian classical dance form
Charity Shaw: Singing “Rise-Up” by Andra Day