Graduate Research And Discovery Symposium (GRADS) 2018

Organized by Research Initiatives, Clemson Graduate Student Government

List of Abstracts

A Pseudo-likelihood for Correlated Extreme Series

Liu Zhu, Xin Liu, and Robert Lund
Department of Mathematical Sciences, Clemson University

This paper develops a pseudo-likelihood for sequences of extremes when observations are dependent in time. The pseudo-likelihood allows researchers to obtain more realistic standard errors of the generalized extreme value parameters. As a motivating example, annual minimum temperatures are examined from the Faraday/Vernadsky research station in Antarctica. Here, the year-to-year correlation in the series is about 0:4. Our pseudo-likelihood allows the series to have temporal correlation, but also has generalized extreme value marginal distributions at each time. An analysis of the Faraday/Vernadsky annual minimum temperatures is conducted. While the standard error of the estimated trend increases when dependence is taken into account, it does not change the correlation-ignored inference that annual minimum temperatures at the station are increasing.

Floating Treatment Wetlands as a Remediation and Production Tool for Growers

Lauren Garcia Chance, and Sarah A. White
Department of Plant and Environmental Sciences, Clemson University

Greenhouse and nursery effluent often contains elevated levels of nitrogen and phosphorus which can limit potential for recycling water on site for production or cause problems in the environment. Floating treatment wetlands (FTWs) are comprised of a buoyant mat planted with macrophytes that absorb and filter the excess nutrients. A mesocosm study was conducted in the summer of 2016 to (1) determine efficacy of common landscape plants to remediate nutrients from water and (2) assess plant viability for container or bare root resale at harvest. An experimental system was assembled using 32 100-gallon Rubbermaid water troughs. Four troughs were treated as an open water control while the remaining 28 troughs were planted with either a monoculture or mixture of five plant species; Iris ensata (Japanese iris), Canna x generalis 'Firebird' (Firebird canna), Agrostis gigantean (redtop), Carex stricta (Tussock sedge), and Panicum hemitomon (Maidencane). Plants were grown for eight weeks, then three plants from each monoculture were removed and transplanted into 11.4 L plastic pots and an additional three plants were direct planted on a pond's edge to assess survival and aesthetics. While C. 'Firebird' and A. alba removed greater than 50% of nitrate from the system, maximum phosphorus removal was 28% and 12% with P. virgatum and C. 'Firebird', respectively. Plants transplanted into pots outperformed those planted using wetland restoration techniques. Based upon results, C. 'Firebird', P. virgatum and A. alba are viable options for use in FTWs to remediate nutrients followed by harvest and resale as a container crop.

Harnessing quasi-zero stiffness of fluidic origami for low frequency vibration isolation

Sahand Sadeghi, and Suyi Li
Department of Mechanical Engineering, Clemson University

This research investigates a quasi-zero stiffness (QZS) property from the pressurized fluidic origami cellular solid, and examines how this QZS property can be harnessed for low- frequency base excitation isolation. The QZS property originates from the nonlinear geometric relations between folding and internal volume change, and it is directly correlated to the design parameters of the constituent Miura-Ori sheets. Two different structures are studied to obtain a design guideline for achieving QZS: one is identical stacked Miura-Ori sheets (ismo) and the other is non-identical stacked Miura-Ori sheets (nismo). Further dynamic analyses based on numerical simulation and harmonic balance method, indicate that the QZS from pressurized fluidic origami can achieve effective base excitation isolation at low frequencies. Results of this study can become the foundation of origami-inspired metamaterials and metastructures with embedded dynamic functionalities.

Synthesis of Δ3-1,2-diazetine derivatives using 4-phenyl-1,2,4-triazoline-3,5-dione (PTAD) and electron rich acetylenes

Chandima J. Narangoda, Madelyn A. Moore, Colin D. McMillen, and Daniel C. Whitehead
Department of Chemistry, Clemson University

Δ3-1,2-Diazetines are a relatively rare and interesting class of heterocycles. These molecules, containing a relatively strained four-membered ring comprised of a carbon-carbon double bond and two adjacent nitrogen atoms, have earned some interest historically because they formally follow the 4n+2 Huckel rule of aromaticity. Studies on the chemical, biological properties and reactivity of Δ3-1,2-diazetines have been stymied by a lack of simple methods for their preparation. Previous methods to

synthesize Δ3-1,2-diazetine derivatives have failed to achieve higher yields and broad substrate scopes. However, we have successfully synthesized several derivatives of Δ3-1,2-diazetines by achieving the cycloaddition of alkyl acetylene sulfides and 4-phenyl-1,2,4-triazoline-3,5-dione (PTAD) in good yield. This presentation will mainly describe the optimization of this new cycloaddition as well as the investigation of the substrate scope.

Engineered Current Collector Interface for High Energy Density Li-Ion Batteries

Lakshman K. Ventrapragada, Apparao M. Rao, and Ramakrishna Podila
Clemson Nanomaterials Institute, Clemson University

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-lasting EVs, DoE estimates that 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 conducting interface between the LFP/C/binder 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 binder-free processes for coating Al foils with CNTS: (i) a CVD-based process for directly growing vertically aligned CNTs (VACNTs) on bare kitchen-grade Al foils [1], and (ii) a spray-coating process for coating industrial-grade Al foils with randomly oriented CNTs [2]. 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 VACNTs- or randomly oriented CNTs-coated Al foils obtained via our roll-to- roll processes enhance the areal (/gravimetric) capacity of LFP by >65% (/>50%) at low C-rates (>2 C), and by >85% (>70%) at high C-rates (>2 C). 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 us many steps closer to the commercial deployment of LIBs in HEVs and EVs.

Medical University of South Carolina Ambulatory Surgery Center and Medical Office Building

Shahrooz Beheshti
Clemson University, Department of Architecture, Art, and Humanities

The new facility for The Medical University of South Carolina aims to improve the quality of patient care through optimization of the built environment. The primary requirement is to provide a comprehensive design for ASC (Ambulatory Surgery Center) and MOB (Medical Office Building) Buildings. The program provided by the client includes Surgery Suits, Pre-Operative and Post-Operative rooms, Imaging, Orthopedics and General Examinam rooms, PT/OT Gym, Retail Shops and Restaurant/Cafe. The project site is located in West Ashley, Charleston. One of the primary objectives of this scheme was to create an efficient connection between Operative Rooms and Pre-Operative/Post-Operative rooms to reduce walking distance for Surgeons, Anesthesiologists, and medical staff. This connection is commonly in a long horizontal format, but in MUSC new facility, this distance is significantly reduced by creating a short vertical connection using a core of 4 elevators. Furthermore, a centralized layout for surgery suits brings further efficiency and make effective relationships between different spaces. All Pre-Op, Post-Op, and Flex Rooms are located in the same area to respond to different patient loads during morning, mid-day and afternoon. Primary site plan organizational strategy was based on separating ASC, MOB, and Community building to maximize access to view and daylight along with taking advantage of passive ventilation. Also, the surface Parking system geometry is based on a circular organization that allows equal and fast access to buildings and parking since Charleston has a severe hot and humid climate.

Roles of Weak Ties: Influences from Peers' Parents

Bobby W. Chung
Clemson University, John E. Walker Department of Economics

Both close friends (strong ties) and distant neighbors (weak ties) play a role in the diffusion of influences. This paper examines how parents influence college attainment of the friends of their children. Peer effects account for at most 50 % of the spillover from peers' parents with college degree. Upon controlling for peer effects and addressing selection bias, an interesting pattern emerges: college attainment of students are only affected by peers' parents of same-gender. Peers' parents being the informational role models and unobserved peer effects are two plausible explanations behind the gender-specific pattern. Policy-wise, the evidence here sheds light on the importance of neighborhood in shaping children developments.

Comparison of Passive and Active Acoustic Sampling in a bat community in south-central South Carolina

Katherine D. Teets, S. Loeb, and D. Jachowski
Clemson University, Department of Forestry and Environmental Conservation

Acoustic monitoring techniques have become more heavily relied on in bat population monitoring studies over the past two decades. There are two broad categories of acoustic monitoring in use today: active and passive. While both methods have advantages, a direct comparison between the two methods has not been conducted in the southeastern United States. Our objective was to compare passive and active acoustic sampling designs. We hypothesized that (1) average number of calls collected by each method would be significantly different and (2) method, amount of clutter at a point, precipitation (mm), temperature (°F), and basal area (m^2/ha) would have an effect on detection probabilities of bats. In summer 2017 we used Anabat Express detectors to record bat calls both actively (20 minutes) and passively (20 minutes and all night) at the Savannah River Site. We collected 108 files using active sampling and 18 calls were collected through simultaneous passive sampling during the same 20-min time period. We collected 1463 passively when detectors were active the entire night. Calls were grouped into five species groups according to call frequencies. Using the Kruskal-Wallis test we found that the average number of calls per 20 minutes was significantly higher for passive sampling all night than for active sampling for each species group. Using multi-covariate detection models, we found that the method model was the top predictive model for almost all species groups, with results indicating that we were more likely to detect each species group when using passive sampling all night and less likely to detect bats when using active sampling or sampling passively for 20 minutes. The global model was the top model for red bats, which is a generalist species. We conclude that passively sampling throughout the night is the best method to use when surveying for most bat species.

When Consumer Type Matters: Price Effects of the United-Continental Merger in the Airline Industry

Haobin Fan
Clemson University, Department of Economics

Studies of airline mergers have largely focused on measuring the impact of mergers on average airfares. As a result, they may not sufficiently reveal the full range of price effects given the complexity of this industry. To address such industry intricacy, I investigate the distributions of prices of merging firms and their rivals in response to the United-Continental merger on routes primarily consisting of price-sensitive leisure travelers (leisure routes) and on routes more likely to have both price-insensitive business passengers and leisure consumers (big-city routes). Results show the merging firms increase fares for business travelers but not for leisure passengers on big-city routes, and reduce prices for leisure travelers on leisure routes, while their legacy rivals increase fares on leisure routes but not on big-city routes. This finding suggests that a critical reason for the inconsistent conclusions in previous research may be the failure to consider the details of the airline industry, such as market types, consumer groups, and firm types.

Are there any benefits to being "Woke"?: Links between critical consciousness and positive youth development

Katrina L. Black, and Edmond Bowers
College of Behavioral, Social and Health Sciences, Clemson University

The Five Cs model of positive youth development (PYD, Lerner et al., 2015) posits that youth who thrive in adolescence are more likely to also contribute to self, family, community or civil society. However, much of the research on this model is derived from a sample of limited racial and ethnic variability (Bowers et al., 2014). For youth of color, the processes predictive of PYD and the motivation for contribution may be different. For example, it has been suggested that critical consciousness (CC), the abilities and skills of marginalized people to reflect critically on social and political conditions and take action to address perceived inequities (Diemer et al., 2014), may influence levels of contribution and civic involvement in youth of color (Hershberg et al., 2015). Few studies have examined the relations between CC and PYD and contribution. Therefore, in the present study, we investigate the links among these variables in a sample of African-American/Black and Caucasian/White youth. Data was derived from a sample of 706 youth (57.2% female) from schools and afterschool programs in a southeastern state who identified as African-American or White. Findings indicated that race moderated the relation between CC and PYD ($b = 0.789$, $p = .019$). The results suggest that being critically conscious predicted less favorable outcomes in youth, and in particular, white youth. These results underscore the importance of considering how critical reflection on perceived inequality might be interpreted by diverse youth and affect their development from a holistic perspective.

Geographic variation of fence lizard nesting behavior and embryo physiology: implications for persistence under climate change

Michael A. Carlo, Benjamin J. Camper, Loquatia A. Cuttino, Madison M. Feiste, and Michael W. Sears
Department of Biological Sciences, Clemson University

Despite the prevalence of phenotypic variations in nature, we lack the understanding to explain why certain patterns arise along environmental gradients. For species with complex life cycles, adaptive responses to the local environment may be necessary throughout development since different life stages often occupy different microhabitats. In particular, immobile stages are sensitive to changing conditions due to behavioral limitations and the small range of conditions experienced over small spatial extents (e.g., an egg). Therefore, plasticity in maternal behavior and in the physiology of immobile life stages may be key factors underlying phenotypic variation in some widespread species. To investigate how nesting behavior and embryo physiology may drive phenotypic variation across the range of a widespread ectotherm, we examined responses of Eastern fence lizards in mobile and immobile life stages to variation in the thermal environment along a latitudinal cline. First, we compared nesting behavior at southern (South Carolina) and northern (New Jersey) latitudes. We found that northern females nest in open areas at forest edges while southern females nest at shadier sites in the forest understory, resulting in a counterintuitive pattern in which embryos at hotter southern latitudes experience cooler temperatures than their northern conspecifics. We then performed a reciprocal transplant experiment, rearing embryos from northern and southern locations in the laboratory under treatments simulating nest temperatures at those sites. Our results show how nesting behavior and embryo physiology contribute to patterns of phenotypic variation across geography and implications for the persistence of the species under climate change.

Virtues as Guides to Maximizing Well-Being: A Theoretical and Empirical Exploration

Natalie Vanelli[1], Cynthia L. S. Pury[1], Charles B. Starkey[1], Shawn Saylors[2], Angela Cataldo[1], Kathleen R. Gonzalez[1], Emily R. Nichols[1], and Mary Margaret P. Green[1]
[1]Department of Psychology, Clemson University, [2]Department of Psychology, Springfield College

Multiple pathways to well-being and the life well-lived have been suggested by scholars, including momentary pleasures, security, positive outlook, autonomy, engaging activity, skilled and meaningful work, and relationships and other social interest (e.g., Adler, 2012; Haybron, 2013; Seligman, 2011). As a limited being, it is impossible for a person to pursue all paths all of the time: choices must sometimes be made. We propose that specific virtues (and specific vices) arise when individuals chose one pathway to happiness over another. This poster describes ongoing work in our lab to develop and test the theory that virtues describe the tradeoffs made by individuals. We developed a scale to measure the relative importance of each of Haybron's (2013) pathways to happiness (Security, Outlook, Autonomy, Relationships, Skilled and Meaningful Activity, and Nature). We based our items on Joseph and Diduca's (2007) Dimensions of Religiosity Scale, which measures preoccupation, guidance, conviction, and emotional involvement. Concurrently, we developed scenarios in which the actor trades one pathway for another. Participants will be asked to rate the virtuousness of each action. In our next study, we will give both the scale and scenarios to college and community samples. If our theory of virtue as a way to maximize happiness is correct, the extent to which a tradeoff is rated as virtuous should be predicted by the relative difference in importance of those pathways to the participant.

Isotopic shift measurement of Na-like Xe ions as a new method to measure relative charge radii of rare isotopes

Roshani Silwal[1], Endre Takacs[1], Joan M. Dreiling[1], Dipti[2], Yuri Ralchenko[2], Alain Lapierre[2], Antonio C.C. Villari[3], Gerald Gwinner[4], Steven A. Blundell[5], John D. Gillaspy[6], and Alexander Borovik Jr.[7]
[1]Dept. of Physics and Astronomy, Clemson University, USA, [2]National Institute of Standards and Technology, USA, [3]Michigan State University, USA, [4]University of Manitoba, Canada, [5]CEA-INAC, France, [6]National Science Foundation, USA, [7]University of Giessen, Germany

The atomic properties of the quasi-hydrogenic Na-like system can be calculated to high precision using ab-initio methods. For instance, assuming a known charge distribution, the absolute transition energies of the D lines of Na-like ions can be theoretically calculated to an accuracy of about 100 ppm [1]. The strong overlap between the 3s valence electron and the nucleus makes Na-like transition energies sensitive to nuclear size effects. In particular, the Na-like 3s-3p D1 transition offer a large calculable field-shift, making these spectral lines potentially useful for extracting information on the nuclear charge radius, a key nuclear physics parameter. In heavy elements, especially in rare (radioactive) isotopes, the values of the absolute nuclear charge radii in the literature have large uncertainties due to limitations of the available experimental techniques. As a proof-of-principle, we have measured the energy shift associated with the D1 3s-3p_{1/2} transition for Na-like Xe-124 and Xe-136. The relative shift in charge radius of these isotopes is inferred by comparing experimental and theoretical energy shifts from high-precision calculations. The expected field shift is approximately 11 ppm of the transition energy, and the shift in the line positions can be determined to the similar level of experimental accuracy. Details of the experiment and theoretical calculations will be presented, and the potential of the technique for the determination of nuclear radii will be discussed.

Asset-based School Leadership

Keneisha Harrington
Department of Educational Leadership, Clemson University

For the past thirty years Asset-Based Community Development (ABCD) has been acknowledged as a method of community development that can assist in redistributing power amongst disenfranchised communities (Kretzmann & McKnight, 1996). Well implemented ABCD can lead to empowerment and ultimately sustainability in the development of communities. Transformative leadership, a theory of leadership centered on liberation, emancipation, justice and equity (Shields, 2010) is becoming increasingly popular in the context of education reform. Its delineation from the standard transactional and transformational forms of leadership make it an attractive option for school leaders who work in underserved communities and who are interested social justice outcomes. In this conceptual paper, I seek to adapt the ABCD method of community development to the Transformative Leadership framework in efforts to create a model of school leadership that acknowledges and addresses the unique plight of African-Americans in the United States. Through a review of selected literature in the community development and educational leadership fields, I make the case for a new model of transformative leadership: Asset-Based School Leadership.

The Benefits of the General Engineering Learning Community: A Look at Enhanced Academic Performance of Under-Prepared First-Year Engineering Students

Abigail Stephan
Learning Sciences, Clemson University

The current interest in STEM fields is influencing significantly more students to pursue a degree in engineering than in the past. Some of these traditional first-year engineering students do not possess the prerequisite skills in mathematics to perform adequately in collegiate courses, causing lower passing rates in introductory calculus, engineering, and science courses. This in turn leads to increased numbers of students on academic probation, loss of scholarships, and decreased retention rates among the students pursuing a bachelor's degree in engineering without a mastery of essential skills in mathematics upon entry to the university. In an effort to combat this trend, programs have developed in institutions across the nation to provide additional support for these students to succeed as both students and as professionals. The present study describes the effects of the optional General Engineering Learning Community (GELC), which was designed to provide academic and self-regulatory support for first-year engineering students entering without adequate skills in mathematics through transparency of course support programs, a study skills course, and weekly collaborative sessions within a community led by a peer coach. In this study, the academic performance of students that are members of GELC is compared to that of students that were eligible but chose not to join the program, with academic performance being measured through scores on the first introductory math exam. The results provide statistically significant evidence that participation in this program bolsters academic achievement in first-year engineering students.

Our surface plasmon coupled-ELISA with enhanced sensitivity will help realize point-of-care applications for sustainable future

Achyut J Raghavendra[1], Jingyi Zhu[1], Wren Gregory[1], Fengjiao Liu[1], Pradyumna Mulpur[2], Shahzad Khan[3], Anurag Srivastava[3], and Ramakrishna Podila[4,5]
[1]Clemson University, Dept. of Physics & Astronomy, [2]Sri Sathya Sai Institute of Higher Learning, India, [3]ABV-Indian Institute of Information Technology and Management, India, [4]Clemson University, Clemson Nanomaterials Institute, [5]Clemson University, School of Health Research

The sensitivity of enzyme-linked immunosorbent assays (ELISA) for biomarker detection can be significantly increased by integrating fluorescence with plasmonics. In surface plasmon coupled emission (SPCE), the fluorophore emission is generally enhanced through the so-called physical mechanism due to an increase in the local electric field. Despite its fairly high enhancement factors, the use of SPCE for high-throughput and point-of-care applications is still hampered due to the need for expensive focusing optics and spectrometers. Here, we present new chemiplasmonic-sensing paradigm for enhanced emission through the molecular interactions between aromatic dyes and C60 films on Ag coated flexible substrates. A 20-fold enhancement in the emission from Rhodamine B (RhB) labeled biomolecules can be readily elicited without quenching its red color emission. As a proof-of-concept, we demonstrate two model bioassays using: i) the RhB-streptavidin and biotin complexes in which the dye was excited using an inexpensive laser pointer and the ensuing enhanced emission was recorded by a smartphone camera without the need for focusing optics, and ii) high-throughput 96-well plate assay for a model antigen (rabbit immunoglobulin) that showed detection sensitivity as low as 6.6 pM.

Graphene as Cathode in an Aluminum-ion Battery

Anthony S. Childress, Prakash Parajuli, Jingyi Zhu, Ramakrishna Podila, and Apparao M. Rao
Dept. of Physics and Astronomy, Clemson Nanomaterials Institute, Clemson University

Few layer graphene is a promising cathode material for aluminum-ion batteries that use chloroaluminate (AlCl4-) ionic liquids as the electrolyte. A fundamental understanding of interactions between the few layer graphene cathode and the ionic liquid electrolyte is key for realizing the full potential of these systems. Through in situ Raman spectroscopy and density functional theory calculations, we show that the cathode is capable of achieving stage-one intercalation within the operating voltage window, leading to improved cell performance. We also show that the presence of structural defects in the few layer graphene such as pores induced via plasma exposure or nitrogen dopants can deteriorate the cell performance by either decreasing the electrical connectivity or precluding stage-one intercalation respectively. The cathodes made with highly crystalline few layer graphene display high power and energy densities (~200 Wh/kg at 200 W/kg and ~160 Wh/kg at 5000 W/kg), and are stable with no loss in performance up to 1000 cycles while fully charging to 2.4 V.

Genomic prediction of grain yield and yield components in sorghum

Sirjan Sapkota, Rick Boyles, and Stephen Kresovich
Department of Plant and Environmental Sciences, Clemson University

Cereal grains contribute to nearly two-third of human caloric consumption and are primary source of feeds for livestock. Sorghum is a heat and drought resilient crop with tremendous genetic diversity that is largely untapped. Genomic selection has been shown to be effective in prediction of traits that are controlled by several loci with minor effect. Yield is a complex trait that is controlled by several minor effect loci. Furthermore, yield is directly correlated with yield components like seed weight and seed number that are correlated with each other. Therefore, understanding the trade-off between yield components is very important in optimizing yield potential, and their application in genomic selection models can enhance the line selection in breeding program. About 400 diverse sorghum accessions, also known as the sorghum association panel (SAP), were chosen for genomic prediction using genomic best linear unbiased predictor (GBLUP). A total of approximately 250k high quality single nucleotide polymorphisms (SNPs) were characterized from genotype-by-sequencing (GBS) using TASSEL pipeline. Predictably, the population structure and genetic diversity estimated for the SAP lines show that the population is clustered by major races, and under strong directional selection. Phenotypic data from yield and yield components were used for training and cross-validation. Cross-validation was done by repeated random sampling and k-fold cross validation scheme. Our results show potentials for increasing genetic gain in breeding program by efficiently screening and introducing new sources of genetic variability in the breeding population.

Polypropylene and PETG 3D Printed Hybrid Structures

Erik S. Antonio, Pu Zhu, and Igor Luzinov
Material Science and Engineering, Clemson University

With the rise of 3-D polymer based printing, especially with the potential of the mass industrial utilization of the technology, there is a need for a better understanding for fabrication of hybrid structures utilizing the materials commonly used. To this end, using fused deposition modeling (FDM) 3D printing technique we fabricated Polypropylene (PP) and Polyethylene Terephthalate Glycol-modified (PETG) hybrid samples and analyzed their properties. The properties are directly related to the printing temperature, viscosity, and percentage within the print of the two components. Our studies confirmed that the hybrid samples have lower mechanical characteristics than the samples printed from either pure material. We associate the decrease in properties with adhesive issues at PP/PETG interface. To improve these properties, PP fiber was mixed with small amount of PETG to create diffusive bonding at the interface. Our approach is expected to be transferable to similar 3D printed polymer hybrid/composite systems that also face poor mechanical properties.

Effectiveness of Ultra-High Performance Concrete Coating on the Resistance of Steel Reinforcement to Corrosion

Haitham Z Hussein, Prasad Rangaraju, and Amir Poursaee
Department of Civil Engineering, Clemson University

The total annual estimated direct cost of metals corrosion in the U.S. is estimated to be over a trillion dollars accounting for a staggering 6.2% of the nation's Gross Domestic Product (GDP). Corrosion is a common problem in reinforced concrete structures. Although, many solutions have been developed to deal with corrosion of steel in concrete infrastructure such as corrosion inhibiting admixtures, cathodic protection devices, etc. these remain as expensive options to remain effective. One potential long-term solution to control corrosion of steel reinforcement in concrete is using ultra-high performance concrete (UHPC) which possesses many advantages such as extremely low permeability and very high bond strength compared to conventional concrete. However, to use UHPC for the entire structure is an expensive proposition. As an alternative approach to

protect steel reinforcement in concrete, coating of steel reinforcement with UHPC grout is explored in this study. Guided by our previous study, the UHPC grout was prepared by using Type III Portland cement with combinations of silica fume, silica flour and ground glass fiber and a powdered high-range water-reducing admixture and steel was coated by this grout. Coated rebar samples were immersed in chloride-free and chloride contaminated simulated Portland cement pore solution and their electrochemical behavior in these solution were examined using linear polarization resistance (LPR) and half-cell potential techniques. The results obtained thus far showed high resistivity for coated samples compared to the uncoated rebars, offering a promise of UHPC coating as a means to enhance life of steel reinforcement in concrete.

The role of the bacterial secondary messenger, cyclic di-GMP, in interkingdom communication

Joseph Angeloni, and Min Cao
Microbiology, Department of Biological Sciences, Clemson University

Cyclic di-nucleotides (CDNs) are described as important secondary signaling molecules in bacteria that have the ability to regulate a wide range of processes. More recently, the role of these molecules has expanded to the eukaryotic domain where they act in modulating the innate immune response, but their influences have the potential to be far reaching. Through our studies, we have shown that Caenorhabditis elegans are able to detect and are attracted towards numerous signaling molecules produced by Vibrio cholerae, even though this bacterium kills the host at a high rate. Of these molecules, it seems that CDNs are playing an important role, specifically c-di-GMP and the hybrid molecule produced by V. cholerae, c-GMP-AMP (c-GAMP). The chemoattraction of C. elegans towards these molecules occur in a concentration dependent manner of 1nM. However, through LC-MS results, c-GAMP was not detected in V. cholerae cell lysate or supernatant, but c-di-GMP was present in concentrations similar to that observed in chemoattractive behavior. Through qRT-PCR results it appears that c-di-GMP and c-GAMP are playing a role in innate immunity in C. elegans by downregulating immune response genes that are normally active against V. cholerae infection. Through lifespan assays, it was also seen that continual presence of c-di-GMP significantly shortens the lifespan of C. elegans. Moving forward, it will be imperative to investigate how c-di-GMP and other CDNs are able to influence behavior of eukaryotes as well as modulate specific immune response and aging pathways.

Dendrimer-based triboelectric nanogenerators for renewable energy harvesting

Fengjiao Liu, Herbert Behlow, Sai Mallineni, Ramakrishna Podila, Sriparna Bhattacharya, and Apparao Rao
Department of Physics & Astronomy, Clemson Nanomaterial Institute, Clemson University

Triboelectric nanogenerators (TENGs) are promising for harvesting electricity from irregular or random mechanical energy (e.g., oceans waves, wind, walking). Polyamidoamine dendrimer is a functional polymer with a tree-like architecture containing highly electronegative moieties, which can be useful for increasing output of TENGs. Here, we present a vertical mode TENG using polyimide along with different generations of dendrimers coated on kitchen Al foils. The total output power of dendrimer TENGs was found to vary with degree of branching with a maximum power density ~495 W cm-2. The sensitivity of dendrimers electrical resistance to their surrounding environment was used to develop a self-powered dendrimer-TENG gas sensor.

Towards Interaction Methods for Granular Privacy Control on Wearable Devices

Byron M. Lowens, and Kelly Caine
Department of Human Centered Computing, Clemson University

The focus of this work entails the elicitation of gestures toward the development of novel gesture-based interactions for wrist-worn and head-mounted devices. In this study, we conducted a gesture elicitation study to investigate what categorization of gestures could be used in various scenarios related to the sharing of health-related data on wearable devices and what type of gestures are used in privacy intensive scenarios. In this work, we set up a fractional factorial mixed design to investigate the breadth of space for interaction that may be used to give users' for granular privacy control on wearables (i.e., WWD/HMD). The focus of this work is to understand users sharing preferences for sharing health-related information from a wearable device (WWD/HMD) with specific recipients (e.g., Family, Healthcare Provider, Employer, etc.) and also to understand what type gestures would be performed when sharing information on a wearable device. This work provides insight into users' wearable data sharing preferences with specific recipients and addresses their criteria for creating private input gestures in WWD and HMD.

Anesthesia Workstation Layouts Based on Task Relationships

Katherina Jurewicz, and David M. Neyens
Department of Industrial Engineering, Clemson University

With the addition of health information technology (HIT) and the electronic medical record (EMR) into the anesthesia workstation in the operating room, the anesthesia tasks and the relationships between tasks have fundamentally changed.

Typically, these EMR computers are attached to the existing equipment and are not incorporated into the existing anesthesia workflow, and the anesthesia provider frequently turns away from the patient and other patient-centric tasks. Thus, there may be a mismatch between the tasks and layout of the workstation in terms of the goals associated with patient care. The objective of this research is to present the task switching and the distribution of tasks for evaluating the workstation layout design and to demonstrate design alternatives such that the patient remains the center of the workflow. In a sample of 6 surgical videos, the tasks for the anesthesia provider were coded at each second of the surgery. Spatial analysis of task-layout relationships was evaluated by mapping all task pairs for a surgery on top of an image of the anesthesia workstation layout. The three most frequently performed tasks in the operating room were patient tasks, EMR tasks, and visual display tasks which respectively consumed 30.0% 26.6% and 18.6% of the surgery time, and a task switch occurred every 6.39 seconds on average. Moving the EMR closer to the patient and creating additional work surfaces formed an anesthesia "cockpit" in which the task flow was patient-centered and the provider did not have to turn away from the patient and patient displays.

Preparing counselors to assist transgender college students exploring their career development

Breana Moser, and David Scott
College of Education, Clemson University

The number of TG college students continues to increase every year. These students face unique challenges that many college and university career centers are not prepared to handle. A professional development design is proposed to identify and assess challenges for both TG students and counselors, provide background information and working definitions from the transgender community, discuss resources for counselors working with transgender students, and consider the role of career development practitioners in the therapeutic relationship.

A Preliminary Study to Investigate the Sensemaking Process of UAV Reports by Operators after Periods of Disconnect for Threat Assessment

Hunter Rogers
Department of Industrial Engineering, Clemson University

Teleoperated robots have been used to reduce human presence and interaction in dangerous or difficult areas or to enhance human capabilities. One of the challenges that still needs investigation is human-robot communication regarding making decisions based on extracted information. As such, the purpose of this research is to address issues of decision making after communication disconnections through interface design by focusing on improving sensemaking. Analyzing the effects of interface design in a UAV threat assessment scenario is ideal to examine not only the sensemaking process but also how that process defines decision making in an environment where efficient decision making and low clutter displays are needed. The data from this will serve to develop an optimal interface for information assimilation. We aim to study different interface designs with varying amounts of information and layouts of information taking into account the performance and cognitive workload of the operator.

Anti-hyperglycemic effects of extracted mangiferin from *Mangifera Indica*

Sepideh Alasvand, and Vivian Haley-Zitlin
Food, Nutrition and Packaging Sciences, Clemson University

Anti-hyperglycemic effects of extracted mangiferin from *Mangifera Indica* Linn: systematic review The role of *Mangifera Indica* constituents in the hyperglycemia of type 2 diabetes mellitus in-vitro and in-vivo was examined. Diabetes is a chronic, progressive disease affecting approximately 30M adults and children in the US. Mangiferin, the predominant constituent of the mango plant, *Mangifera Indica* is an attractive natural source to control blood glucose levels. Twenty-two of 436 studies met the inclusion criteria. Review articles, non-specific mango-related plants, and articles which did not examine glycemic status were included in the exclusion criteria. Articles that met the inclusion criteria included mangifera extracts from *Mangifera Indica* bark-stem (13.63%), peel (9.09%), flesh (27.27%), seed-kernel (9.09%), by-products (4.5%) and leaf (40.9%). In vitro studies accounted for approximately 22.7% of the studies while 86.36% were in vivo; 27.27% were human studies and 59.09% animal studies. Anti-diabetic properties of *Mangifera Indica* were attributed to gene regulation of Glut 4, Irs 1, Pi3K and cell cycle genes, inhibition of alpha glucosidase, improved antioxidant statues, improved insulin sensitivity, and facilitated glucose uptake. A potential role of Mangiferin as a nutraceutical component that improves hyperglycemia was noted. An anti-diabetic role for *Mangifera Indica* should be further pursued in human research as the research to date is limited, but promising.

Integrated Communication and Control for Collective Motion with Limited Communication

Huan Gao, and Yongqiang Wang
Department of Electrical and Computer Engineering, Clemson University

Decentralized collective motion coordination is a rapidly developing field, motivated by its extensive applications in mobile sensor networks, cooperative robotics, and unmanned aerial vehicles. In most existing results, the distributed controller for collective motion coordination is designed in the continuous-time domain in order to conform to the continuous kinetic dynamics of vehicle systems, and discretization of the continuous controller is used in implementation since the information can only be exchanged at discrete-time instants among these systems. However, this approach cannot guarantee the original design performance since discretization may harm or even destabilize the closed-loop system. Inspired by pulse-based synchronization among biological pulse-coupled oscillators, we propose an integrated communication and control approach for collective motion coordination which can circumvent discretization and guarantee the design performance in final implementation. Not only can heading control be achieved to coordinate vehicle headings, but also spacing control is achievable for the circular motion. Numerical simulations are provided to confirm the theoretical results.

Using Bark Thickness to Estimate Fire Sensitivity of Woody Non-Native Invasive Plants

Bridget L. Blood, Lauren S. Pile, Hannah Spencer, Carlee Steppe, Carissa Adams, Timothy S. Shearman, and G. Geoff Wang
Department of Forestry and Environmental Conservation, Clemson University

Forests in the southeastern USA have been historically shaped by frequent surface fire regimes; however, these forests have been significantly altered by widespread fire suppression. Coincidently, an increase in the amount of non-native woody plants has also been reported during the same period. Many forest management efforts to decrease invasion potential include the use of prescribed fire despite a lack of understanding of fire vulnerability of non-native woody plants. To determine the potential application of prescribed fire in controlling the invasion of non-native plants, we compared bark thickness among six non-native invasive tree and shrub species of Asian origin to native fire-tolerant and mesophytic tree species. We hypothesized that non-native species would be less adapted to frequent surface fires compared to native fire-tolerant tree species and possess bark thicknesses more similar to native mesophytic species. We sampled each species along a range of sizes and sites from the Clemson Experimental Forest, Clemson, SC, and Parris Island, Port Royal, SC. Bark thickness was measured at cross sections taken at predetermined intervals along the length of the tree or shrub. We compared bark thicknesses across species and species groups (non-native, fire-tolerant, and mesophytic) with a linear mixed effects model and determined that no non-native species had bark thickness equivalent to native fire-tolerant species. A single prescribed fire may not be enough to control these non-native plants once they are established due to their sprouting ability, but fire may be important for reducing establishment in uninvaded forests.

Engineering *Yarrowia lipolytica* for biosynthesis of flavonoids

Vijaydev Ganesan, and Mark Blenner
Department of chemical and biomolecular engineering, Clemson University

Flavonoids are important natural products with various biological activities. They are reported to show anti-inflammatory, antioxidant, anti-cancer and ant-bacterial activities. Flavonoids are hard to produce by either plant extraction or chemical synthesis due to low productivity and yield. Metabolic engineering can offset the above limitations from plants. Metabolic engineering of microbes has already been shown to synthesize butanediol, artemisinin and omega-3 eicosapentaenoic acid at an industrial scale. Very less progress has been made in the synthesis of flavonoids owing to the long metabolic pathways, heterologous gene expression and reliance on precursor supplementation. E.coli has already been reported to produce flavonoids but the production has been low because of low flux towards TCA metabolites and the inability to perform efficient post translational modifications. Yeasts have higher flux towards TCA metabolites and can perform post translational modifications efficiently compared to bacteria. Here, we review the general metabolic engineering strategies that can be used for improving flavonoids synthesis using *Yarrowia lipolytica*. These strategies including increasing tyrosine accumulation by removing feedback inhibition, improving malonyl coA accumulation by downregulating fatty acid genes and improving the conversion of tyrosine to flavonoids by screening for different gene sources, varying the promoter strengths, balancing gene expression and optimizing the culture conditions

Smart Water Sampling with UAV-integrated Sensor Node

Cengiz Koparan[1], Charles V. Privette[2], Calvin B. Sawyer[2], and Bulent Koc[2]
[1]Department of Plant and Environmental Science, Clemson University
[2]Department of Agricultural Science, Clemson University

Water sampling location, depth, and time are the important management parameters for a water quality monitoring program. It is essential to reduce the cost by minimizing the number of grab samples and to reduce the sampling time by rapidly accessing to the sampling points. Water quality may vary with location and depth. Adaptive, remote, and smart water sampling systems can provide more effective water quality monitoring programs. A smart water sampling system with a UAV-integrated sensor node was developed and tested in this research. The UAV-Assisted Sampling System (UASS) consists of a hexacopter UAV, a triple water sampling cartridge (WSC), and a sensor node. The payload capacity and endurance of the UASS were determined using an indoor test station. The UASS was able to hover 12 min while producing a 24.5 N trust. The decision to collect water samples with the WSC was made based on the pH, Dissolved Oxygen (DO), Electrical Conductivity (EC), and temperature data from the sensor node. The UASS successfully activated the WSC when the water constituent measurements exceeded the assigned threshold values. Field experiments over a 1.1 ha fishing pond showed that an instantaneous decision making for sample collection based on in-situ pH, DO, EC, and temperature measurements were more practical than individual sample collection at each measurement location. The developed system provided rapid water quality assessment using a sensor node and eliminated the unnecessary grab sample collection.

Assessing Drought and Heat Tolerance in Peanut Cultivars, Wild Species, and Experimental Lines Using Physiological Approaches

Zolian Zoong Lwe[1], Shyam P. Tallury[2], and Sruthi Narayanan[1]
[1]Department of Plant & Environmental Sciences, Clemson University
[2]Plant Genetic Resources Conservation Unit, USDA-ARS, Griffin, GA

Peanut (Arachis hypogea) is an important crop grown worldwide for its nutritional value and economic significance. Although the demand for peanuts remains high, increasing drought episodes, combined with high temperatures, threaten the supply. Peanut plants are most sensitive to drought and heat stresses during flowering, which drastically decreases yield due to poor pollen performance and reduced pod-set. Currently, there is no released cultivar tolerant to both stresses in the US peanut belt. This study was conducted to evaluate released varieties of Virginia and Runner type peanuts, wild species, and experimental lines derived from wild species for both drought and heat tolerance during flowering based on pollen viability, pollen germination, and pod number. Plants were grown in 5-gallon pots filled with sterilized field soil at optimum conditions (28/22°C daytime maximum/nighttime minimum + well-watered) in a greenhouse until 9 days after flowering. Thereafter, plants were exposed to drought stress (28/22°C + water-withheld), heat stress (38/28°C + well-watered), or optimum conditions for 7 days. Pollen viability, pollen germination and pod number were measured to assess pollen performance for each genotype. SIN 83 and F7N 1 had high while Gregory had low pod numbers under both drought and heat stresses. SIN 83 also had high while SIN 121 had low pollen germination and viability % under both stresses. Thus, the experimental line SIN 83 will serve as a good genetic material for developing drought and heat tolerant peanut varieties for the US peanut belt.

Feelings in Rhythm: The influence of circadian rhythm on the relation between mental state and cognitive performance under sleep deprivation

Aminah S. Roberts, June J. Pilcher, and Patrick J. Rosopa
Department of Psychology, Clemson University

Sleep deprivation has a negative impact on mental state and performance. However, these effects are influenced by the circadian rhythm or “biological clock.” The purpose of this study was to examine if body temperature, an indicator of circadian rhythm, moderates the relationship between mental state and cognitive performance. Mental state was measured by positive and negative mood captured by Positive Affect(PA) and Negative Affect(NA), as well as Morale and Engagement. Fifty-eight subjects underwent sleep deprivation and were evaluated across four testing sessions: 6:30pm-10:30pm, 11pm-3am, 3:30am-7:30am, and 8am-12pm. During each of the sessions they completed a complex task, the LSAT and a simple task, the psychomotor vigilance task (PVT). For the LSAT, percent correct out of total (PCrTot) was examined. The variables measured for the PVT were inverse reaction time (InvRT) and lapses. The results showed that in session 3 (3:30am-7:30am), during the nadir (lowest point) of the circadian rhythm, only PA significantly predicted InvRT. Body temperature was not found to be a significant moderator between mental state and performance. These results suggest that during the lowest point of our day positive mood affects performance on simple cognitive tasks. This has implications for repetitive work undertaken during the night shift.

A PeerTutor Application with Audio Prompting to Support Word Reading

Jill Shelnut, and Michelle Popham
Clemson University, College of Education

Students with or without disabilities are expected to read high-frequency words fluently. Students with disabilities, however, may need more intensive instruction and practice in order to catch up with their nondisabled peers (Denton & Al Otaiba, 2011). Systematic peer tutoring is an evidence-based strategy that incorporates components of explicit instruction, including active student responding, frequent opportunities for practice of critical skills, and the provision of immediate feedback (Bowman-Perrott et al., 2013). One potential solution for having two low-performing students working together on word reading is to make correct responses available through audio prompting (Cooke, Mackiewicz, Wood, & Helf, 2009; Mackiewicz, Wood, Cooke, & Mazzotti, 2011). Several low-tech studies have investigated the use of peer tutoring with audio prompting on a variety of literacy skills with positive results (Mackiewicz et al., 2011; Wood et al., 2013). We proposed the development of an app that pronounces words for students, so instructional feedback is immediate and accurate.
This session demonstrates an application for iPad®, PeerTutor, to support word-reading skills of pairs of students who are low performing and at risk for learning disabilities. The pilot study used the experimental app to practice sight words to test the feasibility of the system and to get feedback from teachers and students. Potential benefits and challenges will be shared.

Applying Progress Monitoring in an Introduction to Special Education Class

Michelle Popham, Jennifer Counts, Pamela M. Stecker, and Abby Allen
Clemson University, Department of Special Education

Valid and reliable assessments are required at all levels of education to measures student learning. Curriculum-Based Measurement (CBM) is one assessment method that has demonstrated reliability and validity for measuring content-area knowledge in secondary-level, content-area classes (e.g., Espin et al., 2013). The use of CBM in a preservice setting allows for both vocabulary knowledge to be assessed and for the curriculum-based measurement procedure to be modeled. Because CBM is used to evaluate a student's performance frequently across time (Deno, 1985) preservice teachers can make decisions about their own progress and make changes to class preparation and study strategies based on the data. Preservice teachers will gain an authentic experience in participating in CBM and interpreting data from CBM that may serve as a foundation for future use of CBM in their classroom. One descriptive study investigated the use of vocabulary-matching in a college course (Larson & Ward, 2006) and found that vocabulary-matching probes reflected student growth in vocabulary knowledge across the course of the semester; however, the study did not investigate technical adequacy features of the vocabulary-matching tool. This poster describes how teacher educators can create, administer, score, and graph data using CBM methodology. Benefits and limitations of using this methodology for monitoring progress in PK-12 in content area will be discussed. Results of our study, in an introductory special education class, will be summarized including technical features of vocabulary-matching measures, student performance on curriculum-based measurement knowledge pretests and posttests, and preservice teachers' satisfaction with the activities as support for learning about progress monitoring.

Genetic profile of site-specific dental plaque from children

Abdullah Abood, and Vincent Richards
Clemson University, Department of Biological Sciences

According to the National Institutes of Health, dental caries is the leading chronic disease of children in the United States. Dental caries is biofilm-mediated, multifactorial and dynamic. As explained by the "ecological plaque hypothesis", caries is a result of dysbiosis of the normal bacterial community implicated when acidogenic bacteria ferment carbohydrates. Excessive ingestion of sugars such as sucrose results in a lower pH environment due to acid production, allowing only acidogenic and aciduric bacteria to thrive, leading to carious lesions in the enamel and the underlying dentin layer. The community shows resilience by counteracting the acidic environment through commensal alkali-producing bacteria. Research using microbial profiling (16S rRNA gene sequencing)has shown that the bacterial composition of dental plaque differs significantly as the health status of the tooth changes. S. mutans is considered the major bacterial culprit in dental caries and is found in high abundance in carious lesions. Richards et al. (2017) reported the presence S. mutans in healthy dentition as well, however at lower frequency. The progression of disease was thought to be characterized by a domination of aciduric and acidogenic bacteria and a diminished bacterial diversity, however, a recent study reported that bacterial diversity and species richness are not affected by changes in health status. Our results indicate that bacterial taxa distributions are correlated with the health status of dentition leading to significant differences in the taxonomic, genetic, and metabolic potential of dental biofilms.

Optimum Size and Placement of Distributed Generators in Microgrid based on Reliability Concept

Fatemeh Tooryan, and Edward R. Collins
Clemson University, Department of Electrical and Computer Engineering

Integration of various on-site distributed generators in a micorgrid, which can either be operated
in grid-connected or islanded mode, helps to satisfy the local demand. The optimum sizing and placement with a techno-economical optimization of a microgrid is done with Particle Swarm Optimization (PSO). The problem of optimum placement and size is formulated as a nonlinear integer minimization problem which minimizes the sum of the total capital, operational, maintenance and replacement cost of Distributed Generators (DGs), subject to constraints such as voltage, energy limits of each DG, exchanged power with utility and the constraints of system reliability. The exchanged power with the main grid, economics of DG units and penalty for not
supplying the loads are taken into consideration. In this paper, some notions of reliability indices are calculated in order to evaluate the performance of a microgrid in both grid-connected and islanded mode, and the effect of reliability on total cost of microgrid is evaluated. The uncertainty of PV output is also considered which plays an important role in optimization technique.

A Protocol For Automated Adaptive Discretization of Complex Geometry

Akash Gupta, and Ethan O. Kung
Clemson University, Department of Mechanical Engineering and Bioengineering

This study aims to summarize our experiences with iterative adaptive meshing and suggest preliminary guidelines that facilitate the generation of a converged adapted mesh. Our protocol utilizes the Adaptive Meshing Algorithm (AMA) of SimVascular to reduce iteratively, the Mean Interpolation error (MIE) by progressively refining the mesh through each iteration. The AMA is applied to the steady flow solution of an isotropic mesh (whose edge size is set as defined below) for the initial iteration, which attempts to reduce the MIE, by a specified reduction factor (R). The minimum edge size parameter is progressively reduced by a refinement factor (F) in subsequent iterations, and the process of the first iteration is repeated. The protocol continues in a similar manner for a user specified number of iterations. Our suggestions for the algorithm parameters are, Mesh Strategy: Anisotropic; Isotropic Mesh Edge Size set so that initial MIE<150; MIE Reduction Factor (R) =0.75, Min. Edge Size Reduction factor (F) =0.75; Maximum Edge size=Isotropic mesh edge size, Initial minimum edge size=0.75xIsotropic mesh edge size. We have observed that an initial mesh with a MIE of 150 or less facilitates solution convergence. We would not recommend setting the maximum edge to be size larger than the isotropic mesh edge size since it did not reduce MIE and reduced the number of elements. The isotropic mesh adaption is of scant utility. We believe that these guidelines are a useful template, which users can customize to their particular application.

3D-printed graphene nanocomposites for smart-home and security applications

Sai Sunil Kumar Mallineni, Yongchang Dong, Herbert Behlow, Apparao Rao, and Ramakrishna Podila
Clemson University, Department of Physics

A new “wireless” paradigm for harvesting mechanical energy via a 3D-printed wireless triboelectric nanogenerator (W-TENG) comprised of an ecofriendly graphene polylactic acid (gPLA) nanocomposite and Teflon is demonstrated. The W-TENG generates very high output voltages >2 kV with a strong electric field that enables the wireless transmission of harvested energy over a distance of 3 m. The W-TENG exhibited an instantaneous peak power up to 70 mW that could be wirelessly transmitted for storage into a capacitor obviating the need for hard-wiring or additional circuitry. Furthermore, the use of W-TENG for wireless and secure actuation of smart-home applications such as smart tint windows, temperature sensors, liquid crystal displays, and security alarms either with a single or a specific user-defined passcode of mechanical pulses (e.g., Fibonacci sequence) is demonstrated. The scalable additive manufacturing approach for gPLA-based W-TENGs, along with their high electrical output and unprecedented wireless applications, is poised for revolutionizing the present mechanical energy harvesting technologies.

The Meaning of Leisure: Definitions of Leisure and Leisure Experiences in the Employed College Student Workplace

Katherine Ann Jordan[1], Denise M. Anderson[2], Ed Bowers[1], Sarah Winslow[3], Tony Cawthon[4]
[1]Clemson University, Parks, Recreation, and Tourism Management
[2]Clemson University, College of Behavioral, Social and Health Sciences
[3]Clemson University, Department of Sociology, Anthropology, and Criminal Justice
[4]Clemson University, Student Affairs and Higher Education

Work and life balance is an important value of the Millennial generation. Leisure experience contributes to feelings of work and life balance. Leisure is typically thought of as occurring during free time, but some believe leisure can be experienced during work. As such, employed college student leisure experiences in the context of the on-campus workplace were explored through semi-structured interviews in the spring of 2017 (N=34). Interviews were recorded, transcribed, and verified by the researcher.

Summaries of interviews were verified with each participant and additional researchers assisted in the analysis of the data. Participants were found to experience leisure in the workplace, through the work activities or through social breaks, which contributed to their overall feelings of being balanced. Future research should explore whether this phenomena exists in the broader population of college students employed on and off campus as well as how leisure experience can be facilitated and promoted in the workplace to aid work and life balance.

Occurrence and Possible Causes of Peach Skin Streaking

Linus Schmitz, and Guido Schnabel
Clemson University, Department of Plant and Environmental Sciences

Streaking is a skin discoloration in red blush varieties of peaches, causing economic loss to South Carolina growers. The affected peaches display non-pigmented streaks which vary in intensity and length ranging from faint to pronounced streaks and even sunken, necrotic tissue. Our observations associate the phenomenon with periods of drought which are followed by light rain, suggesting an atmospheric or depository accumulation of the causal agents. Occurrence and severity data were obtained from one commercial and one research farm during the 2017 growing season with trees having been examined for symptoms in weekly intervals starting four weeks prior to harvest. The data emphasized that streaking is greatly location-dependent. Incidence was also recorded with relation to fruit position within the canopy. Precipitation data and pH of rain water were determined from twelve sites at the commercial farm covering six varieties with ripening periods between mid-June and mid-August. Both precipitation and pH differed greatly between sampling dates and locations. Rain samples were analyzed for total and free chlorine as well as chlorine dioxide. Although levels of free chlorine and chlorine dioxide were not within the detectable range of 0.01-6 mg/L for Cl2 and 0.05-11mg/L for ClO2, more work needs to be done to determine their concentrations at the time of precipitation. Acidic and ozonated solutions were applied to two varieties prior to harvest but none of the treatments reproduced the symptoms.

Perception versus potential of functionality of hospital corridors: A Literature Review

Rutali Joshi
Clemson University, Planning, Design and Built Environment

There is evidence of several studies being done in treatment areas of the hospitals. Inspite of corridor spaces occupying 40% of the built area, these transitional spaces seem to be neglected. Hospital circulation zones serve as a ‘‘backstage’’ or ‘‘neutral space’’ for interpersonal communications. They could serve a therapeutic function for varying patient user types. For example, in orthopedic settings, patients with impaired ambulation could use corridors and adjacent public spaces for rehabilitation purposes. In psychiatric facilities they could contribute to healing of patients by creating positive perceptions of the space; maintaining safety and security, and reducing staff stress through design by increasing visibility into the wards. Inspite of the potential outcomes that a better designed and configured corridor could offer to various users of the space, they are seen to have reduced value and functionality. A literature search was conducted through a multi-vista lens to cater to needs of patients, care partner, and clinicians. Based on a careful analysis of each source identified, 6 research themes were determined: wayfinding and spatial orientation; spillover space; communication, interaction and socialization patterns; falls; visibility; and healing elements – acoustics, materials, view to nature and natural light. The first two were classified as functional features and the rest as perceptual features highlighting quality of care. Each of these design themes was linked to patient, family and staff health outcomes to identify gaps. It is a step towards building semantic understanding of design of corridors with respect to the healthcare setting as a whole.

Investigating microbial inhibitions in co-digestion of fats, oils & grease with municipal sludge & their effect on process kinetics

Mehul Soni, and Sudeep Popat
Clemson University, Department of Environmental Engineering & Earth Sciences

Methane yields from conventional digestion systems aren’t sufficient to fulfil the requirements of modern-day resource recovery facilities. Although there are numerous articles on co-digestion of municipal sludge with FOG waste reporting noticeable increase in biogas production, our present study is focused on the intermediates formation and consumption at various stages occurring in the duration of the test which is generally lacking. This information is crucial in understanding the nature and the mechanism of inhibition which are not very well understood. Preliminary studies were conducted to find a PS:TWAS:FOG ratio (v/v) which enabled us to produce maximum possible biogas and use that ratio for the next set of experiments. Among all the ratios tested, the sample with 25% FOG yielded the highest methane production at 150.94 mL-CH4/g-COD, followed by sample with no FOG addition at 124.32 mL-CH4/g-COD. For samples with FOG content higher than 25%, methanogenesis ceased to occur producing very little methane ranging from 13.95 mL-CH4/g-COD to 16.93 mL-CH4/g-COD. It was worth noticing that sample with 25% FOG content, which produced only 288mL biogas in the first 45 days, could overcome inhibition and produced over 800mL in the following 30 days. These results support the new findings that suggest possible recovery of digesters inhibited

after a certain lag phase and contradicts earlier hypothesis of LCFA inhibition to be irreversible. We are now in the process of running two semi-continuous digesters (1xControl and 1x25% FOG) with samples being collected at regular intervals to identify and quantify the intermediates being formed.

Teaching Writing in Two Language Contexts: Literacy in Students' L1 and L2

Stephanie Madison Schenck
Clemson University, College of Education

While much of the extant research focuses specifically on second language writing without looking closely at a student's writing abilities in their first language, research that investigates the relationship between L1 and L2 writing is growing. Therefore, the focus of my study is to investigate the ways in which American K-12 teachers in multiple language settings address writing instruction with their students. This qualitative study looks at four teachers in unique positions of teaching writing in different language contexts. One teaches public elementary school ESOL and Spanish for Heritage Learners. The second teaches early college high school English Creative Writing, SAT Prep, and Spanish I-II. The third teaches 11th grade English and French I-AP in a rural public high school. The fourth teaches high school English, English Creative writing, and ESOL for international students in an affluent private school. Each of these contexts requires the teacher to teach writing to students in their L1 and L2. I examine differences in strategies, expectations, and goals, as well as how these strategies cross over into both classes. I also explore the ways that "quality writing" is measured in each writing context, and the ways the definition of quality writing varies for each teacher, writing context, and group of students. Finally, I review what we can learn from these teachers, what we can apply to our own context of writing instruction, and how these results can be used for advocacy for L1/L2 writing instruction in various ways.

"Walk a Mile in My Shoes" - Breast Cancer Survivors' Views of the Endocrine Therapy Experience

Julie Bedi[1], Rachel Mayo[1], Elizabeth Charron[1], Windsor Sherrill[1], Karyn Jones[1], Liwei Chen[1], Regina Franco[2], and Matt Olinger[2]
[1]Clemson University, Department of Public Health Sciences
[2]Greenville Health System, Center for Integrative Oncology and Survivorship

Purpose
This study aims to understand, from the survivor perspective, modifiable factors that have the greatest impact on the likelihood of endocrine therapy (ET) continuation.

Methods
Twenty-two hormone receptor-positive breast cancer survivors under age 64 who had been prescribed ET since 2000 were recruited for participation in focus groups conducted in four South Carolina locations. Qualitative data analysis was completed by a three-member research team using an inductive narrative approach with input from a breast cancer survivors' panel at a local hospital. Themes were examined by participant decision to continue or discontinue ET. Quotations exemplifying each theme are provided.

Results
Participants' feedback centered on a risk vs. benefit analysis unique to the individual survivor. Main themes included the importance of an open, honest patient/provider relationship and the need for personal information seeking and affirmation in the decision to take ET. There was clear support for the utility of multidisciplinary cancer care teams and incorporating integrative approaches.

Conclusions
The few studies that have addressed currently used interventions to improve adherence showed little to no improvement over usual care. Research employing patient-centered perspectives is imperative. Novel and practical patient-centered interventions in research exploring openness in the patient/provider relationship, survivor information seeking practices, multidisciplinary teams, and integrative approaches are needed. This study highlights key elements that can be incorporated in interventions to enhance the endocrine therapy experiences for breast cancer survivors.

Role of eIF2-alpha kinases in *Entamoeba histolytica* Stress Control

Natacha U. Karambizi, and Lesly A. Temesvari,
Clemson University, Department of Biological Sciences

In well studied systems (i.e., mammalian), stress activates kinases that phosphorylate a serine residue of the eukaryotic initiation factor (eIF2α). This consequently reduces the level of protein translation and permits the system to only focus on the expression of specific genes that are crucial to overcome stress. Our lab has previously shown that the level of phospho-eIF2α increases when *Entamoeba histolytica* is stressed. Presumably, stress-activated kinases are responsible for phosphorylating eIF2α;

however, the identification and characterization of such eIF2α kinases has never been undertaken in this organism. We isolated the genes encoding eIF2α and the two putative eIF2α kinases (EHI_109700, EHI_035950), herein referred to as eIF2ks, from *E. histolytica* via PCR. Next, we will express eIF2α and these kinases in *E. coli*. We will then track phosphorylation of recombinant eIF2α by recombinant eIF2α kinases. To determine if these kinases are necessary for stress response, DNA encoding the kinase domains of the two eIF2ks were sub-cloned into "trigger" vectors, which may be used to knockdown expression of genes in *E. histolytica*, and transfected the vectors into *E. histolytica*. In parallel, we will use commercial eIF2α kinases inhibitors to inhibit the activity of the kinases. *E. histolytica* cell lines with reduced expression of endogenous eIF2ks or *E. histolytica* cells treated with inhibitors will then be exposed to different to stress conditions (serum starvation, heat shock, and oxidative stress) and cell viability will be tracked.

Surface Functionalization of Silica Nanoparticles in Nafion Nanocomposite Membranes for Vanadium Redox Flow Batteries

Allison Jansto, and Eric Davis
Clemson University, Department of Chemical and Biomolecular Engineering

Vanadium redox flow batteries (VRFBs) have emerged as a promising solution for grid-scale energy storage for intermittent energy generation, however the proton exchange membrane (PEM) often suffers from high vanadium crossover, which decreases the lifetime and efficiency of the battery. Nafion, a commonly utilized PEM for VRFBs, has been modified with nanoparticles to alleviate the vanadium crossover, but little has been done to understand how they work to reduce the crossover because studies have shown that they exist in both the hydrophobic and hydrophilic domains. In this study, the surface chemistry of silica nanoparticles was systematically altered to elucidate if this can be used to rationally tailor their dispersion in the membrane. The nanoparticle loading and diameter were also varied in an attempt to better understand how nanoparticle-Nafion interactions act to reduce vanadium ion crossover in these nanocomposite films. Specifically, several types of interactions between silica nanoparticle surface and Nafion structure were investigated, specifically electrostatic interactions within the ionic channels of Nafion. The effect of these interactions in terms of dispersion was obtained by electron imaging in addition to the vanadium ion permeability measured by observing concentration changes over time by ultraviolet-visible spectroscopy. The bridging support between silica nanoparticle surface and end group was also investigated, ranging from a relatively flexible, saturated chain to a significantly less flexible chain containing aromatic groups. Results from this study indicate that the surface functionalization of the silica nanoparticles plays an important role in controlling the permeation of vanadium ions across these nanocomposite membranes.

Novel methods for Radiosurgery

Bishwambhar Sengupta, Donald Medlin, and Endre Takacs
Department of Physics and Astronomy, Clemson University

Stereotactic radiosurgery (SRS) with the Rotating Gamma System (RGS) has been used to effectively treat functional disorders of the brain, such as trigeminal neuralgia, arteriovenous malformations, and benign and malignant tumors within the brain with minimal dose spillage to the surrounding healthy tissue. Although under normal operation the RGS produces a sharp penumbra, treatment of lesions near critical organs at risk (OAR) is risky or impossible. Here we present two new operation modes of the RGS, the Intensity Modulated Radiosurgery (IMRS) and Speed Modulated Radiosurgery (SMRS) modes, which could further sharpen the penumbra of the RGS to target lesions near critical OARs. Geant4 based Monte Carlo simulations of the RGS dosimetry were performed for the normal, IMRS and SMRS operation modes of the RGS. Results from the normal and IMRS models were validated with comparisons to experimental data collected with EBT3 films. For the IMRS and SMRS modes the penumbra significantly sharpened along the semi-major axis of the dose profiles; however, the IMRS mode requires a longer dose delivery time compared to the SMRS mode. Nonetheless, both operation modes could be used to target lesions near critical OARs that are not currently possible with the RGS or other SRS devices.

Working Smarter: How to Make Faster Discoveries With Data

Justin Sybrandt, and Ilya Safro
Clemson University, School of Computing

Literature underpins research, providing the foundation for new ideas.
But as the pace of science accelerates, many researchers struggle to stay current. To expedite their searches, some scientists leverage hypothesis generation (HG) systems, which can automatically inspect published papers to uncover novel implicit connections. With no foreseeable end to the driving pace of research, we expect these systems will become crucial for productive scientists, and later form the basis of intelligent automated discovery systems. Yet, many resort to expert analysis to validate such systems. This process is slow, hard to reproduce, and takes time away from other researchers. Therefore, we present a novel method to validate HG systems, which both scales to large validation sets and does not require expert input.

In search of a dynamics-based predictor of action capabilities

Katie Lucaites, and Chris Pagano
Clemson University, Department of Psychology

According to ecological theory, an individual determines their action capabilities by comparing characteristics of the environment to the morphological (body-scaling) and dynamic (action-scaling) properties of their action-system. While body-scaling has long been represented quantitatively by a dimensionless ratio between the size of the environmental feature and the relevant size of the individual, the present research attempted to find a dynamics-based predictor of action-scaling. Participants walked towards doorways of various widths before judging whether or not they could successfully pass through the doorway. While walking, positional data was collected from motion trackers on the left and right shoulders. Two measures of dynamic movement were calculated for each trial: the standard deviation of lateral position (SDLP) quantifies the magnitude of lateral shoulder sway while walking, and the sample entropy (SampEn) quantifies the predictability of the lateral sway pattern over time. Hierarchical linear modeling will be used to determine if SDLP and SampEn quantify action-scaling to predict doorway passability judgments.

Interdisciplinary Collaboration to Enhance Agriscience Teacher's STEM Proficiency to Teach Innovative Plant Propagation Techniques

Ashley Coutta, Rachel DuRant, and Catherine DiBenedetto
Clemson University, Department of Agricultural Education

An interdisciplinary collaboration was born between the Agricultural Education (AGED) program and the Plant and Environmental Science (PES) department at [University] when graduate students were in need of a laboratory to accompany their plant propagation course. Instructors developed a special AGED graduate student laboratory focused on sexual plant propagation techniques. An innovative approach was employed by utilizing current research already being conducted by PES on microgreen production. Microgreens can be grown in a greenhouse or an indoor, electrically lit environment. Ease of production factors allow microgreens to be an innovative method to teach sexual reproduction in school-based agricultural education (SBAE) programs. Microgreens are a novel/innovative idea due to many factors. The brevity of time from sowing to harvest and how microgreens are utilized after harvest make them an efficient commodity. "Harvested at the first true leaf stage" results in a very young and tender plant (Treadwell, Hochmuth, Landrum & Laughlin, 2010). Fresh vegetables and convenience are two factors not often associated in the consumer's experience. Microgreens are clean, bite size, tender, ready to eat raw or cook very quickly with large surface area to volume ratios. (Treadwell, et al., 2010). Being easy to produce, fast growing, and having a desirable shelf-life makes microgreen production an up and coming commodity of the agricultural industry. Microgreens can be harvested as early as seven to twenty-one days after being sown, which allows for rapid response to market demand and aligns well with teaching a plant propagation unit of instruction in a SBAE program.

Experience of Family Violence and Dating Violence among Rural Teens: Subjective Well-Being as a Protective factor

Lyudmyla Tsykalova, Natallia Sianko, and Jim McDonell
Clemson University, Department of Department of Youth, Family and Community Studies

The study investigated how recognition of family violence by different family members impacts adolescents' likelihood of becoming a victim or perpetrator of teen dating violence; and it tested the protective role of subjective well-being for adolescents exposed to violence. A sample of adolescents in grades 6 through 12 (n = 514) and their caregivers (n = 429) completed a survey. Teens' and caregivers reports of exposure to household violence were used in a negative binomial regression to predict teen dating violence perpetration and victimization. Results indicated that family violence was associated with an increase in dating violence victimization and perpetration, while subjective well-being was associated with a decrease in both aspects of dating violence. Implications for research and practice are discussed.

Complexity of the *Phacoides pectinatus* (Bivalvia: Lucinidae) Gill Microbiome

Jean Lim[1], Annette Summers Engel[2], Laurie C. Anderson[3], Barbara J. Campbell[1]
[1]Clemson University, Department of Biological Sciences
[2]University of Tennessee Knoxville, Department of Earth and Planetary Sciences
[3]South Dakota School of Mines and Technology, Department of Geology and Geological Engineering

Bivalve species in the family Lucinidae fulfill most of their nutritional needs through gill bacterial endosymbionts, belonging to the class Gammaproteobacteria, which oxidize sulfur and use this chemical energy to fix carbon for their hosts. Beyond the sulfur-oxidizing symbionts, the presence of other species in lucinid clam gills have not been comprehensively studied, although multiple symbionts have been reported in other marine animals. This projects investigates the types of species present in the gills a mangrove-associated lucinid species, Phacoides pectinatus, as well as their functions. We consistently detected the presence of three bacterial species within the host: the sulfur-oxidizing symbiont, another gammaproteobacterial heterotroph and a spirochete. Both gammaproteobacterial species encoded genes and transcripts for the uptake of host-derived carbon and gill-specific

substrates, while the spirochete species contained functions for the transport and utilization of multiple sugars and organic acids. Results of this study provide evidence of the presence and activity of multiple bacterial species in the gills of P. pectinatus, indicating that the gill microbiomes of this and other lucinid species are more diverse than previously documented.

Consequences of Bullying Victimization among Rural Youth: Exploring Mediating Mechanisms

Emily Schafer, Matthew Flege-Hudson, Susan Limber, and Martha Thompson
Clemson University Department of Youth, Family, and Community Studies

Bullying is one of the most widespread forms of violence facing youth, parents, and educators and is recognized as a serious public health concern for children and adolescents. Research has consistently found significant, negative consequences for the victims of bullying. Bullied youth are more likely than their non-bullied peers to report poorer overall health and somatic stress complaints such as headaches, sleep problems, or unsourced pain. Bullying has also been shown to increase the likelihood of depression and anxiety and to intensify its severity among adolescents. Bullied children have been found more likely, even than peers maltreated by a caregiver, to be depressed and/or anxious. Unfortunately, little research has examined factors that may mediate the relationship between bullying victimization and these negative outcomes.
Using a longitudinal design, the current study will look at the following: Do self-blame, self-esteem, and/or emotional dysregulation mediate negative outcomes for students who have been bullied?
The current study hopes to add to the existing bullying literature by surveying an understudied population: rural students in the southeastern US. Negative outcomes measured will be: depression, anxiety, somatic complaints, and overall difficulties. Educators, clinicians, and other practitioners can benefit from a fuller understanding of the mechanisms that lead some students to increased difficulties while others are minimally impacted.

Augmentation of In-Furrow Applied Insecticides with Superabsorbent Polymer to Combat Spotted Wilt of Peanut

J. Mitchum Haynes[1], Nathan Smith[2], Albert Culbreath[3], and Dan Anco[1]
[1]Clemson University, Department of Plant and Environmental Sciences
[2]Clemson University, Department of Agricultural Sciences
[3]University of Georgia, Department of Plant Pathology

Spotted wilt of peanut (Arachis hypogaea L.) is a common disease that causes severe economic losses in peanut producing regions around the world. The causal agent is Tomato spotted wilt orthotospovirus (TSWV), which is transmitted by species of thrips (Thysanoptera: Thripidae) with western flower thrips (Frankliniella occidentalis) and tobacco thrips (F. fusca) being of particular importance in the southeastern United States. Field trials were conducted in 2017 to determine if management of spotted wilt and subsequent productivity of peanut could be improved by applying a superabsorbent polymer (2.24 kg/ha) with standard in-furrow insecticides at the time of planting. To determine this, insecticides (phorate and imidacloprid) were individually applied with or without polymer across varieties susceptible (FloRun 157 or TUFRunner 511), moderately susceptible (Georgia 06G), and resistant (Sullivan and TifNV-High O/L) to TSWV. Untreated controls were included in all trails. The study utilized a randomized complete block design and was conducted in three locations across South Carolina and Georgia. Stunting of plants was significantly reduced (reduction of 8%, $P<0.05$) when susceptible varieties were treated with phorate and the polymer. Polymer-associated effects on thrips counts and damage, phytotoxicity and yield were not significant ($P>0.05$) across locations. While additional experiments are needed, these results suggest that superabsorbent polymer could be used to mitigate the symptoms of spotted wilt on susceptible varieties.

Forming Team-Based Learning Teams with Kolbe A™: The Effect of Team Construction and Training about Conation on Team Satisfaction

Staci N. Johnson, Eliza D. Gallagher, and Claire L.A. Dancz
Department of Engineering and Science Education, Clemson University

The ability to work in teams is an essential skill for college graduates to possess as they enter the job market. Team-based learning (TBL) course design attempts to capitalize on the benefits of team work while providing frameworks intended to decrease the likelihood and severity of social loafing. Evidence suggests that this course design is not sufficient to overcome all negative practices and opinions for students working in teams. Student attitudes toward team work and assignments within TBL courses have been previously shown to be positive, but there is still room for improvement. This quasi-experimental test-retest study examined the impact of a) utilizing Kolbe A™ Index scores for team formation and b) training about conation, on student perceptions of their team within an undergraduate science course (n=22). Since the objective was to determine if a) Kolbe A™-based team formation and b) training about Kolbe A™ scores, affects the perception of team work, students were surveyed at three times points in the semester utilizing the ten-item "Feelings About Teams" survey. Creating student teams with Kolbe A™ resulted in improved “cohesion” (items 8 and 9; $p<0.0083$) while the combination of team formation and training about conation resulted in improved “communication” (item 1; $p<0.0167$), “cohesion” (items 2, 8, 10; $p<0.0083$), and “mutual respect” (item 7; $p<0.0167$). Future research should repeat these methods with a larger and more diverse population of students.

The Role of Using *World of Warcraft* in Facilitating Vocabulary Acquisition for English Language Learners

Juan Li
Clemson University, College of Education

This sequential explanatory mixed methods study intends to explore ELLs' vocabulary acquisition under a gaming environment by conducting a replication of a current survey study, and then a follow-up in-depth exploration with four purposefully selected participants using interviews and other text-based materials. The first, quantitative study aims to address game players' attitude towards acquiring English vocabulary through playing World of Warcraft (WoW) (Blizzard Entertainment, 2012), and by extending the existing instruments, testing the model fit, and conducting a path model, probe the factors that serve as predictors to players' preference of using WoW to acquire vocabulary. The second, qualitative case study will elaborate the statistical results derived from the first phase to further understand why and how these predictors contributing to players' English vocabulary acquisition in the gaming world of WoW. Both studies will be pilot tested. This study will first inform the educators of the factors that positively affect players' attitude towards using WoW for English vocabulary learning, and the follow-up exploration will provide valuable information of how and why the facilitative outcomes take place.

Transforming filters into a controlled-mixers for renewable energy harvesting

Jaime A. Idarraga-Mora[1], Scott M. Husson[1],
David A. Ladner[3]
[1]Department of Chemical & Biomolecular Engineering
[3]Department of Environmental Engineering and Earth Sciences

Osmosis is simply the natural trend of solutions of different salt content to get mixed, even when there is a filter between them. Reverse osmosis (RO) happens when water goes in the opposite direction of the naturally-occurring osmosis. Commercial filters used for seawater desalination are known as reverse osmosis membranes. These membranes perform excellent in separating seawater and fresh water with a high reverse water flow at high pressure, however, they do not promote fast mixing (high natural flow) of solutions when this pressure is lowered. Enabling the speed of this mixing, would lead to technologies that harvest renewable energy.
The objective of this work was to reduce the overall structure of a RO membrane. We achieved this reduction in structure of the RO membrane, by replacing the nonwoven backing, and recomposing it using robust, woven mesh with less thickness, higher porosity, and different opening sizes. We studied the role of the opening size of woven mesh on mechanical strength and water flow through the RO membrane. Results showed that woven mesh backings provide sufficient strength; however, the membrane undergoes deformations when pressure and the opening size increase. An opening size of 125 µm or smaller provided sufficient strength to a commercial membrane when operating at 200 psig. In the best case, the SW30HRLE structure was reduced by 74%, yielding a 48% improvement in water flow through the membrane. We concluded that resistances to osmosis in a RO membrane are additive, and are reduced by using woven mesh backings.

Hybrid Cooling System for Ground Vehicle Applications

Shervin Shoai Naini, Junkui Huang, Richard Miller, and John Wagner
Clemson University, Department of Mechanical Engineering

Improved propulsion system cooling remains an important challenge in the transportation industry as heat generating components, embedded in ground vehicles, trend toward higher heat fluxes and power requirements. The further minimization of the thermal management system power consumption necessitates the integration of parallel heat rejection strategies to maintain prescribed temperature limits. When properly designed, the cooling solution will offer lower noise, weight, and total volume while improving system durability, reliability, and power efficiency. This study investigates the integration of high thermal conductivity materials, carbon fibers, and heat pipes with conventional liquid cooling to create a hybrid "thermal bus" to move the thermal energy from the heat source(s) to the ambient surroundings. The innovative design can transfer heat between the separated heat source(s) and heat sink(s) without sensitivity to gravity. A case study examines the thermal stability, heat dissipation capabilities, power requirements, and system weights for several driving cycles. Representative numerical results show that the high thermal conductivity materials and carbon fibers offer moderate cooling while loop heat pipes provide significant improvements for passive cooling.

Connecting weather and space weather: An information theory based approach to diagnose atmospheric tidal variability using satellite data

Komal Kumari, and Jens Oberheide
Clemson University, Department of Physics

Evidence shows that Earth and its atmosphere are changing due to both natural and human-induced effects. Scientists need to understand current atmospheric processes, so they will be better able to determine future changes and assess the consequences for society. Earth's atmosphere supports a variety of waves which are responsible for spatial-temporal changes in temperature, winds, density, and chemical constituents. "Atmospheric Tides" are the most striking dynamical feature of the upper atmosphere (i.e. mesosphere and lower thermosphere [MLT], 50-120 km). Tides are key to understanding how tropospheric weather influences space weather. Seasonal variability of the tides and its impact on the MLT has been extensively studied, but very little is known about variability on shorter time scales. Evidence shows that day to day tidal variability is quite significant. Therefore, it is very important to assess short-term variability and see its role in dramatic variability of various state variables of the ionosphere, thermosphere, and mesosphere. Due to current inherent observational limitations for this purpose, I am developing a statistical empirical model of short term tidal variability using a novel approach leveraging Information Theory and Bayesian statistics. The model diagnoses short-term tidal variability as a function of other atmospheric drivers using time dependent probability density functions, Shannon entropy and Kullback-Leibler divergence. In the talk, the statistical significance of the approach and its predictive capability will be exemplified using SABER (an instrument onboard the TIMED satellite) tidal diagnostics.

A Polydiacetylene Based Biosensor for Foodborne Pathogen Detection

Yueyuan Zhang[1], Tim Hanks[2], Julia Northcutt[1], Bill Pennington[3], Paul Dawson [1]
[1]Department of Food, Nutrition and Packaging Sciences, Clemson University
[2]Department of Chemistry, Furman University
[3]Department of Chemistry, Clemson University

The overall objective of my research is to develop biosensors for the rapid detection of foodborne pathogens in a food processing environment using polydiactylene vesicles. Polydiacetylene (PDA) vesicles are conjugated polymers which can self-assembled in water, possess a liposome-like bilayer structure and blue in color after UV irradiation. It has been reported that stimuli such as mechanical stress, temperature increase or pH change will trigger the color transition from blue to red. In this study, selected aptamer(ssDNA) was conjugated to the surface of PDA vesicles to target Salmonella enterica typhimurium. With the aptamer conjugated, PDA vesicles will be able to "catch" the bacteria and therefore undergo a color transition from blue to red within a short time. Uniform PDA vesicles have been generated using efficient inkjet printing method to minimize the particle size variation. Aptamers were conjugated to the polydiacetylene vesicle surface using EDC-NHS reaction. Salmonella enterica typhimurium and E. coli have been tested for specificity. Sensitivity of the biosensor will also be investigated in this study.

West Point Women's Views on Leadership: Perspectives from the First Female Graduates Through Current Cadets

Leslie Lewis
Clemson University, Department of Educational and Organizational Leadership Development

Women's leadership experiences in male-dominated settings are understudied and, as a result, are not always clearly understood. Women have attended the US military service academies since 1976. In the spring of 2016, the US Military Academy (USMA) celebrated 40 years of women at West Point with a conference attended by women graduates from across the years (and current women cadets). These women represented considerable leadership experience and a wide variety of careers, both in and out of the military. There is little scholarly research, however, on the lived experiences of these women and even less on women and leadership development at West Point. This research is an attempt to begin to fill that gap and gain insight into how women's experiences at West Point impacted their leadership development. This presentation will share the results of a qualitative survey study, which included responses from West Point women from all four decades and current women cadets. The presenter will share how participants defined leadership, identified their own roles as leaders at West Point, and described how their experiences at West Point affected their leadership development. Although the survey focused on leadership, themes of sexism, misogyny, and lowered self-confidence, as well as resilience and persistence, emerged in the women's responses. This work is important in adding to the existing literature of women's experiences in male-dominated environments and sets the stage for the examination of the leadership development of women in other male-dominated settings like STEM.

A systematic review of the psychological, sociological, and educational outcomes associated with participation in wildland recreational activities.

W. Hunter Holland[1], , Jennifer Thomsen[2], Christopher Monz[3], and Robert Powell[1]

[1]Clemson University, Department of Parks, Recreation & Tourism Management
[2]University of Montana, Department of Society and Conservation
[3]Utah State University, Department of Environment and Society

Participation in wildland recreation is associated with a range of individual-level outcomes. Although these outcomes have been extensively studied, few have systematically examined and summarized this empirical evidence. Therefore the goals of this study include identifying: 1) the breadth of individual-level outcomes associated with wildland recreation; 2) the setting and programmatic attributes that research suggests are driving these outcomes; and 3) the gaps in our knowledge regarding the outcomes associated with wildland recreation. We systematically examined 235 articles published between 2000 and 2016 that evaluated the psychological, sociological, and educational outcomes associated with participation in wildland recreation. We identified 11 broad categories, the most common related to personal development (59%), pro-social behaviors (52%), mental restoration (42%), and environmental stewardship (36%). Results highlight some gaps in our knowledge regarding outcomes and their potential causes. We conclude by discussing trends and implications for managers and future research.

Understanding the Roles that Surface Physical Modification Play on Membrane Fouling

Anna Malakian, and Scott M. Husson
Clemson University, Department of Chemical and Biomolecular Engineering

Reduction in water transport (flux) due to fouling is one of the largest costs associated with membrane processes in water treatment. The key to minimizing the energy intensity of membrane-based water treatment systems is designing membranes with high water transport and low fouling propensity. The fouling propensity of a membrane depends greatly on foulant type, operating conditions, and membrane surface properties. Literature and experience show that modification of membrane surfaces with chemical coatings can be effective but not sufficient for controlling membrane fouling. The observation that physical patterning of a membrane surface can improve its fouling resistance provides an orthogonal membrane design parameter. The objective of this project is to develop fouling-resistant membranes. To attain the project objective, we carried out a systematic study to understand the roles of membrane surface properties on threshold flux using crossflow filtration with a constant crossflow velocity. A line and groove nano-pattern was applied by embossing commercial polyamide thin-film composite nanofiltration membranes such as the GE HL series. Silica nanoparticles were functionalized by silane chemistry and applied as a model foulant to study the role of colloidal foulant chemistry. Results of this study suggest that combining physical patterning on a membrane surface is an effective strategy for designing membranes with a low propensity for fouling by colloidal nanoparticles.

Nitrogen stress induced modification of the foliar phytochemical composition in strawberries

Ashwini Narvekar, and Nishanth Tharayil
Clemson University, Department of Plant and Environmental Sciences

Secondary metabolites play a significant role in acclimatizing plants to various environmental stresses. Though many of these secondary metabolites have direct benefits to human health, the current agricultural practices, by providing optimal growing conditions, compromise the biosynthetic capacity of plants to produce phytochemicals. Our work focuses on the nutrient stress dependent inflection point of carbon partitioning between growth and production of phenylpropanoids in plants. Using a non-targeted metabolomics approach, present study exhibited a non-linear response between foliar phytochemical content in Fragaria ananassa (cv.Camarosa and Albion) and applied nitrogen (N) fertilizer concentration (control, 8mM N, 16mM N and 30mM N). The tentatively identified metabolites encompassed different groups of phenolics namely, hydrolysable tannins, hydroxycinnmate derivatives, flavones, flavonols, flavan-3-ols and proanthocyanidins. In cv. Albion, the content of different phenolic classes, was lowest ($P<0.05$) at 16mM N as against control and 30mM N treatment. However, in cv. Camarosa, the different phenolic content exhibited linear increase with decrease in N concentration. Flavonol content in both the cultivars increased by >1.2 fold at low N treatment as against 30mM N. Simple monomeric and dimeric ellagitannins including tellimagrandin and geraniin was abundant under nitrogen deficiency, whereas, complex ellagitannins including casuarcitin and castalgin was more abundant under nitrogen replete treatment, exhibiting variation within a class. The total proanthocyanidins content increased with decrease in N fertilization in both the cultivar and the increase predominantly contributed from vacuolar derived form. In general, low N treated samples exhibited higher antioxidant capacity on DPPH.

Exploring venom gene expression among lineages of the Sidewinder rattlesnake (Crotalus cerastes) through venom gland transcriptomics

Rhett M. Rautsaw[1], Darin R. Rokyta[2], Christopher L. Parkinson[1]
[1]Clemson University, Department of Biological Sciences
[2]Florida State University, Dept. of Biological Science

Within many species of venomous snakes, venom differs significantly across geography and life stage. Understanding and characterizing geographically or ontogenetically variable venom can be used to explore the factors influencing phenotypic divergence and maintenance. Sidewinder rattlesnakes (*Crotalus cerastes*) are small-bodied, moderately-venomous snakes endemic to warm deserts in southwestern North America. Despite being relatively common, few studies of the venom composition and variation of this taxon have been undertaken. Here, we used RNA-seq to characterize *C. cerastes* venom expression across their range in the United States and test for differential expression among phylogeographic lineages and age classes. We collected eight *C. cerastes* representing four phylogeographic lineages in the southwestern United States, isolated and extracted RNA from their venom glands, and generated transcriptomes in order to characterize toxin gene expression for the species. We compared toxin gene expression among individuals using hierarchical clustering and differential expression analysis. *Crotalus cerastes* venom was comprised largely of hemorrhagic toxin genes—mainly snake venom metalloproteases (SVMP)—though the most highly expressed transcript was a neurotoxic phospholipase A2 (PLA2). Sidewinder venom composition appeared largely conserved across the species as hierarchical clustering demonstrated a largely homogeneous pattern of expression and few genes were found to be significantly differentially expressed across geography or age. The conservation of venom expression is surprising given that many other rattlesnake species exhibit well-known intraspecific venom variation. Our data represent the first venom gland transcriptomes of *C. cerastes* and provides evidence of venom expression conservation in this species.

The Effects of Yoga on Physical Functioning in Community-Dwelling Older Adults

Alysha A. Walter[1], Brandi M. Crowe[1], Marieke Van Puymbroeck[1], Jaesung Park[1], Em V. Adams[1], and Arlene A. Schmid[2]
[1]Clemson University, Department of Parks, Recreation & Tourism Management
[2]Colorado State University, Department of Occupational Therapy

Impaired balance, loss of muscle strength, and decreased flexibility are associated with the loss of physical function in older adults.1-3 Muscle weakness and decreased lower body flexibility affect walking speed and dynamic balance during the again process.4,5 There is a high probability of fall risk for older adults with impaired balance.6 Yoga, an exercise involving breathing techniques, postures, and meditation, has been shown to improve balance, mobility, muscle strength, and flexibility.7-10 Thus, the purpose of this study was to determine the outcomes of an 8-week yoga intervention on balance, gait, flexibility, and strength in older adults. The Fullerton Advanced Balance Scale11 (FAB), the 10-meter walk12 (10MW), and the Senior Functional Fitness Test13 were the three assessments utilized pre-/post-intervention. Non-parametric statistical analysis to compare the within group means and calculation of percent change were conducted to determine changes over the 8-week period. Seven of 13 participants completed the yoga study. Participant's scores revealed a significant change in the Chair Stand Test and the 2-Minute Step Test. A positive trend was shown in the FAB, 10MW, Arm Curl Test, Back Scratch Test, Chair Sit-and-Reach test, and the Timed Up-and-Go Test. An eight-week yoga intervention may have the potential to improve balance, strength, and flexibility in older adults based on positive trends demonstrating improvement in the data. The results suggest that yoga may be an effective exercise for older adults.

Ambient Desorption-Optical Emission Spectroscopy Using a Liquid Sampling-Atmospheric Pressure Glow Discharge Microplasma Source

Htoo W. Paing, and R. Kenneth Marcus
Clemson University, Department of Chemistry

One of the biggest challenges in analytical chemistry that we face today is the lack of a truly portable technique for detection of a wide range elements in ambient conditions that does not require sample preparation. Current techniques that utilizes inductively coupled plasma for elemental analysis requires not only a large bench top space but also an excessive amount of resource consumption in terms of power, gas, and analyte. This presentation describes a novel concept of utilizing a microplasma source for the purpose of ambient desorption-optical emission spectroscopy. Gaining elemental information in open air without the need for expensive and bulky instrumentation. This source will allow for the analysis of solid and residue samples without the requirement sample preparation. In terms of nonproliferation, it can gather important information such as if it is truly a nuclear bomb, what is the construction material of the bomb carrying device, what is purity of the materials used, etc. This presentation will describes the method, instrumentation, and applicability of this instrument. Also, disadvantages, advantages, and future research on this device will be mentioned.

Living to work: the effects of occupational calling on mental health at work

Chloe Wilson, and Thomas W. Britt
Clemson University, Department of Psychology

While many employees work to live, others live to work. Those who experience work this way are described as having a calling. Calling refers to employees who feel emotional ties to their work, viewing their work as both important and rewarding. Many positive outcomes have been linked to calling, but less is known about the potential negative outcomes that may also occur. Those employees who perceive emotional ties to their work tend to devote longer hours and make personal sacrifices to live out their calling (Bunderson & Thompson, 2009; Serow, 1994). Employees with a calling have been found to willingly sacrifice their own time, providing additional resources and energy to the organization because of their felt importance to the work (Bunderson & Thompson, 2009; Serow, 1994). These individuals are at risk for potential poor mental health symptoms. The present study contributes to research by examining how different components of calling resulted in increased mental health symptoms through both working excessively and compulsively and work-family conflict. These findings demonstrate the unique contribution and the greater impact that working excessively has on individual mental health symptoms. In summary, while working excessively, or compulsively may be beneficial for the organization, it poses as a threat to employee's mental health symptoms. The results provide additional evidence to the growing research on the dark side of calling.

A Review of the Association Between Neural Tube Defects and Maternal Obesity

Lucy Pulliam, and Jane DeLuca
[1]Clemson University, Healthcare Genetics
[2]Clemson University, School of Nursing

Neural tube defects (NTDs) are a devastating form of birth defect that occurs in 0.5-2/1000 pregnancies worldwide, making them one of the most common serious birth defects. Findings that a low intake of the vitamin folic acid can increase the risk of NTDs in pregnancy led to a campaign to fortify flour with folic acid and encourage folic acid supplements during the periconceptional period. This resulted in a significant decrease in NTDs. However, a cohort of NTDs continues to occur. Understanding the reason for these folic acid resistant NTDs and decreasing their occurrence is an important public health goal. Maternal obesity (BMI > 30) has been implicated as a risk factor for NTDs. It is crucial today to understand the role of maternal obesity in NTDs since obesity is increasing in the U.S. and worldwide at an alarming rate. The purpose of this study was to do a systematic review of the literature of the past 10 years to determine the association between maternal obesity in pregnancy and the risk of having a baby with a NTD. Four individual studies showed a correlation between maternal obesity and the occurrence of NTDs, as well as three large meta-analyses. The odds ratios of these three meta-analyses indicated that maternal obesity increased the risk of NTDs in pregnancy – OR 1.68, OR 1.70, and OR 1.87. Associations between NTDs and maternal obesity are apparent and require additional investigation.

Torpor Patterns and Hibernacula Conditions of Perimyotis subflavus in White-Nose Syndrome Positive and Negative Sites

Pallavi Sirajuddin[1], Susan C. Loeb[2], and David S. Jachowski[1]
[1]Clemson University, Department of Forestry and Environmental Science
[2]United States Forest Service, Southern Research Station

Perimyotis subflavus populations have experienced >90% declines in the southeastern U.S. due to white-nose syndrome (WNS), despite milder and shorter winters. Data are lacking on P. subflavus response to WNS and hibernacula temperatures in the south. We initiated a study in the winters of 2015-16 and 2016-17 to compare torpor patterns and hibernacula conditions of P. subflavus in WNS+ in South Carolina and WNS- sites in Florida and Mississippi. We used temperature sensitive radio transmitters and Lotek dataloggers to record individual skin temperatures (Tsk) and iButtons to record hibernacula temperatures (TH) and humidity. We collected data on 29 P. subflavus in SC, 12 in FL, and 8 in MS. Mean TH in SC ranged from 9.3°C to 12.1°C and mean TH was 13.6°C in FL. Bats in MS rarely went into deep torpor. Average torpor Tsk in SC (15.5°C) did not differ significantly from average torpor Tsk in FL (15.9°C) and were well within Pd growth range. Torpor bouts ranged from 1 to 15 days and numbers of torpor bouts did not differ between sites ($P = 0.12$). Arousal length ranged from 30 to 593 minutes and arousal frequency did not differ between sites ($P = 0.22$). Bats typically aroused during the evening 2-3 hrs before sunset for all three sites. Our results suggest similar torpor patterns between SC and FL indicating that cavernicolous bats in the southern part of the range are highly susceptible to WNS but bats that use other types of roost may be less susceptible.

Research Agenda in Barriers to Successful Research Commercialization

Grant A. Allard
Clemson University, Policy Studies

My poster presents my research agenda for exploring the barriers to efficient technology transfer from universities and public research organizations to commercial applications and what we can do to overcome them. I present my research question, the state of scholarly literature on this topic, and the four streams of scholarly research I am pursuing to create new knowledge and practical insights. I will include an interactive element to my presentation that engages participants to think further about university technology transfer and give feedback from their experiences.
Technology transfer, or research commercialization, is the process of translating scientific findings into commercial use. Research commercialization is part of the mission for universities and public research organizations such as the United States' national laboratories because it is thought to support innovation and economic development. Yet, only a fraction of the technologies that are invented and patented are commercialized. We do not understand the causes of these barriers or the actions that governments can take to overcome them. I research the technology transfer process and the decisions that governments can make through four streams: 1) the organization of technology transfer, 2) information behavior in technology transfer, and the political economy of technology transfer, and 4) ethics in technology transfer.
My poster will be designed to be compelling for scholars and understandable to non-experts. Technology transfer is of utmost importance to national economic competitiveness, solving of large global problems, and national defense. I will show how my research has implications for each.

Concentration polarization modeling for high-pressure membranes with engineered surface features

Zuo Zhou[1], Steven T. Weinman[2], Scott M. Husson[2], Sapna Sarupria[2], David A. Ladner[1]
[1]Clemson University, Department of Environmental Engineering
[1]Clemson University, Department of Chemical Engineering

Patterned membranes have attracted a lot of attention and have been seen as a promising method to reduce membrane fouling, thereby increasing membrane performance. Research has focused on studying the influence of patterned membranes on fouling. Concentration polarization (CP), as a mass transfer related phenomenon that often results in fouling, needs to be studied thoroughly to help understand patterned membrane systems. The main objective of this paper is to review concentration, shear stress and pressure profile over a wide range of pattern sizes. A computational framework was developed to predict concentration polarization of flat and patterned membranes using computational fluid dynamics (CFD) method. Several models with rectangle, trapezoid and triangle patterns ranging from nanoscale to millimeter scale were examined under the same pressure, velocity, and salt concentration conditions. Results indicated that patterns affected velocity, shear stress and concentration distributions dramatically. Membranes with large patterns had distorted velocity profile in the system due to the surface features. Lower shear stress was observed in the lower region of the patterns, corresponding to the higher concentration region. Under laminar flow, pattern height plays an important role in reducing CP. In most cases, patterns only increased concentration polarization, unless it reaches a certain size where vortices develop. The best pattern discovered in the models reduced CP by 21.6% compared to a flat membrane and increased flux by 1.48%.

Early semester prediction of student completion of self-paced course components

Khushikumari Patel[1], Eliza Gallagher[1], Charity Watson[2], Claire L. A. Dancz[1]
[1]Clemson University, Department of Engineering and Science Education
[2]Florida International University, STEM Transformation Institute

Nationwide, a surge in students who are under-prepared for collegiate mathematics has left institutions struggling to meet the needs of these learners. Many schools have moved to online or hybrid instructional models for developmental mathematics. These models work very well for many students, but not at all for others. At Clemson University, all STEM majors who are not yet calculus ready take precalculus under blended course model that includes an asynchronous, self-paced, online component and a face-to-face support component. One lens for understanding why some students struggle in self-paced courses is to observe how a student approaches a task. The Kolbe A™ Index measures an individual's conation, or method of operation when given flexibility in approaching a task. In the precalculus course at Clemson, each student works independently on the self-paced component and can be assumed to follow his/her natural conative instincts. Our objective is to use the Kolbe A™ Index to predict at the start of the semester which students are likely to struggle in self-paced course components and, ultimately, to offer recommendations on how to help these students complete such courses. This study focuses on the correlation between Kolbe ATM results and student performance in precalculus to determine if certain conative categories are particularly well-suited or poorly-suited to this course model. We report preliminary data from a small pilot study and discuss next steps to predict which students are "at risk" on the basis of Kolbe ATM results.

Risky behaviors and violence among adolescents

Ana Uka
Clemson University, Institute of Family and Neighborhood Life

Current research suggests that the knowledge of the associations between adolescent risky behaviour and delinquent behaviours such as fighting at school or violence among peers is conceptually and empirically inadequate to substantially provide a base of assessment of adolescent health and risk. The aim of this paper is to contribute towards the knowledge and findings about the relationships between adolescent risky behaviours and violent behaviours among adolescents in an educational setting. From a developmental perspective, links between such behaviors in adolescence are discussed and investigated in light of a psychosocial stress model. This report summarizes results from Youth Risk Behavior Survey (YRBS), the 2011 national survey, conducted among students aged 12-18 in grades 9–12. A total of 15,364 students completed the national survey in 2011 where (N = 7656, 49.6%) were male and (N = 7708, 50%) were female students. Bivariate and multivariate logistic regression analyses showed that the odds of fighting at school are increasingly greater as children's frequency of carrying weapon at school ($\beta = 1.77$, SE =.08), playing videogame and watching TV scores separately increase among different races. When all four predictor variables were considered together, they significantly predicted whether or not a student would fight at school, ($\chi 2 = 478.67$, df = 5, N= 14059, $p < .001$). Finally, conclusions for future research, behavioral interventions and educational policies on adolescent health are provided.

The Perpetuation of Orientalist ideologies for post 9-11 Pakistan

Firasat Jabeen
Rhetorics, Communication, and Information Design, Clemson University

In his landmark scholarship Orientalism, Edward Said tells us that mass media in the postmodern world provides the reinforcement of orientalist mindsets towards the Orient—an argument which is corresponding to what Johan Galtung contends about the structural imperialism of center and periphery in terms of communication. Galtung claims that "just as the Periphery produces the raw material that the Center turns into goods, the Periphery also produces events that the center turns into news" (93). Following these assumptions, this paper analyses the orientalist issues by comparative rhetorical analysis of media portrayals of two incidents in Pakistan: (i) the Daniel Pearl Case (2002), and the Raymond Davis Case (2011). By employing propaganda theories offered by Edward S. Herman and Noam Chomsky, I rhetorically analyze the news stories of these incidents in the US print media, under the framework of "worthy and unworthy victims." This essay argues that the US media perpetuates the orientalist issues—Western civilizational superiority versus Eastern barbarism—about the East (in this case Pakistan). The comparison of these two incidents not only provides examples of the US media's proclamations about an aberrant and inferior East but also a site to explore the global hegemony of information that the US media enjoys. Thus, by comparing two above-mentioned incidents, I argue that in the post 9/11 world, the process of orientalism, implicated in the operations of power—imperialism, still perpetuates for Pakistan.

The Effect of Freezing on Peach Quality

Wesam Al-Jeddawi[1], Urban Wählby[2], and Paul Dawson[1]
[1]Clemson University, Department of Food, Nutrition and Packaging Sciences
[2]The Electrolux Group

Loss of quality is one of the major problems facing the produce market. In general, the higher storage temperatures cause faster deterioration due to biological, chemical and physical changes which lead to reduce overall quality. Freezing is a simple method to preserve foods especially fruits. The purpose of this research is to determine whether freezing rates and holding temperatures influence peach quality (physical and chemical properties). Peaches (*Prunus persica*) were cut into 8 lengthwise slices and dipped in 2% of ascorbic acid for 2 minutes. The slices were then drained and packaged. Fifteen treatments of peach were placed into freezers at different freezing rates to core holding temperatures of (20°F), (10°F), (0°F), (-20°F) and (-106°F). Quality measurements included freeze and thaw loss, color (L, a, b, chroma, and hue values), texture, moisture content, ascorbic acid equivalent antioxidant capacity (AAEAC), scanning electron microscopy (SEM) and sensory evaluation. Peach slices frozen at (-106°F) had less weight loss and lower L* and a* values than samples frozen at (20°F) while the b*, chroma and hue were higher at (20°F) than (-106°F). The firmness values of all the frozen-thawed peaches samples decreased. The firmness value of (-106) was lower than the firmness value of (20F). There was no difference among all samples in AAEAC and moisture content. There were larger and fewer surface ice crystal pores at (20°F) than (106°F). The sensory evaluation was acceptable and similar for all samples after freezing while the samples after thawing were not acceptable primarily due to changes in appearance.

Engineering Enzymes for Broad Temperature Range Applications Through Active Sites Flexibility

Weigao Wang, and Siva Dasetty
Clemson University, Department of Chemical and Biomolecular Engineering

Psychrophilic and thermophilic enzymes show different optimal temperatures. Compared with the thermophilic enzymes, the psychrophilic enzymes have fewer enthalpic interactions to break to form the transition state from the enzyme-substrate complex. However, whether the cold activity can be added by introducing the flexibility is still unknown. In this study, nine residues were mutated by either being replaced with Glycine or the small side chain amino acids. Two out of nine mutants (E316G and E361G) were selected out. The activity assays of mutants and wild type on three different substrates (p-nitrophenol butyrate, p-nitrophenol octonoate and p nitrophenol laureate) showed that compared with wild type, mutants marginally increased specific activities compared with the wild type GTL on p-nitrophenol butyrate(C4), and decreased specific activities on p-nitrophenol octonoate (C8) and p-nitrophenol laureate(C12). Moreover, after 3 hour-incubation at 70oC, the fractional activities retained of these two mutations were higher than the wild type. Furthermore, the activation enthalpy and entropy of E361G and E316G showed decreased values compared with the wild type on both C4, C8 and C12. From the dynamic simulations, mutations showed decreased fluctuation on the lid domain, and insignificant change of the flexibility around the active sites. The docking results showed the wild type binds better than mutants on three substrates mentioned. The structural analysis using simulation found that the catalytic triads of the mutants are different with wild types, which may contribute to the changes of the specific activities.

Adaptive Sport for Social Change: An Evaluation of the Effectiveness of a U.S. – Thai Sport Diplomacy Program

Garrett A. Stone, Lauren N. Duffy, Jordan J. Chastain, Jason C. Chavis, Joseph P. Duma, Lauren Fleming, Wallace Gulledge, Megan L. Latimer, Madeline L. Nance, Samantha L. Stevenson, and Hannah M. Wells
Clemson University, Department of Parks Recreation and Tourism Management

The purpose of this study is to investigate the effectiveness of a sports diplomacy program funded by the U.S. Bureau of Education and Cultural Affairs (BECA). The program, Adaptive Sport for Social Change (ASSC), is designed to provide increased adaptive sport opportunities in Thailand through a train-the-trainer model that develops the interest and capacity of local university students. Ultimately the program aims to prepare students enrolled in the Institute of Physical Education in Chiang Mai (IPECM) with the knowledge and skills needed to deliver adaptive sport programming in their communities. The core research question guiding the study is: How effective was the program in preparing IPECM students to deliver adaptive sport programming in their communities? In order to answer this question, data will be collected from three populations involved in the program: 1) IPECM students who will receive the training and immediately implement an adaptive sport program with Thai and U.S. adolescents, 2) U.S. coaches who will be traveling to Chiang Mai to train the IPECM students, and 3) U.S. adolescents with disabilities who are also traveling to Chiang Mai to participate in the program. Using a mixed-method design, data will be collected through participant observations, structured surveys, a rapid appraisal technique, and in-depth semi-structured interviews. The research team will then conduct quantitative (descriptive statistics, t-tests) and qualitative (thematic) analyses in order to answer the research question. The team will also share lessons learned, which may guide the efforts of individuals working with people with disabilities, particularly in international contexts.

High power and high brightness continuous wave near 980 nm single mode fiber laser using Yb-doped photonic bandgap fiber

Turghun Matniyaz, Joshua Parsons, Thomas Hawkins, and Liang Dong
Clemson University, Department of Electrical and Computer Engineering

We report on the generation of near 980 nm continuous wave single transverse mode laser output using Yb-doped photonic bandgap fiber (PBF). The active fiber is pumped by a multimode output diode laser at 915nm with maximum power of 140 W. The fiber has a hexagonal shape cladding and core with flat-flat core diameter of about 20um and flat-flat cladding diameter of about 122um. This PBF is designed such that higher order modes will have high transmission loss while maintaining negligible loss for fundamental mode. Previously reported experiments with record high output efficiency results used special fibers, e.g. rod-type photonic crystal fiber, saddle-shape fiber, etc., which limited its practical application. Past approaches using free space scheme with bulk optical elements achieved near 50% output efficiency, while monolithic scheme using all fiber optical elements achieved only near 20% output efficiency. In our case, we have used PBF with an average cladding diameter near 125um, which is convenient to splice with standard single mode optical fibers. We have achieved output laser efficiency of approximately 24% with single FBG scheme. Further experiments are continuing to reach our goal of increasing output laser efficiency to more than 50% with double-FBG scheme, i.e. HR FBG (>99% reflectivity) on pump end and OC FBG (near 10% reflectivity) on the opposite end. This could be used to build a monolithic fiber laser by splicing pump end of the HR FBG to the output pigtail fiber of the 915 nm pump

Quantitative Predictions of Shape Memory Effects (SME) in Polymers

Christopher Hornat, Ying Yang, and Marek W. Urban
Department of Materials Science and Engineering, Clemson University

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 extension 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 a single DMA experiment.

A Multicity Analysis of Urban Greenspace and Crime

S. Scott Ogletree
Clemson University, Department of Parks, Recreation, and Tourism Management

Urban greenspaces, such as parks, vacant lots, or greenways, are seen as a positive part of the city landscape. Many benefits to local and regional residents have been found to be associated with the amount of greenspace, from increased physical activity to better mental health. Along with these positive associations there has been thought that vegetated areas can also lead to increased crime. This relationship has been researched in a limited number of locations with varying results as to whether the correlation is positive or negative. As crime can be one barrier to residents receiving the benefits of urban greenspace, greater understanding of the relationship could lead to cities better designed to increase human well-being. This study investigates the association between urban greenspace and crime across 300 cities, accounting for possible environmental and social covariates of crime and extending prior studies that have focused on single cities. Using data at the census block group and city level, the relationship is tested in the context of differing social and physical settings to see if greenspace leads to higher crime and how this relationship varies across cities. Preliminary results will be presented.

Diamonds in the Rough? From King Coal to “Clean Coal”: Loco Motives to Make America Great Again

John Sherwood
Clemson University, Department of Environmental Engineering and Earth Sciences

How clean is clean coal? What is happening in the coal industry? Where are the jobs? And is there a conflict between coal jobs and mining "clean coal"? All this and more will be answered through an exploratory data analysis of coal usage throughout the U.S. from 2008 to 2016.

Engineered Current Collector Interface for High Energy Density Li-Ion Batteries

Lakshman Ventrapragada[1,2], Stephen Creager[2], Apparao Rao[1], Ramakrishna Podila[1]
[1]Clemson Nanomaterials Institute, Clemson University
[2]Department of Chemistry, Clemson University

Resistive interfaces within the electrodes limit the energy and power densities of a battery, e.g., a Li-ion battery (LIB). Typically, active materials are mixed with conductive additives in organic solvents to form a slurry, which is then coated on current collectors (e.g., bare or carbon-coated Al foils), to reduce the inherent resistance of the active material. Although many approaches using nanomaterials to either replace Al foils or improve conductivity within the active materials have been previously demonstrated, the resistance at the current collector-active material interface (CCAMI) - a key factor for enhancing the energy and power densities remains unaddressed. We show that carbon nanotubes (CNTs), either directly grown or spray coated on Al foils, are highly effective in reducing the CCAMI resistance of traditional LIB cathode materials (LiFePO4 or LFP and LiNi0.33Co0.33Mn0.33O2 or NMC). Moreover, the CNT coatings displace the need for currently used toxic organic solvents (e.g., N-Methyl-2-pyrrolidone or NMP) by providing capillary channels, which improve the wetting of aqueous dispersions containing active materials. The vertically aligned CNT-coated electrodes exhibited energy densities as high as: 1) ~500 Wh kg-1 at ~170 W kg-1 for LFP, and 2) ~760 Wh kg-1 at ~570 W kg-1 for NMC. The LIBs with CCAMI-engineered electrodes withstood discharge rates as high as 600 mA g-1 for 500 cycles in case of LFP, where commercial electrodes failed. The CNT-based CCAMI engineering approach is versatile with wide applicability to improve the performance of even textured active materials for both cathodes and anodes.

Feasibility and Psychosocial Outcomes for an Osher Lifelong Learning Institute Hatha Yoga Program

Adams, E.V., Walter, A.A., Van Puymbroeck, M., Crowe, B., Hawkins, B. Schmid, A.A.

Feasibility and Psychosocial Outcomes for an Osher Lifelong Learning Institute Hatha Yoga Program
The purpose of this study was to use a successful aging lens to evaluate psychosocial constructs and the feasibility of an Osher Lifelong Learning Institute based yoga program, and to evaluate the possible effects yoga may have on psychosocial constructs for older adults. Feasibility analyses included participant responses, and the demand, attendance, practicality of running the program, and the fidelity of the intervention. A packet of self-report surveys were administered at baseline and after the eight weeks of yoga to assess quality of life,22 hope,23 inspiration,24 well-being,25 barriers to exercise,26 leisure constraints,27 mindfulenss,28 meaning,29 self-compassion,30 grattitude,31 and demographic information. Two focus groups were conducted at the end of the eight weeks to record participants' perceptions of the course, and course outcomes. A convergent mixed methods approach was used to evaluate feasibility and client outcomes. Attendance and fidelity were observed by researchers. Quantitative measures were analyzed with SPSS 24; percent change was also calculated. Focus group were transcribed and analyzed independently by two researchers. Overall, qualitative results were positive, while quantitative were not. Participants conveyed the accessibility of chair yoga was imperative to their participation, and chair yoga was reportedly difficult to access in the community. Small class sizes and individualized attention with hands-on assists, reportedly increased benefits gleaned from the class. Participants reported that eight-weeks was not long enough to notice a change in overall quality of life, and a longer course may be considered. Four of the participants continued to engage in a yoga practice since the program ended.

Human Energy harvesting using Autowinder Principle

Abby George, David Moline, and John Wagner
Clemson University, Departments of Mechanical and Electrical & Computer Engineering

The proliferation of users for smartphones and smartwatches around the world has been pushing the research on extending the life and improving charging times for batteries. Meanwhile, technologies that harvest energy from seemingly wasteful sources hold promise over a dependence on the grid for power needs. The advanced functionalities and computing power offered by such smart devices means most devices lack the power capacity to last a full day of use, often forcing the user to depend on battery packs. However, the limitation on battery capacity and size constraints limit their usability, ultimately requiring users to depend on the power grid to recharge their devices. Hence, a portable energy harvesting system designed to generate electricity from human movements has great potential as an offline power source. In my research, the feasibility of a conceptual energy harvesting device based on the automatic winding mechanism found in watches is explored. The dynamics of the combined device-user system is studied and the equations are derived. The conceptual harvester device would consist of a pendulum coupled to a DC generator via a step-up gear train. The output from the generator would be rectified and conditioned to provide a constant DC power. The expected power output at each stage of the harvester is studied and simulated. A prototype energy harvester device is designed and fabricated to study the behavior.

The Piety of Violence: Dissent and Consensus in Post-Genocide Rwanda

Victoria Houser
Clemson University, Rhetorics, Communication, and Information Design

While extensive political and social justice research has been conducted on the genocide in Rwanda, few scholars have examined the significance of the rhetorical and symbolic action at play during and after the conflict. Using Kenneth Burke's concepts of piety and terministic screens, I argue that extending the range of symbolic interaction with the genocide opens space for understanding the intricacies of the mass violence. This dissuades people from reducing the events to the single, well-known catastrophe of the genocide and creates a wider dialectical interaction with the violence. I explore the cyclical nature of victimage in Rwanda through the lens of entelechy and then situate the use of terministic screens as a disruption to harmful consensus. Chantal Mouffe's and Sharon Crowley's theories of dissent inform the ways in which division operates as a healthy rhetorical function in the reconstruction of post-genocide Rwanda.

Use of Supplementary Cementitious Materials in Full-Depth Reclamation of Asphalt Pavements

Omar Amer, and Prasad Rangaraju
Clemson University, Glenn Department of Civil Engineering

Full Depth Reclamation (FDR) is a rapid means to rehabilitate existing pavements by mixing the reclaimed asphalt and base materials with ordinary portland cement (OPC). Compacting the resulted blend provides a stable base upon which a new layer of asphalt pavement can be constructed. The South Carolina Department of Transportation has employed FDR as a standard rehabilitation operation in maintaining the state's large network of roads. However, the huge demand for OPC in the FDR projects coupled with the relative tight supply of OPC is forcing the construction industry to explore the use of industrial by-

products as supplementary cementitious materials (SCMs). In this study, four different coal-combustion residues (coal ashes) from Duke Energy and ground glass fibers (GGF) from PPG Inc. are being evaluated for use in FDR projects. Two methods of implementing the selected SCMs are being investigated: (I) as pozzolans, to replace up to 40% of Cement by mass, and (II) as source materials in a geopolymer-based stabilization. For this purpose, the chosen SCMs were characterized for their chemical and mineralogical composition and physical properties. The pozzolanic reactivity, relevant mechanical and durability aspects of the blended materials – at selected dosage levels – are being inspected. The results so far have shown that both GGF and fly ashes can be used as pozzolans for base stabilization; however, stabilizing the base materials with GGF-based geopolymer yielded the best performance. This project highlights the beneficial utilization of industrial by-products as valuable construction materials, that otherwise would be land filled as solid wastes.

Savoring as a Moderator of the Daily Demands-Uplifts and Psychological Capital Relationship: A Daily Diary Study

Anton Sytine, Gargi Sawhney, Chloe Wilson, Clemson University, Maddie Keith, and Thomas Britt
Clemson University, Department of Psychology

Experiencing varying amounts of demands and uplifts on a day-to-day basis may affect an individual's psychological capital (PsyCap), that includes hope, optimism, resilience, and self-efficacy. Furthermore, savoring positive experiences may enhance the positive effects of experiencing uplifts, while diminishing the negative effects of experiencing demands. Therefore, the present study aimed to assess how experiencing daily demands and uplifts affect university students' PsyCap, as well as whether savoring positive experiences moderated the relationship between demands, uplifts, and PsyCap. University students (N=109) participated in a daily diary study over the course of eight days. Daily demands were negatively related to overall psychological capital and each subscale. Daily uplifts and savoring were positively related to overall psychological capital and each subscale. Finally, daily savoring significantly interacted with daily demands to predict same day optimism, resilience, and overall psychological capital. Future research ought to continue to examine how savoring affects individual's experience of daily demands and uplifts, as well as using dairy studies to gain a more in-depth understanding of individual variability in mental health outcomes.

Lentil (*Lens culinaris* Medikus) diet change body fat and gut microbiome

Niroshan Siva[1], Casey R Johnson[2], Vincent Richard[3], Elliot D. Jesch[4], William Whiteside[4], Pushparajah Thavarajah[1], Susan Duckett[5], and Dil Thavarajah[1]
[1]Plant and Environmental Sciences, Clemson University
[2]Mayo Clinic School of Medicine
[3]Biological Sciences, Clemson University
[4]Food, Nutrition, and Packaging Sciences, Clemson University
[5]Animal and Veterinary Sciences, Clemson University

Lentil is a rich source of protein, minerals, vitamins, and healthy carbohydrates known as prebiotics. Prebiotic carbohydrates are fermented by beneficial gut microorganisms related to body fat reduction. The objective of this study was to determine the effects of lentil based diet on body fat, blood plasma triglycerides (TG), and fecal microbiota composition in rats. A group of Sprague Dawley rats were fed with a standard diet, corn diet, and lentil diet for 6 weeks. End of the study period, rats fed with lentil diet showed lower mean body weight (443 g/rat) than rats fed with control (511 g/rat) and corn (502 g/rat) diets. Body fat percentage and TG concentration were reduced in lentil and control fed rats (20-24% and 109-133 mg/dl, respectively) than corn fed rats (29% and 169 mg/dl, respectively). Considering the fecal microbiome, Actinobacteria and Bacteriodetes abundance were increased in rats fed with lentil and corn (4-5% and 34-37%, respectively). Firmicutes were reduced in rats fed with lentil and corn (53-57%) than those who fed with standard diet (65%). These results showed that lentil diet may be used as a possible whole food solution to reduce obesity risk in humans. However, further human studies are required to determine the efficacy of lentil diet to combat obesity risk.

Effectiveness of Ultra-High Performance Concrete Coating on the Resistance of Steel Reinforcement to Corrosion

Haitham Z.Hussein, Prasad Rangaraju, and Amir Poursaee
Clemson University, Glenn Department of Civil Engineering

The total annual estimated direct cost of metals corrosion in the U.S. is estimated to be over a trillion dollars accounting for a staggering 6.2% of the nation's Gross Domestic Product (GDP). Corrosion is a common problem in reinforced concrete structures. Although, many solutions have been developed to deal with corrosion of steel in concrete infrastructure such as corrosion inhibiting admixtures, cathodic protection devices, etc. these remain as expensive options to remain effective. One potential long-term solution to control corrosion of steel reinforcement in concrete is using ultra-high performance concrete (UHPC) which possesses many advantages such as extremely low permeability and very high bond strength compared to conventional concrete. However, to use UHPC for the entire structure is an expensive proposition. As an alternative approach to protect steel reinforcement in concrete, coating of steel reinforcement with UHPC grout is explored in this study. Guided by our

previous study, the UHPC grout was prepared by using Type III portland cement with combinations of silica fume, silica flour and ground glass fiber and a powdered high-range water-reducing admixture and steel was coated by this grout. Coated rebar samples were immersed in chloride-free and chloride contaminated simulated portland cement pore solution and their electrochemical behavior in these solution were examined using linear polarization resistance (LPR) and half-cell potential techniques. The results obtained thus far showed high resistivity for coated samples compared to the uncoated rebars, offering a promise of UHPC coating as a means to enhance life of steel reinforcement in concrete.

Visualization and quantification of *A. niger* biofilms by Confocal Laser Scanning Microscopy

Aswathy Shailaja[1], Terri F. Bruce[2], Charles A. Pettigrew[3] and Rhonda Powell[2], and Julia L. Kerrigan[1]
[1]Department of Plant and Environmental Sciences, Clemson University
[2]Clemson Light Imaging Facility, College of Sciences, Clemson University
[3]Procter & Gamble, Global Microbiology, Mason, Ohio

Biofilms are a heterogenous aggregate of microorganisms that are adhered to a surface and enclosed in extracellular polymeric substances (EPS). To study filamentous fungal biofilms that are representative of those in the built environment, we established a method for engineering biofilms in a controlled reactor under low-shearing force on a glass coverslip. Aspergillus niger is being studied because it is ubiquitous and a model organism. The purpose of this research is to assess cell viability and EPS production in A. niger biofilms to better understand biofilm dynamics. Cell viability quantification in filamentous fungal biofilms has not been reported, thus we are comparing two different methods to determine which is optimal. One method utilizes the LIVE/DEAD Yeast Viability Kit containing FUN1 cell stain that exhibits orange-red fluorescent intravacuolar structures in metabolically active cells, while dead cells fluorescence green-yellow. The second method involves using the LIVE/ DEAD BacLight Bacterial Viability kit containing SYTO9, a green fluorescent stain with a capacity to penetrate the active cell walls, and Propidium Iodide, a red fluorescent stain that penetrates the damaged cell membrane. Confocal laser scanning microscopy and the computer program COMSTAT are being used to visualize and quantify biofilms. Once cell viability and EPS production methods are established, biofilms will be tested against anti-microbial agents to determine their efficacy.

An Evaluation of Bite Counting as a Form of Visible Feedback

Jacqueline McSorley
Clemson University, Department of Psychology

This study aims to determine if viewing bite count in real time has the same effect as viewing visible food records to decrease intake during a meal. A growing number of adults and children in the United States are considered overweight. Behavioral intervention is the most commonly used treatment to lower consumption of food in order to reduce rates of this epidemic. This includes the idea of self-monitoring food intake through a variety of methods like bite counting. Another factor that leads to the reduction of food consumption is the presence of feedback. This feedback can take the form of visible food records such as chicken bones, candy wrappers, or bottle caps. In this study, chicken wings were used as the visible food record and compared to a bite counting monitor. A 2x2 between-subjects study will be conducted with the following conditions: bones/bite group, bones/no bite group, no bones/bite group, no bones/no bite group. An effect of food waste is hypothesized such that individuals will consume fewer grams when the chicken bones are present. Additionally, an effect of bite count is hypothesized such that individuals will consume fewer grams when bite count is present. Finally, no interaction between food waste and bite count is hypothesized such that individuals will consume the fewest grams when both are present and the most grams when neither are present. Evidence from this study can lead to further reduction of food consumption in order to combat the obesity epidemic worldwide.

High sensitivity dopamine detection by non-graphitic nitrogen doped graphene

Bipin Sharma, Yongchang Dong, Lakshman Ventrapragada, Prakash Parajuli, and Ramakrishna Podila
Clemson University, Department of Physics and Astronomy

In this study, we present a study of the mechanism of dopamine (DA) sensing with nitrogen doped graphene electrode in cyclic voltammetry (CV). Graphene was doped by the method of Chemical Vapor Deposition (CVD) - a controlled way of doping graphene with different types of nitrogen doping configuration (pyridinic, pyrrolic, and graphitic). A 3 electrode working setup was constructed with the nitrogen-doped graphene (N-Graphene) as one of the electrodes, and cyclic voltammetry was performed with a DA salt as the electrolyte. A new detection limit of 2 μM was obtained.

Game for Learning--A deconstruction of RollerCoaster Tycoon Touch

Qianyi Gao
Clemson University, Department of Teaching and Learning

RollerCoaster Tycoon Touch is a construction and management simulation game where players can design, build, and manage unique roller coasters and theme park. This poster aims to better understand the mechanics of the game through the analysis of MDA Framework and explore its potential for learning through Vygotsky's social constructivism theory. Affinity groups or culture embedded in the game and its limitations are also presented.

What does volume of a molecule really mean?

Arghya Chakravorty, and Emil Alexov
Department of Physics and Astronomy, Clemson University

Biomolecules are what drive the existence of life and therefore understanding their roles at microscopic level can have significant implications. Decades of development of study have resulted into a multitude of models that can be used to investigate molecular behviours computationally. An important feature of such a model is a description of molecular geometry, such as volume and surface area (SA), which are essential to understanding processes of molecular transfer properties across media, their stability in solutions, etc. This has utility in the field of drug-design and pharamacology. Keeping in mind the wider implications of modelling molecular volume and SA, this talk examines the various models of moelcular volume, the reasons for their development, how they differ and how does that affect our understanding of molecular transfer phenomena.

Carbon Tape as Convenient Electrode Material for Electrochemical Paper-Based Microfluidic Devices (ePADs)

Paige Reed[1], Frederico J. Gomez[2], Maria Fernanda Silva[2], and Carlos Garcia[1]
[1]Clemson University, Department of Chemistry
[2]Instituto de Biología Agrícola de Mendoza Universidad Nacional de Cuyo, Mendoza, Argentina

Electrochemical paper-based analytical devices represent an innovative platform for fluid handling and analysis, with a wide range of applications. Nevertheless, the intrinsic properties of the paper can impose limitations to both the selection of the electrode material and the physical attachment of the electrodes to the device, both of which can significantly impact the analytical performance of the device. To address these limitations, we herein propose carbon tape, as a simple and low cost alternative to develop ePADs. The proposed materials were characterized using a combination of contact angle analysis, resistivity, Raman spectroscopy, cyclic voltammetry, and electrical impedance spectroscopy. To enhance the performance of the device, carbon nanotubes were then added to the paper device to provide not only a surface for proteins to adhere but also an enhanced electroactive surface. The analytical performance of the resulting device was assessed by integrating three enzymes that facilitate the oxidation of ethanol, glucose, and polyphenols and by performing the detection of these analytes in beer samples. The resulting device, for which materials costs less than a dollar, represents a simple alternative to monitor three of the most important parameters during the production of beers.

Derivative Conceptualizations Across Calculus and Engineering: An Analysis of Textbooks

Tony Nguyen[1], and Isabelle Matz[2]
[1]Clemson University, Department of Engineering and Science Education
[2]Clemson University, Department of Mathematical Sciences

The derivative has multiple aspects and representations. This study analyzes the qualitatively different ways that the derivative is conceptualized across calculus and engineering textbooks.

Understanding Tenure at Comprehensive Universities: A Phenomenological Exploration of Pre-Tenure Track Faculty Experiences

Chelsea Waugaman, and Pamela A. Havice
Clemson University, Department of Educational & Organizational Leadership Development

The tenure process for faculty at all types of higher education institutions and in all disciplines is oftentimes characterized in the literature as ambiguous and changing (O'Meara, 2011; O'Meara, Terosky, & Neumann, 2008). This is especially true in the understudied comprehensive university (Rice, Sorcinelli, & Austin, 2000; Youn & Price, 2009). The purpose of this research project was to explore what pre-tenure comprehensive university faculty experienced and how they successfully navigated their tenure track processes. To investigate this topic, a hermeneutic phenomenological data analysis was employed on interview data, participant journals, and promotion and tenure evaluation criteria collected from nine pre-tenure or recently tenured higher

education/student affairs faculty members in the 2017-2018 academic year. Themes were organized within a conceptual framework of faculty contexts that started from the individual micro-level, advanced to the institutional and disciplinary meso level, and concluded with a more global, abstract macro level that privileged certain faculty knowers and forms of knowledge (Gonzales & Rincones, 2011; Melguizo & Strober, 2007; Rhoades & Slaugher, 2004).Participant stories were overwhelmingly positive and brought to light the sources of support and forms of human, social/social network, and structural capital (Perna, 2005) the pre-tenure faculty possessed that helped them succeed at their institutions. This GRADS research lecture will unpack the participants' narratives, couched within the faculty contexts. The toolkits of capital the participants utilized will also be explained. Best practices will be shared for future comprehensive university faculty navigating tenure and senior faculty wishing to mentor junior, untenured faculty.

Evaluating the Effectiveness of Integrative STEM Education Teacher and Administrator Professional Development

Chelsea Waugaman, William L. Havice, and Pamela A. Havice
Clemson University, Department of Educational & Organizational Leadership Development

The integration of science, technology, engineering, and mathematics (STEM) education, also referred to as integrative STEM education, is a relatively new interdisciplinary teaching technique that incorporates an engineering design-based learning approach with mathematics, science, technology, and engineering education (Sanders, 2010, 2012, 2013 & Wells, 2010, 2013). Over the past 12 years, almost 500 kindergarten through eighth grade teachers and elementary school administrators in three counties in South Carolina have participated in annual Integrative STEM Education Institutes. In this professional development program they learned how to incorporate problem-based and project-based learning that helped students work in groups to develop cross-curriculum skills. A research team from the Educational Leadership program at Clemson University's College of Education developed a mixed-methods research project to determine the instructional effectiveness of the institute. The project's quantitative survey data illustrated improved teacher efficacy with integrative STEM education learning outcomes immediately after the institute as well sustained alumni use of those teaching techniques in the years following the professional development program. Qualitative data from interviews and focus groups revealed the degree to which the integrative STEM education pedagogy influenced individual students and teachers employing the practice and how doing so influenced the academic programs, schools, and districts.

Making User-Tailored Privacy Work

Moses Namara, Henry Sloan, Priyanka Jaiswal, and Bart Knijneneburg

In User-Tailored Privacy, a user is provided with just the right amount of control and right useful privacy-related information that is not overwhelming or misleading to help relieve them of the burden that comes with making online privacy decisions. For this approach to work, a system first measure's a user's privacy related characteristics and behaviors, uses this as input to model their privacy preferences and then adapt the system's privacy settings to these preferences. This adaptation could take the form of a default setting or a recommendation, either with or without an accompanying justification. In this lecture, we explore the adaptation methods that could best cater to the varying individual privacy differences. Furthermore, based on user's privacy attitude and preference, we learn of the situations and the privacy features for which these adaptations would strike a balance and appropriately reconcile the need for extensive customizability and personalization with user's apparent lack of skills and motivation to manage their own privacy settings.

Engineering oleaginous yeasts to convert lignocellulosic-derived compounds to oleochemicals

Allison Yaguchi, Michael Spagnuolo, Kaelyn O'Neill, Nicky Franaszek, and Mark Blenner
Clemson University, Department of Chemical and Biomolecular Engineering

Yeasts are commonly found in beer and wine, where they convert sugars to ethanol. Oleaginous yeasts are those that, instead of making ethanol, make high amounts of fatty acids and lipids. These lipids are important for sustainable production of oleochemicals, such as biodiesel and omega-3 fatty acids. Most bioprocesses are economically unfavorable, since we have to feed the yeast with glucose, which is very expensive. If feedstocks were derived from waste streams and toxic by-products, the cost of sustaining bioprocesses dramatically decreases. The presented work discusses characterization of *Cutaneotrichosporon oleaginosus*, one of the few yeasts capable of converting toxic compounds derived from lignin to value-added oleochemicals. Being the second-most abundant biopolymer in the world, rarely used industrially outside of its heating value, and difficult to work with, lignin is a rational choice for a sustainable, cost-effective feedstock. We have characterized biomass accumulation, lipid profiles, and gene expression patters for *C. oleaginosus* on model lignin monoaromatics. In depth RNAseq analysis elucidates the pathways responsible for metabolism, as there are no studies analyzing aromatic metabolism in this yeast. The collective data suggest this yeast is capable of being a model organism for sustainable conversion of lignocellulosic biomass into value-added oleochemicals.

Engineering Yarrowia lipolytica for biosynthesis of flavonoids

Vijaydev Ganesan, and Mark Blenner
Department of chemical and biomolecular engineering, Clemson University

Flavonoids are important natural products with various biological activities. They are reported to show anti-inflammatory, antioxidant, anti-cancer and ant-bacterial activities. Flavonoids are hard to produce by either plant extraction or chemical synthesis due to low productivity and yield. Metabolic engineering can offset the above limitations from plants. Metabolic engineering of microbes has already been shown to synthesize butanediol, artemisinin and omega-3 eicosapentaenoic acid at an industrial scale. Very less progress has been made in the synthesis of flavonoids owing to the long metabolic pathways, heterologous gene expression and reliance on precursor supplementation. E.coli has already been reported to produce flavonoids but the production has been low because of low flux towards TCA metabolites and the inability to perform efficient post translational modifications. Yeasts have higher flux towards TCA metabolites and can perform post translational modifications efficiently compared to bacteria. Here, we review the general metabolic engineering strategies that can be used for improving flavonoids synthesis using Yarrowia lipolytica. These strategies including increasing tyrosine accumulation by removing feedback inhibition, improving malonyl coA accumulation by downregulating fatty acid genes and improving the conversion of tyrosine to flavonoids by screening for different gene sources, varying the promoter strengths, balancing gene expression and optimizing the culture conditions

Impacts of Military-Connectedness and Military-Related Residential Mobility on Student Academic Development

Georgia McKown
Clemson University, Learning Sciences Doctoral Student

This literature review sought to delve deep into the body of existing research concerning military-connected students and their academic development. Its primary goals were to identify the specific developmental impacts of being a military-connected child including researching if residential mobility among military-connected students impacts their academic development. Through this review, the author discovered that very little research currently exists in the realm of academic development of military-connected students, and almost no research exists that speaks specifically to the academic impacts of military-connected residential mobility. Additionally, the author found that there are many individual schools and districts that have developed and implemented academic programs and strategies that target the academic development of military-connected students, but their progress and impact are rarely tracked and scaled. At the conclusion of the literature review, the author suggests that more longitudinal and widespread research needs to be done concerning military-connected students and their residential mobility in order to draw correlation and devise supports.

Engineering Yarrowia lipolytica as a Protein Factory

Dyllan M. Rives, and Mark A. Blenner
Clemson University, Department of Chemical and Biomolecular Engineering

Yeast cells are promising protein production platforms because yeast, unlike bacteria, have post-translational modification machinery and ER quality control. Furthermore, yeast are easier to process and engineer, compared to alternatives such as CHO and plasma cells. Yarrowia lipolytica, an oleaginous yeast with several genetic engineering tools, has shown to be an effective protein factory. This research aims to engineer the protein secretory pathway of Y. lipolytica for optimal protein secretion of lignocellulolytic, industrial, and pharmaceutical enzymes. My current work is focused on expressing heterologous laccase genes lac2, lccI, and lacIIIb from Trametes versicolor. Activity assays, SDS-PAGE, and Quantitative Polymerase Chain Reactions (qPCR) will be used to investigate protein activity, production titer, and gene expression, respectively. Preliminary qPCR results suggest good expression of lac2 in Y. lipolytica cells transformed with episomal expression plasmids. In order to improve protein secretion in Y. lipolytica, future work will focus on overexpressing endogenous folding factors and expressing heterologous folding factors from known efficient secretion systems, such as CHO cells. It is expected research in this area will lead to improved titers in production of relevant industrial enzymes and therapeutic protein products.

Effects of ergot alkaloids during mid-to-late gestation on uteroplacental sufficiency and fetal growth

J.L. Britt, M. F. Miller Jr., B. M. Koch, N. M. Long, S. Pratt, J. G. Andrae, and S. K. Duckett
Clemson University, Department of Animal and Veterinary Sciences

The objective of this study was to evaluate placental and fetal growth and development in ewes consuming ergot alkaloids found in endophyte-infected tall fescue [Lolium arundinaceum (Schreb.) Darbysh], the primary cool season perennial forage grass for livestock in the southeastern United States. Thirty-six Suffolk ewes (78.24 kg ± 9.5) carrying twins at d 35 of gestation were randomly assigned to one of two treatments: endophyte-free tall fescue seed (E-; 0.0 µg ergovaline + ergovalinine/g) or endophyte-infected tall fescue seed (E+; 4.14 µg ergovaline + ergovalinine/g) during MID gestation (d 35 – d 85) or LATE

gestation (d 86 – d 133) in a 2x2 factorial design. Fetal and maternal necropsies were performed at d 133 of gestation. There was no significant difference ($P > 0.05$) in placental or fetal weights based on E+ or E- treatment during MID gestation. A significant interaction ($P = 0.02$) between treatment and time was observed wherein the fetal-placental weight ratio was highest for E+E+ ewes. Ewes receiving E+ treatment during LATE gestation had lighter ($P < 0.003$) uterine and placentome weights. Cotyledon and caruncle tissue weights were reduced ($P < 0.002$) in ewes on E+ treatment compared to E- treatment during LATE gestation. Cotyledon and caruncle weights were reduced by 25% and 19%, respectively. Overall fetal weight was decreased ($P = 0.002$) by 10% for ewes on E+ treatment compared to E- treatment during LATE gestation. Ergot alkaloid exposure during LATE gestation negatively impacts placental and fetal growth and development and induces uteroplacental insufficiency.

An implantable hydraulic sensor for non-invasive detection of tibial plate bending with plain radiography

Apeksha Rajamanthrilage[1], Paul W Millhouse[1], Jeffrey N. Anker[1], Hunter Pelham[2], Nathan Carrington[2], Caleb J. Behrend[2], John D. DesJardins[2], Thomas B. Pace[3], and Md. Arifuzzaman[1]
[1]Clemson University, Department of Chemistry
[2]Clemson University, Department of BioEngineering
[3]University of South Carolina School of Medicine-Greenville and Greenville Health System(GHS), Department of Orthopedic Surgery

Tibial fractures are the most frequent long-bone fractures and most common site of bony nonunion. Physicians require methods to evaluate when a fracture fixation is safe to resume weight- bearing and they routinely acquire plain radiographs to show the hardware and fracture callus as a method of diagnosis and evaluation. However, these images are incapable of fully assessing the mechanical properties of the fracture callus. We describe a sensor to non-invasively measure orthopedic tibial plate bending, read using plain radiography. Bending of the tibial plate under load presses an integrated lever upon a sensor bulb which pushes a radiopaque fluid (Cesium acetate 85% w/w%) through a channel. The degree of plate bending implicates by the change in fluid level within the channel.
The hydraulic sensor was tested on a fractured Sawbones® tibia mimic by monitoring the fluid displacement (mm) vs the applied force (N). It shows a fluid displacement of 1 mm for applied load of 100 N. Reproducibility of the hydraulic sensor was examined by executing five loading and unloading cycles while fluid level within the channel was tracked with photographic images and plain radiography. The hydraulic action amplifies the signal from the plate bending motion and the radiopaque fluid level is easily observed using standard radiography already employed in routine patient workups. This approach provides bio mechanical information by plain radiography. In addition, the approach is generalizable to detecting pressure from analyte-specific gel swelling for non-invasive in vivo chemical measurements using plain radiography.

Reducing inter-observer variability in CT measurements of cancer lesions through a peer benchmarking decision support aid

MinJae Woo[1], Steven Lowe[2], Alex Ewing[3], Michael Devane[2], and Ronald Gimbel[1]
[1]Department of Public Health Sciences, Clemson University
[2]Department of Radiology, Greenville Health System
[3]Department of Quality Management, Greenville Health System

[Purpose]
To assess whether a peer benchmarking decision aid may reduce variation in computed tomography (CT) measurement of cancer lesions and, if not, identify possible barriers to reducing variation.
[Methods]
In this IRB–approved study, 13 attending GHS radiologists independently obtained the longest-axis measurement of 5 hepatic metastasis and 5 lung lesions during three non-contiguous time periods (T1, T2, and T3), each separated by a minimum of 30 days. Just prior to T3, the participants were exposed to a peer benchmarking decision aid that visualized how far below or above their measurements were to a gold standard and how different their image choice was compared to peers.
[Results]
Variability in intra-observer measurement was minimally observed; overall agreement rate was 0.983. Overall inter-observer agreement rates for all participants were 0.966. The intra-observer variability remained less than inter-observer variability throughout study. In cancer lesions with loosely defined outer parameters, variation in measurement was higher than those lesions with clear boundaries. The decision aid did not statistically reduce inter-observer measurement variability. Potential barriers to reducing measurement variation included: variation in clinical opinion regarding the image slice choice for the longest axis measurement ($p=0.045$) and the starting point, axis, and the end point of lesion measurement ($p=0.011$).
[Findings]
Inter-radiologist variability in measuring the size of cancer lesions is a result of systematic not random factors. Measurement variation may be reduced if the outer parameters of a lesion are more clearly defined.

Enzyme Immobilization: Exploring the Structure-Function Relationship of Linker Attachment Sites of T4 Lysozyme

Maxwell Hilbert, Adam Beitz, and Mark Blenner

Immobilized enzymes can be used as biosensors because their ability to detect highly specific substrates. Enzymes alone are susceptible to degradation and loss of function in solution but when immobilized to a surface, the lifetime and stability of the enzyme can be increased, and the surface-chemistry can promote enzyme-substrate interactions. Our goal is to fundamentally understand the interactions between the enzyme, linker, and surface during covalently, site-specific immobilization that can be detrimental to its activity. We begin our study with the model enzyme, T4 Lysozyme, by exploring the effects on enzymatic activity of different site-directed cysteine mutations for linker attachment. The site of each mutation will ultimately change the orientation of the enzyme when immobilized via linker attachment. Based on the findings of a well characterized enzyme, such as T4 Lysozyme, we ultimately want to create heuristics for efficient enzyme immobilization techniques and apply our newfound knowledge to an uncharacterized enzyme, cytochrome P450 (CYP201A2), for biosensor development.

Impacts of Ergot Alkaloid Exposure During Mid and Late Gestation on Maternal Glucose and Insulin Secretion

M. A. Greene, J. L. Britt, M. F. Miller Jr., M. C. Miller, B. M. Koch, S. K. Adams, and S. K. Duckett
Clemson University, Animal and Veterinary Sciences Department

The objective of this study was to evaluate glucose and insulin secretion in gestating ewes consuming ergot alkaloids in endophyte-infected tall fescue seed at two stages of gestation. Fifty-five Suffolk ewes (83kg) estimated to be carrying twins at d35 of gestation were randomly assigned to endophyte-free tall fescue seed (E-; 0.0µg ergovaline + ergovalinine/g) or endophyte-infected tall fescue seed (E+; 4.14µg ergovaline + ergovalinine/g) during two stages of gestation (MID: d35 – d85 and LATE: d86 – parturition) in a 2x2 factorial design. Plasma and serum samples were collected from ewes at d35, 55, 85, 105, and 133 of gestation. Plasma glucose and insulin levels were analyzed using hexokinase reagent assays (Pointe Scientific, Canton, MI) and Mercodia Ovine Insulin ELISAs (Mercodia AB, Uppsala, Sweden). Serum NEFA concentrations were analyzed using MaxDiscovery NEFA Assays (Bioo Scientific, Austin, TX). RQUICKI values were calculated using the formula: RQUICKI=1/[log(Glucose)+log(Insulin)+log(NEFA)]. Insulin and RQUICKI values were not significant ($P>0.05$). A significant ($P < 0.02$) interaction between treatment, treatment period (MID vs LATE), and gestational age was found for glucose and glucose-insulin ratios. Glucose concentrations for E-E+ ewes were higher compared to E-E- ewes at d133 while glucose-insulin ratios were higher for E-E+ ewes at d105 and E+E- ewes at d133 compared to E-E- ewes. There was an interaction ($P<0.01$) between treatment and treatment period for NEFA concentrations where levels were highest for E-E+ ewes in late gestation. Introducing ergot alkaloids during late gestation influences glucose and NEFA concentrations warranting future research into impacts on maternal health and fetal development.

Transcriptomic analysis of environmental microorganisms exposed to low dose radiation

Molly Wintenberg[1], Lisa Manglass[2], Nicole Martinez[2], and Mark Blenner[1],
[1]Clemson University, Department of Chemical Engineering
[2]Clemson University, Department of Environmental Engineering

Traditional radiation detection systems are extremely sensitive to low levels of ionizing radiation, however the disadvantages of being easily identifiable, mandatory placement near a radioactive source for detection, and capacity to report radioactivity at a specific moment in time diminish their applications in the field. Given the current state of world affairs, there is a need for an inconspicuous sensor capable of unattended autonomous operation for reporting radioactivity even if the source has been relocated. A set of biosensors capable of discerning radionuclide type that are based on transcriptional changes have the potential to monitor and report on nuclear fuel cycle, enrichment, and weapon development activities in diverse environmental conditions. Transcriptional responses of model and environmental microorganisms exposed to acute and chronic alpha, beta, gamma, and neutron radiations will be analyzed to identify unique radiation-induced signatures. After quantitative PCR verification, these unique signatures will be used to engineer a set of microbial transcriptional based biosensors. In addition to identifying radiation induced transcriptional signatures, studies will be performed to measure microbial response to radiation induced oxidative stress and reactive oxygen species (ROS) production. The results of this work will expand upon the limited knowledge of low level radiation effects in microorganisms.

Developing Elementary Preservice Teachers' Science teaching Self-efficacy through method class

Khushbu Singh[1], and Cynthia Christine Mi Deaton[2]
[1]Clemson University, Department of Curriculum & Instruction
[2]Clemson University, Department of Teacher Education

Science teaching has been identified as one of the most challenging processes for preservice elementary teachers. The high level of abstract topics, principles, theories, and laws in science lead to varying degrees of challenges in science teaching. For instance,

it's difficult for student teachers to develop conceptual understanding of science and its practical application in actual classroom setting. Therefore, the new elementary education program designed allowed student teachers to enhance their Pedagogical Content Knowledge in Mathematics and Science (MS) and science practicum.
The purpose of the study was to examine the personal beliefs about science teaching and self-efficacy for science teaching that are held by two different cohorts of a new elementary program. A quantitative approach with statistical analysis was used to guide the study. The main source of data collection was semi- structured interviews supported by three major assessments: Draw a Science Teacher Test (DASTT) Science teaching Efficacy Belief Instrument (STEBI) and Beliefs about Reformed Science Teaching and Learning instrument (BARSTL). Findings were organized systematically, analyzed and interpreted descriptively at the beginning and by the end of the semester. Results of the quantitative analysis between pre and post assessment of DASTT, showed that transition from the teacher centered to student centered teaching was statistically significant. Findings from STEBI and BARSTL have also shown that the elementary method coursework in science were the bases for preparing student teachers to teach science.

None but ourselves: An examination of emancipatory practices in Afrocentric Schools.

Lashia Bowers
Clemson University, Department of Educational Leadership

Scholars have detailed how systematic racism has impacted the psychological development of African American students. Afrocentric schools have utilized emancipatory practices to liberate African American students from (mis)information imposed on them by challenging cultural hegemony. Afrocentric schools has been viewed by many as an solution to many educational and social issues. However, the experiences and perceptions of school leaders and mental health professionals in Afrocentric schools has not been adequately addressed in current research. Using the underpinnings of Critical Race Theory (CRT) and Afrocentricity this presentation will delineate the necessity of a closer examination of the educational and psychological outcomes of emancipatory practices. I argue that these practices can be useful for black students in any school setting. Suggestions for further research will be offered as well as recommendations for practitioners.

The role of natural mentors on positive youth development and adolescent eating disorder symptomatology

Lauren E. Stephens[1], Jacqueline V. Lerner[2], and Edmond P. Bowers[1]
[1]Clemson University, Department of Parks, Recreation, and Tourism Management
[2]Boston College, Lynch School of Education

Eating disorders and related symptoms are a prevalent issue affecting adolescents. The frequency with which they are occurring and their potential for influencing long-term outcomes is cause for concern among youth development professionals (Gongora, 2014). The current study takes a positive youth development (PYD) approach to examine the strengths and resources that may moderate the effect of eating disorder symptomatology on youth PYD. In particular we consider the contextual resource of natural mentors (DuBois & Silverthorn, 2005), who are adults youth encounter within their daily lives through existing social networks. Consistent, intentional, youth-adult relationships have been found to produce positive development in the lives of adolescents (Rhodes & Lowe, 2009); however, no research has been conducted to examine the presence of natural mentors on adolescent eating disorder symptomatology and PYD. Using data from 839 youth in Grade 9 from the 4-H Study of PYD (e.g., Lerner et al., 2005), we conducted MANOVA and hierarchical OLS regression analyses to model the relationships among the presence of a natural mentoring relationship, eating disorder symptomatology, and a multidimensional measure of youth thriving, the Five Cs of PYD. Results reflected the importance of natural mentors for the prevention of eating disorder symptomatology and the promotion of PYD in adolescents and suggested that interventions for eating disorders should consider level of symptomatology, youth gender, and social support. In addition, the findings indicate that programs designed to address eating disorders in adolescents could experience greater benefits if prevention and intervention efforts include young people's natural mentors.

Peroxisome Engineering for Sustainable Plastics and Chemicals

Michael Spagnuolo, Murtaza Shabbir Hussain, and Mark Blenner
Clemson University, Department of Chemical and Biomolecular Engineering

Brewer's yeast has been used for thousands of years to make valuable products for humans in the form of bread and alcohol. The advent of genetic engineering has allowed researchers to expand that list of products to everything from fuel and chemicals to pharmaceuticals and food. Further advances in biotechnology have resulted in the transfer of these metabolic engineering tools to other, less well-studied organisms. The use of other organisms opened up the possibility of harnessing these organisms' unique and potent properties. One such organism is the oleaginous yeast *Yarrowia lipolytica*. This yeast is particularly adept at producing and consuming lipid-like compounds. Such compounds have the potential to be easily converted to industrially-beneficial products, such as fatty alcohols and certain plastics (polyhydroxyalkanoates, PHAs). Fatty alcohols find use as lubricants, fuels, specialty chemicals, detergents, and in the cosmetics industry. PHAs hold promise as a source of mechanically-

tunable biopolymers. Our engineering efforts have shown that, by altering the carbon flux to, and enzyme composition of, *Y. lipolytica*'s peroxisome, improvements in product yield and efficiency can be realized.

Conceptualizing Concurrency in Computing: The Development of Undergraduate Student Reasoning

Aubrey Lawson, and Eileen T. Kraemer
Clemson University, School of Computing

In computing, concurrency relates to the situation in which several processes execute at the same time and may interact in ways that produce results that differ from that obtained via sequential execution. We seek to study how students conceptualize concurrency concepts, how these conceptualizations mature over the course of their undergraduate education, and the relationship between student conceptions about sequential programs and those about concurrent programs. We administered a pencil-and-paper assessment that comprises two natural language problems and a survey to gather information on students' problem solving strategies and attitudes towards computing. The first question requires that students use fundamental logical structures such as branching and looping to design a program that calculates average rainfall figures. The second question involves concurrency in that students must describe a computer system that allow multiple sellers to sell concert tickets to the same event, without double booking. The survey uses Likert scale and free response questions to ask students about their attitudes towards CS and whether they use visualizations (e.g. flow charts, diagrams) throughout their software development process. The assessment was distributed to students at each level of the CS program at Clemson. We employ a grounded theory analysis to identify the emerging strategies and conceptions and compare them across grade levels to discover how students mature over the course of a CS education. This analysis will inform an intervention that will promote the growth of student conceptions that can be built upon productively throughout their course of study.

TriggerWarning: Self-harm on the internet

Shelley Lloyd
Clemson University, Rhetorics, Communication, and Information Design

According to an article published in November of 2017 in the Journal of the American Medical Association, self-harm behaviors among teenagers (especially teenage girls) have been on the rise since 2009. These findings coincide with the raise in youth suicides and reports of increases in diagnosed depressive disorders. While not all self-harm is due to depressive disorders, depression often coexists alongside anxiety and dissociative disorders and the rhetorical nature of depression makes it difficult to tell where depression ends and another disorder/illness begins. Since 1997 -- when the laws changed to allow direct-to-consumer drug advertisements -- self-doctoring has become common in the treatment of mental health. While it is believed that the taboo of discussing mental illnesses has decreased in recent years the raise in self-harm behaviors among teenagers seems to belie that idea. Has the taboo begun to vanish? Or has the trend of self-doctoring alongside (or perhaps instead of) treatment from medical professionals lead to this tread? Kimberly K. Emmons, in her book Black Dogs and Blue Words: Depression and Gender in the Age of Self-Care, suggests that "A rhetorical care of the self, as opposed to uncritical self-doctoring, requires attention to… layers of discourse in order to open avenues for critique and meaningful social action" (15). My study proposes to look at discussions of self-harm online in order to discover the discourse surrounding teenage self-harm behaviors in search of a discourse that might lead to "a rhetorical care of the self."

Tuning the surface plasmon resonance by patterning silver nanoparticles using glucose crystal deposition and mechanical deformation

Meenakshi Ranasinghe, Fathima Ameer, Tatiana Estrada-Mendoza, George Chumanov, and Jeffrey Anker
Department of Chemistry, Clemson University

Silver nanoparticles have interesting optical properties depending on their size and shape, and they are being used in many analytical applications like biosensors and surface-enhanced Raman scattering (SERS). But it is challenging to control size and shape via patterning to tune the optical properties of nanoparticles. We have developed a simple technique to change the shape of Silver nanoparticles (100 nm) by mechanically compressing them using a glass rolling pin. The resulting change in shape induces a red-shift in the localized surface plasmon resonance (LSPR) scattering spectrum. We also patterned the silver nanoparticles and tuned their optical properties by depositing glucose crystals on the nanoparticles followed by mechanical deformation of both glucose and silver nanoparticles. It resulted in a protected region of silver nanoparticles around the deposited glucose crystal and the size of the protected region depends on the thickness of the glucose deposit. The nanoparticles located further away from the glucose deposit showed change in shape leading to a red shift in the localized surface plasmon resonance (LSPR). However, the silver nanoparticles underneath the glucose deposit were either aggregated and/ or deformed or remain unaffected. The particles that are aggregated and/ or deformed appear red in color while the single undeformed particles appear green in color due to change in refractive index in the presence of glucose. In summery our approach provides a simple method to pattern the silver nanoparticles and to selectively change their surface plasmon resonance.

Relaxation dynamics and Transport properties of Nafion-Silica Nanocomposites

Apoorv Balwani, Antonio Faraone, and Eric M. Davis

Nafion-silica nanocomposites (NSiNCs) have garnered interest as the proton exchange membrane in vanadium redox flow batteries as they help to combat the issue of high vanadium ion crossover, which results in a reduction of battery lifetime. To date, however, the mechanism of crossover reduction in these NSiNCs remains unclear. We expect the water-mediated ion transport to be coupled to the local chain relaxation dynamics and propose that silica nanoparticles (SiNPs) impact this interaction. To elucidate the relationship between water/ion transport and chain dynamics, we employ neutron spin echo (NSE) spectroscopy to quantify segmental relaxation dynamics and time-resolved attenuated total reflectance-Fourier transform infrared (tATR-FTIR) spectroscopy to evaluate the water sorption kinetics. Results from NSE suggest a decrease in segmental relaxation dynamics with introduction of SiNPs, while tATR-FTIR data indicate deviation from Fickian transport for all samples investigated. These sorption data were regressed to a diffusion-relaxation model to provide further insight into the effect of SiNPs on the viscoelastic properties of NSiNCs. Results from this investigation establish a basis for understanding the interplay between water/ion transport and chain dynamics in NSiNCs.

Case Histories of Liquefaction-Induced Building Damage – Focusing on the 22 February 2011 Christchurch Earthquake

Mengfen Shen[1], Qiushi Chen[1], Jie Zhang[2], and C. Hsein Juang[1]
[1]Clemson University, Glenn Department of Civil Engineering.
[2]Tongji University, Department of Geotechnical Engineering

Soil liquefaction is one of the major geohazards triggered by an earthquake. It can cause lateral spreading, ground settlement, sand boiling, which in turn, may damage buildings and infrastructure and result in loss of life. While many case histories of soil liquefaction have been reported after recent major earthquakes, few focused on detailed study of liquefaction effects on buildings and infrastructure. The objective of this ongoing study is to develop case history database of liquefaction effects, in particular, liquefaction-induced building and infrastructure damages. Using the 22 February 2011 Canterbury earthquake as an example, this paper compiles nine case histories of liquefaction-induced building damages. The development of the case history database, including the compilation and processing of information on site condition (geological and geotechnical condition), earthquake shaking, and site response (land and building damage), is reported. Such a case history database could be used for the performance-based liquefaction risk assessment and as a basis for developing liquefaction hazard mitigation measures.

Poaching Myanmar's Giants

Christie Sampson[1], Peter Leimgruber[2], David Tonkyn[3]
[1]Clemson University, Department of Biological Sciences
[2]Smithsonian Conservation Biology Institute
[3]University of Arkansas, Little Rock

Managing wildlife populations in human dominated landscapes is one of the many challenges faced by global stakeholders engaged in conservation policy. In Myanmar, a joint project between the Smithsonian Institution, World Wildlife Fund, and the Myanmar government is seeking to re-wild a portion of the countries more than 5000 captive Asian elephants. In order for this project successful, we must understand how local communities perceive elephants, conservation efforts, and poaching in order to gain their support. We have conducted over 300 interview surveys assessing the direct impacts of conflict and an additional 50 in-depth surveys quantifying the indirect impacts of human-elephant conflict faced by human populations that share the landscape with elephants. In addition we have conducted over 150 interview surveys assessing the perception of poaching, poachers themselves, and the benefits and/or consequences to having poaching occurring within a community. This information is being used by the local government and associated research agencies to develop additional human-elephant conflict mitigation methods and conservation policies that engage with local stakeholders.

The Effects of Foster Care on Child Education: Evidence from South Carolina

Kelsey Roberts
Clemson University, Department of Economics

The foster care system is designed to provide temporary safe placement for children away from the perpetrators of abuse or neglect. On average, those who have experienced foster care tend to experience greater difficulty with completing their education and performing at the level of their same-aged peers. Despite a large literature on negative outcomes for foster children, the causal effect for the children on the margin is still unknown. Following the methodology of Doyle (2007, 2008), this paper utilizes the propensity to remove of the investigative case worker as an instrumental variable to account for endogeneity of the removal decision. I estimate the causal effects of removal on children's standardized test scores and grade repetition.

Incorporating Broad Range Temperature Activity in Enzymes

Siva Dasetty, Weigao Wang, Mark Blenner, and Sapna Sarupria
Clemson University, Department of Chemical and Biomolecular Engineering

Enzymes are proteins that regulate life processes in every living organism. These molecular machines generally function efficiently around the thriving environments of their source organism. For example, deviating from the organism's habitat temperature could result in the loss of the enzyme functionality. Psychrophiles and thermophiles are microorganisms that live under low (< 20 ℃) and high (> 50 ℃) temperatures, respectively. To maintain the structure-function relationship, these enzymes need to control their dynamics at their living temperatures. Several studies have been conducted to understand the origin of the ability of psychrophilic enzymes to function at cold denaturation temperatures of thermophilic enzymes, and vice versa. The findings indicate that low temperature activity in psychrophiles result from high active site flexibility. In contrast, an overall rigid structure was attributed to the high temperature activity in thermophilic enzymes. Broadening the working temperatures of enzymes has has numerous industrial applications. Examples include food and beverages, textiles, detergents, and pharmaceuticals. Here, we pursued a hypothesis that combine the dynamic properties of psychrophilic and thermophilic enzymes to engineer biocatalysts that function in a wide range of temperatures. In principle, low temperature activity in psychrophilic enzymes may be mutually exclusive of their stability. Therefore, thermophilic enzymes can be engineered to function at low temperatures by incorporating active site flexibility without compromising their thermal stability. We test this hypothesis by mutating glutamic acid to glycine near the active site of Geobacillus thermocatenulatus (GTL) – a thermophilic enzyme. We performed two such mutations, Glu316Gly and Glu361Gly and observed an increase in the specific activity at both lower and higher temperatures compared to that of wild type (WT) GTL. We used all-atom molecular dynamics (MD) simulations to explore the local and global flexibilities, and elucidate the mechanisms through which the mutations have increased the catalytic activity of GTL. We find that the change in specific activities by mutations was not due to enhanced active site flexibility. Rather, altered lid fluctuations, organization of active site triad, and binding ability of substrates may have collectively played a role in inducing changes in the specific activity. In our poster, we will discuss these results and comment on the implications for designing enzymes with a broader range of stability and activity.

Accurate early detection of cancer by applying machine learning to extracellular vesicles profiles

Paritra Mandal[1], and Brian Dean[2]
[1]Clemson University, Healthcare Genetics
[2]Clemson University , Department of Computer Science

Extracellular vesicles (EVs) are small membrane enclosed vesicular structures that are transporters or carriers of lipids, proteins, mRNA, and miRNA and are categorized as "exosomes", "microparticles" and apoptotic bodies in increasing order of their sizes. They are released from cells and were originally thought to be placeholders for cellular waste. They are currently getting their due recognition in that they have been found to play a central role in disease progression, since they can make the microenvironment more suited for disease invasion. They enable both long-range and short-range intercellular communication even where there is no direct cell-to-cell contact. The recent development of new cutting-edge isolation methods enables researchers to elucidate the biological pertinence and role that EVs can play in early detection, prognosis and therapy. Computational models based on machine learning techniques can be trained to classify the biological profiles of EVs as healthy versus at-risk, and automatically identify features in these profiles corresponding to biomarkers that can be used to detect the incidence of the certain cancers. A candidate panel of a combination of miRNA and proteins from microvesicles and exosomal miRNAs such as hsa-mir-4508, hsa-mir-1246, mi-21, mir-223 etc. reportedly found to be differentially expressed in breast cancer patients is currently being studied to train a classifier to differentiate between the EV profiles of a healthy sample to identify contrast. The goal is to create a sensitive customized classifier to identify all conditions such as expression levels in these small vesicles and related mechanisms involved in progression of cancer.

School Resource Officers in Public Schools: A National Review

Jennifer Counts, Kristina Randall, Joseph Ryan, and Antonis Katsiyannis
Clemson University, College of Education

School Resource Officers have become commonplace in schools across the nation. There have been several recent occurrences of the misuse of School Resource Officers in schools. The purpose of this review is to examine the availability and nature of current state legislation and DOE/DOI guidelines regarding the use and training of SROs. Additionally, recommendations are provided regarding the use of SROs in public schools to provide administrators with assistance on how to develop effective SRO programs.

Efficacy of Cyberbullying Interventions in Schools: A Systematic Review

Simone Adams, Kristina Randall, and Joseph Ryan
Clemson University, College of Education

The explosion of technology and its ease of accessibility has led to a new and aggressive form of bullying affecting today's youth called cyberbullying. The purpose of this systematic review is to synthesize recent literature to identify (a) effective cyberbullying programs, (b) determine gaps in the field of cyberbullying prevention programs, and (c) provide recommendations for future research. A systematic search yielded 13 experimental and quasi-experimental studies, investigating the efficacy of cyber perpetration and/or victimization prevention programs, published between 2006 and 2016. Participants in each study were school-age adolescents, in grades 4 through 12 across Europe, Asia, North America, and Australia. Results revealed that 7 studies showed a reduction in cyber victimization, while 12 studies showed a reduction in cyber perpetration behaviors. Overall, digital media programs demonstrated greater success than traditional bullying programs in reducing cyberbullying. In addition, interventions appeared to be more effective for younger students in comparison to older ones. Implications, limitations, and areas for future research are discussed.

Impact of Exclusionary Discipline Practices on English Learners

Jennifer Counts[1], Denise Whitford[2], Michael Couvillon[3], and Antonis Katsiyannis[1],
[1]Clemson University, Special Education
[2]Purdue University, Special Education
[3]Drake University, Special Education

Disciplinary exclusions disproportionally effect students from underrepresented groups. English Learners are one group that has received minimal attention in this area. Using data from the U.S. Department of Education, Office for Civil Rights, Civil Rights Data Collection, we examined exclusionary discipline practices involving English Learners. Results indicate variation across states regarding exclusionary practices involving English Learners, particularly English Learners with disabilities. Though they only represented 0.9% of all students with disabilities, English Learners with disabilities comprised 7.6% (n = 65,143; state range: 2.4-23.7%) of disciplinary exclusions. Odds of exclusion for English Learners with disabilities ranged from OR = 0.01 to OR = 25.20, and OR = 0.05 to OR = 26.13 for those without disabilities. Implications for research and practice are discussed.

Second year evaluation of the impact of a required agricultural mechanics unit of instruction on pre-service teachers and their students.

Curtis H. Berry, and A.P. Byrd
Department of Agricultural Sciences, Clemson University

The purpose of this research was to assess the confidence and self-efficacy levels of pre-service agricultural education teachers in their field placement before and after taking a required unit of agricultural mechanics classes. Participants consisted of agricultural education pre-service teachers during two consecutive years at Clemson University. Data were collected using two separate Likert-type scales measuring student teacher self-efficacy within classroom management and confidence in teaching required content. Results from this study indicate that a required unit of agricultural mechanics is beneficial to pre-service teachers prior to their student teaching experience. Students demonstrated an overall increase in self-efficacy and confidence; however, the researchers also found a slight decline in self-efficacy for certain data points pertaining to classroom management. These findings lead us to conclude that more courses in classroom management or time in the field would be beneficial to pre-service teachers. This study will be continued for a third year in order to further assess the needs of the program and to determine how to better prepare pre-service teachers in South Carolina and across the nation. These assumptions align with prior notions of self-efficacy theory in teaching, which requires experience throughout several years to master classroom management components.

Persistence of E. coli O157:H7 and L. monocytogenes on the exterior of common packaging materials

Duleeka P. Kuruwita[1], Xiuping Jiang[1], Duncan Darby[1], Julia L. Sharp[2], and Angela M. Fraser[1]
[1]Department of Food, Nutrition, and Packaging Sciences, Clemson University
[2]Department of Statistics, Colorado State University, Fort Collins

Worldwide, acute gastroenteritis (AGE) is the second most common cause of infectious disease. Contaminated exterior surface of a food package with low-infectious dose bacteria – E. coli O157:H7 (<10-100 cells) and L. monocytogenes (<1000 cells), could be a source for AGE transmission. Our aim was to determine the persistence of E. coli O157:H7 and L. monocytogenes on three packaging materials – oriented polyethylene terephthalate (OPET), oriented polypropylene (OPP), and nylon-6. Coupons (25 cm2) from each material were sterilized under ultraviolet light for 5 minutes. Spot and spread inoculation was done on coupons with ca. 7 log CFU of a 3-strain-mixture of green fluorescent protein (GFP)-labeled E. coli O157:H7. All the coupons were

incubated at Technical Association of the Pulp and Paper Industry-TAPPI standards. Surviving E. coli O157:H7 cells on coupons were recovered in saline at 0, 0.25, 0.5, 1, 2, 3, 5, 7, 14, 15 days. Recovered cells were enumerated on tryptic soy broth supplemented with ampicillin using the 3 tubes most probable number-MPN method. The same procedure was carried out for 3-strain-mixture of rifampin-resistant (Rif)-L. monocytogenes using tryptic soy broth supplemented with rifampin for the MPN method. (GFP)-E. coli O157:H7 and (Rif)-L. monocytogenes survived on OPET, OPP, and nylon-6 for 15 days. The survival of E. coli O157:H7 was significantly different from the survival of L. monocytogenes between days 0.5-1, 1-2, and 3-5. The survival of both bacteria on all three materials were not significantly different. Highly contaminated outer surface of food packages could be potential fomites for AGE outbreaks.

Race & Equity in Science Teaching and Teacher Preparation: A Case Study of Racial Microaggressions in the K-12 Science Classroom

Nikeetha Dsouza, Alison Leonard, and Cassie Quigley
Department of Teaching & Learning, College of Education, Clemson University

Inequities still exist in science education. Students who differ from mainstream/dominant students like beginner bilinguals (speaks one language and developing skill in another, often English) are still excluded from active participation and achievement in science. Focusing on science teacher preparation and how teachers can support these students, I address these issues of inequities from a critical race perspective - this presents the issue of diversity and equity from the point of view of race, culture and language. They argue that inequities in education exist because racism exists in these institutions and therefore we must address race, to address issues of diversity and equity. In particular, I use a case study approach and analyze a student-teacher's field experiences with two beginner bilingual students to explore and understand teacher beliefs and practices that either hinder or facilitate learning in beginner bilingual students. Built from Critical Race Theory, I use Perez Huber & Solorzano's (2015) model of Racial Microaggression to identify and illustrate how instances of subtle acts of racism within the teacher's experiences reflected larger structural and institutional forms of racism, which still exists in educational practices like teacher education. The findings suggest we need to reconsider the focal point of our teacher education programs to center race and equity rather than relegating it to a mere unit in teacher preparation curriculum (as cited in abstract Dsouza, Leonard & Quigley, 2018, NARST).

The Effects of Catalyst Loading on Hydrogen Peroxide Production in a Microbial Fuel Cell

Emily Murawski, and Sudeep Popat
Clemson University, Department of Environmental Engineering and Earth Sciences

Microbial fuel cells (MFCs) represent an emerging technology for wastewater treatment, in which electroactive bacteria convert the chemical energy contained in wastewater into electrical power, while simultaneously decreasing the organic content in the wastewater. Microbial peroxide producing cells are a variation on MFCs where a carbon catalyst is used at the cathode to partially reduce oxygen to hydrogen peroxide (H_2O_2). H_2O_2 is a useful chemical for wastewater treatment, because it is a strong disinfectant and chemical oxidant that can be used in tertiary treatment. Especially in decentralized wastewater treatment systems which separate blackwater and greywater, such as those used on military bases and space vessels, optimizing this process may allow the energy content of the blackwater to treat greywater with the H_2O_2 produced. Optimizing the system includes addressing key factors in both the anode and cathode chambers. This research focuses on improving the efficiency of the reaction in the cathode chamber. Preliminary data shows that lower catalyst loadings lead to a higher efficiency of H_2O_2 production, whereas higher catalyst loadings lead to the complete reduction of oxygen to water. Catalyst loadings of 0.5, 1.5, and 5 mg/cm2 are being investigated. In addition, three different current densities of 0.1, 0.5, and1 mA/cm^2 are currently being tested to determine the effect of the current produced at the anode on H_2O_2 production efficiency. Preliminary results indicate that lower catalyst loadings and higher current densities lead to a higher production efficiency of H_2O_2.

Ensuring Compliance: Analyzing the Effectiveness of Auto Insurance Regulation on Uninsured Drivers and Fatalities

Jonathan Ernest
Clemson University, Department of Economics

Automobile insurance is a costly required expense for most American drivers, yet some people choose to drive without it. Previous research has explored the adverse effects of having more insured drivers, specifically resulting in a higher incidence of fatalities. My research builds upon this idea, through the evaluation of recently enacted laws in several states requiring an electronically accessible statewide database of uninsured drivers. Such a database increases the probability of being caught while driving uninsured, and is generally introduced separately from any large changes to required levels of coverage or penalties for driving uninsured. I first test whether this regulation accomplishes its goal of reducing the rate of uninsured drivers, by controlling for exogenous factors that may also impact the decision to acquire insurance. I then test whether the implementation of this regulation results in previously uninsured drivers driving less cautiously, by examining the number of fatal accidents per mile driven.

The Perpetuation of Orientalist ideologies for post 9-11 Pakistan

Firasat Jabeen
Clemson University

In his landmark scholarship Orientalism, Edward Said tells us that mass media in the postmodern world provides the reinforcement of orientalist mindsets towards the Orient—an argument which is corresponding to what Johan Galtung contends about the structural imperialism of center and periphery in terms of communication. Galtung claims that "just as the Periphery produces the raw material that the Center turns into goods, the Periphery also produces events that the center turns into news" (93). Following these assumptions, this paper analyses the orientalist issues by comparative rhetorical analysis of media portrayals of two incidents in Pakistan: (i) the Daniel Pearl Case (2002), and the Raymond Davis Case (2011). By employing propaganda theories offered by Edward S. Herman and Noam Chomsky, I rhetorically analyze the news stories of these incidents in the US print media, under the framework of "worthy and unworthy victims." This essay argues that the US media perpetuates the orientalist issues—Western civilizational superiority versus Eastern barbarism—about the East (in this case Pakistan). The comparison of these two incidents not only provides examples of the US media's proclamations about an aberrant and inferior East but also a site to explore the global hegemony of information that the US media enjoys. Thus, by comparing two above-mentioned incidents, I argue that in the post 9/11 world, the process of orientalism, implicated in the operations of power—imperialism, still perpetuates for Pakistan.

Husband wages and the female labor force participation in India

Smriti Bhargava
Clemson University, John E. Walker Department of Economics

The World Bank has ranked India as the country with the 20th lowest female labor force participation rate. This is an interesting puzzle given India's rapid economic growth and that the country has experienced massive decline in fertility rate, increase in educational attainment levels, fall in gender literacy gap, rising wages and rising returns to education. This paper studies the effect of rising husband wages to explain the overall decline in female labor force participation for the period 1983-2012 using a sample of country representative matched husband wife pairs. Results show statistically significant positive and rising own wage elasticity of labor supply of married women along with statistically significant negative and rising husband's wage elasticity of labor supply of married women.

Modeling Microbial Transport in Response to Bioaugmentation for In Situ Bioremediation of 1,4-Dioxane

Ángel A. Ramos-García, and David L. Freedman
Clemson University, Department of Environmental Engineering and Earth Sciences

1,4-Dioxane (dioxane) has emerged as an important groundwater contaminant throughout the United States. Due to its apparent recalcitrance and possible carcinogenicity, there is considerable interest in developing technically and economically feasible remediation strategies. In situ bioremediation is recognized as one of the most cost-effective and sustainable means for remediating contaminated sites with recalcitrant compounds. Microbes have been identified that are capable of aerobically biodegrading dioxane through metabolic and cometabolic pathways. However, at many sites it appears that the necessary microbes are either lacking or present at very low densities. In such instances, bioaugmentation may be required. Although injection of microbial cultures into aquifers has gained wide acceptance, the practice is largely empirical. Models to predict the movement of bioaugmented microbes in porous media are lacking. Several studies have evaluated the role of various physical, chemical and biological factors on microbial transport and removal in natural subsurface environments, but little has been done to model migration through soil in response to bioaugmentation. Transport of certain microbes possess interesting challenges, since they tend to clump together when grown to high densities, a property that may inhibit their movement in aquifers. The primary objectives of this study were to characterize a new isolate obtained from a dioxane-contaminated site capable of metabolizing the contaminant, and to develop a model that can predict the transport of microbes through soil, with a specific focus on bacteria capable of biodegrading 1,4-dioxane.

A novel right-side assist implementation could bring potential hemodynamic improvements in Fontan patients

Ehsan Mirzaei[1], Minoo Kavarana[2], Dimitrios Georgakopoulos[3], and Ethan Kung[1]
[1]Clemson University, Department of Mechanical Engineering
[2]Medical University of South Carolina, Division of Cardiothoracic Surgery
[3]Sunshine Heart, Inc.

Infants born with only one functional ventricle need a 3-staged surgical intervention to survive. The majority of these children might suffer from heart failure at later ages. We believe that implanting a Ventricular Assist Device (VAD) at the junction of a patient's inferior vena cava (IVC) and pulmonary artery during the third stage of the operations known as Fontan procedure could

improve their cardiac output and reduce their inferior vena cava pressure. The C-Pulse heart assist device manufactured by Sunshine Heart was selected for this purpose. The C-Pulse system which consists of a cuff and an external driver is typically used in patients with heart failure; the cuff is wrapped around the outside of the aorta, and is inflated and deflated in counterpulsation with the heart. In the proposed Fontan right-side assist application, the C-pulse device would be wrapped around the Fontan extra-cardiac graft and implanted together with the graft during the Fontan surgery. In order to investigate the physiologic impacts of such a device application, a computational physiology model was utilized. The aim of this study is to determine whether the current C-Pulse system can generate physiologic benefits, and to investigate device modifications to further improve patient hemodynamics.

Understanding the African American Urban Experience Between 1957 and 1969

Makonen A. Campbell
Clemson University, Department of History

Historical research on the African American urban experience has "focused on large concentrations of urban poor in the centers" of large cities, mainly in the North and West. Over four hundred cities and towns implemented urban renewal as a means for the construction of model cities, while exploiting an opportunity to relocate minorities out of urban areas. The memories of urban renewal differ from how communities were portrayed to the public. However, when those memories are juxtaposed against archival records, and statistical facts, they sharpen the focus of the African American urban experience. This project focuses on the community of Brooklyn, located in Charlotte, North Carolina, the largest African-American community in the city. This study takes a unique look at urban renewal through the memories of its former residents. Their memories serve as source material and through the analysis and juxtaposition of memories, memoirs, journals, newspaper articles, and archival records, I offer that a broader understanding of the African American urban experience can be gained. I argue that although Brooklyn was a tightly knit community, it was an artificial construct that occurred because of segregation. With the loosening of housing restrictions, middle and working class African Americans began to flee from Brooklyn ahead of urban renewal. Once the city of Charlotte began moving forward with urban renewal, those who suffered the most were the old and poor.

Critical Parameters in the Lipase Transesterification of Cottonseed Oil

Stanley Terrell Anderson II
Clemson University, Biosystems Engineering

Eversa Transform was used as an enzymatic catalyst to transform crude and glandless cottonseed oil into biodiesel. Oils were reacted with methanol in a 6:1 molar ratio with the amounts of water, lipase and temperature modified. Reactions were conducted in the presence of lipase and water at doses of 2, 5 and 8 wt. % and 1, 3 and 6 wt. %, respectively. Product composition and conversion was determined using the gas chromatography method of ASTM D6584. Oxidative stability was determined following EN 15751. The conversion to fatty acid methyl esters averaged 98.5 % across all samples. Lipase dosage did not affect conversion while water dosage and temperature were determined to be significant. ANOVA analyses showed no indication of interaction between any variables. Induction periods (oxidative stability) of the glandless and heavy pigment (crude) cottonseed oils were significantly different, but there was no difference between the two oils conversions. A SuperPro Designer simulation using 2% Eversa demonstrated that it is feasible to scale up biodiesel production and obtain high oil conversion within 1% of the small-scale reaction with accurate assumptions.

Integrated Communication and Control for Collective Motion with Limited Communication

Huan Gao, and Yongqiang Wang
Clemson University, Department of Electrical and Computer Engineering

Decentralized collective motion coordination is a rapidly developing field, motivated by its extensive applications in mobile sensor networks, cooperative robotics, and unmanned aerial vehicles. In most existing results, the distributed controller for collective motion coordination is designed in the continuous-time domain in order to conform to the continuous kinetic dynamics of vehicle systems, and discretization of the continuous controller is used in implementation since the information can only be exchanged at discrete-time instants among these systems. However, this approach cannot guarantee the original design performance since discretization may harm or even destabilize the closed-loop system. Inspired by pulse-based synchronization among biological pulse-coupled oscillators, we propose an integrated communication and control approach for collective motion coordination which can circumvent discretization and guarantee the design performance in final implementation. Not only can heading control be achieved to coordinate vehicle headings, but also spacing control is achievable for the circular motion. Numerical simulations are provided to confirm the theoretical results.

Female Representation on Corporate Boards: An Analysis of Increasing Representation Since the 2008 Financial Crisis

Benjamin Posmanick
John E. Walker Dept. of Economics, Clemson University

Since the 2008 Financial Crisis, the share of corporate board seats held by women has steadily increased from about 12% to about 20%. I examine this phenomenon and the analysis shows that the increase in female representation is driven by an increase in the demand for female board members rather than an increase in the supply of potential female board members. Prior research has noted the increased monitoring capacity women bring to corporate boards. My findings are consistent with these findings because in the wake of the Financial Crisis shareholders demanded increased diligence in corporate governance. Further, the wages paid to female board members are increasing over the period, which, when coupled with an increase in female board membership, indicates an increase in demand.

The Rise of Human-Machine Teams

Lorenzo Barberis Canonico, and Nathan McNeese
Department of Human-Centered Computing, Clemson University

The current trajectory of the field of computer science is aimed at developing artificial general intelligence (also known as AGI). This kind of strong AI would theoretically be capable of performing any human task, initially just as well as a human can, and eventually, through self-improvement, much better than any human possibly could. AGI differs from the kind of narrow AI that we see today in that, unlike current AI, it can easily transfer learning between tasks because of a true understanding of itself and its environment. Irrespective of the debates over the feasibility of AGI in the first place, we seek to shift the focus away from developing technology meant to make humans obsolete in order to replace them. Instead, we propose to reconsider the very premise that the human brain is only useful until it can be replaced by an artificial one. We stand behind the most cutting-edge research to prove that effective human-AI partnerships outperform not just human teams but also sophisticated AI systems.

Impacts of Child Sexual Abuse on Non-Offending Mothers: An Ecological Systems Approach

Amaris Josephine Tejada
Teaching & Learning, Clemson University, College of Education

Adverse Childhood Experiences (ACEs) have been found to correlate to negative behavioral outcomes, depression, and suicide. 46% of children in the US have experienced at least one ACE. Further, research shows that 10% of those who have experienced Child Sexual Abuse (CSA) attempt suicide at least once, with that percentage increasing with each additional ACE. While there has been an interest in better understanding CSA, much of the previous research focuses solely on the impacts of CSA on the child. Consequently, research fails to acknowledge that non-offending mothers also experience a period of emotional adjustment, which is critical to understand. Further contextualization would allow researchers to better understand how the emotional adjustments of non-offending mothers impacts the victimized child. Therefore, this literature review seeks to answer: How do the emotional impacts of CSA on non-offending mothers adversely affect a child's period of emotional adjustment and wellbeing in the aftermath of abuse.
A review of the literature revealed several emotional impacts on non-offending mothers, such as: clinical levels of emotional distress; depression; and PTSD-symptomatology. Further, research shows that a mother's prolonged exposure to emotional instability in the aftermath of discovery leads to inadequate levels of support for their child during the periods of reporting, investigations, and recovery; which according to researchers, would lead to a higher likelihood of their child attempting suicide.

Make Space For Us: Sister Circles and Black Womyn Collegians Experiences at PWIs

Courtney Allen
Educational and Organizational Leadership Development , Clemson University

The purpose of this poster is to explore the ways in which sister circles are vital to the success of Black women collegians as PWIs. For Black womyn collegians (BWC) having a nurturing and supportive environment during college at a predominately White institution (PWI) is fundamental. PWIs at the foundation, were not created for BWCs; which leaves a lack of understanding for the importance of support for this population. The challenges BWCs face daily at PWIs daily include microaggressions, and isolation, not feeling accepted within the norm of the campus community. Coping strategies such as sister circles are a necessity for BWCs in the academy given multiple intersecting oppressions they face. This poster will provide literature and theoretical support for the importance of coping strategies for BWC, and explain how each institution is responsible to cultivate these counterspaces for BWC in the academy.

Unilateral Divorce Laws Reduce the College Attainment of Whites but not Blacks

Elijah Neilson, and Peter Blair
Department of Economics, Clemson University

During the 1970's thirty US states replaced mutual consent divorce laws with unilateral divorce laws that allowed for either spouse to initiate divorce proceedings. The change from a mutual consent to unilateral divorce regime redefined property rights within marriages and changed the incentives for women and men to invest in human capital. Exploiting the variation across states and over time in the adoption of unilateral divorce laws, we show that white males and white females are less likely to report having a bachelor's degree or higher in states that adopted unilateral divorce laws. This distortion of the human capital decision only occurs in states with community property laws, where the law requires an even split of the couple's assets in the event of a divorce. We find no distortionary effects of unilateral divorce laws on the human capital decisions of black men or black women, even in states with community property laws.

Equine Assisted Programs for Military Service Members: A Program Evaluation Using Importance-Performance Analysis

Taylor Hooker, Jasmine Townsend, Brent Hawkins, and Stephen Lewis
Department of Parks, Recreation and Tourism Management, Clemson University

Developing research, anecdotal evidence and a growing focus on non-pharmacological interventions for veterans with post-traumatic stress support the use equine-therapy as a therapeutic outlet; however, programmatic factors that contribute to veteran's desire to attend such programs are under-investigated. Furthermore, evaluative processes in equine therapy for this particular population are scare and vary greatly from program to program. The use of the Importance-Performance Analysis (IPA) tool when applied to social services yields direct, applicable feedback of program success and relevancy. In this study, interviews with the selected population informed the evaluation tool used to assess the importance, and subsequent performance, of various program factors in a national military-specific equine therapy program. Results of this study provided insight into key factors being sought after in similar equine therapy programs to inform the development and maintenance of programs serving the veteran population. The application of the IPA, a consumer feedback tool typically reserved for market research, to the health and human services sector provided a new pathway for quality assurance and program analysis for the equine therapy field.

Simultaneous Determination of Fat-Soluble Vitamins in Dietary Supplement by HPLC Using Different Detectors

Yaqi Wang, Feng Chen, and Weizheng Wang
Department of food nutrition and packaging science, Clemson University

The consumption of dietary supplement especially multivitamins and minerals have increased in a great extent during last decades. Since various forms of fat soluble vitamins (FSVs) vitamin A, D, and E along with other complex components have been practically added into MVM dietary supplements as the common ingredients, the level of those FSVs require precise and accurate determination due to their potential health risks. This research aims to develop and optimize an efficient and rapid method with high sensitivity and resolution to simultaneously detect FSVs including vitamin A esters, vitamin E succinate, and vitamin D3 in MVM dietary supplements using HPLC coupled with DAD detectors, as well as ELSD detector. In this study, samples were prepared using 0.1N HCl to hydrolyze the microencapsulation of the FSVs. Then direct liquid-liquid extraction using hexane and ethyl acetate instead of saponification has been applied to extract FSVs followed by solid phase extraction to clean and concentrate the sample. The sample was then injected into reverse-phase HPLC for analysis. The results showed that the FSVs mentioned above can be efficiently separated and simultaneously determined. The day-to day repeatability was in most cases under 7%, and within day variation was smaller than 6% for all vitamins. Simultaneous determination of FSVs have been developed for serum and plasma samples, milk and other dairy product, and animal feeds. However, few research has developed effective method for simultaneous detection of those four types of FSVs mentioned in MVMs dietary supplements due to matrix interference and degradation from sample preparation. The described analytical method is effective and fast, enabling to analyze several FSVs with high sensitivity simultaneously.

Community dynamics of the microbiome within water cooling towers

Emlyn Hammer, and Vincent Richards
Department of Biological Sciences, Clemson University

Water cooling towers can serve as a reservoir for biofilms, free-living amoebas and pathogenic bacteria that can be a conducive environment for disease outbreaks, specifically Legionnaires disease. Currently, the most effective detection and disinfection methods have yet to be identified when it comes to targeting Legionella within man-made water systems. Thus, five water cooling towers were sampled for a year and assessed through NGS to determine community profiles and predictive patterns associated with Legionella spp. Pseudomonas, Methylotenera, Sphingomonas and Flavobacterium were the most abundant

bacterial genera, while Vermamoeba, Cercomonas, fungi in the subphylum Ascomycota and ciliates in the super-clade CONthreeP were the most prevalent eukaryotes. Legionella was present in each sample type (bright sediment, dark sediment, and water) but only in low relative abundance within the microbiome. Legionella associated amoebas such as Acanthamoeba, Vannella and Naegleria were also present in the community. Genera was not differentially abundant across sample type, whereas Flavobacterium was the only observed genus differentially abundant over time. Temperature, Br/Cl concentrations and time had the highest correlation with the biological data, suggesting they're driving forces in the community. Furthermore, samples grouped by collection time showed that samples collected before and after the Br/Cl concentrations dropped to 0.00 are temporally divergent than the rest of the samples. Microbial association network analyses are currently being conducted to further explore the interactions among the community and environmental parameters. Understanding these interactions can provide a stepping stone for preventing outbreaks due to earlier detection and better disinfection methods.

Roost Selection of Southeastern Myotis in an Old-Growth Bottomland Hardwood Forest

S. Piper Kimpel[1], and Susan C. Loeb[2]
[1]Department of Forestry and Environmental Conservation, Clemson University
[2]USDA Forest Service, Southern Research Station, Clemson

Little is known about the roosting habits of southeastern myotis, Myotis austroriparius, in Coastal Plain forests. Our objective was to quantify characteristics of roosts selected by southeastern myotis in Congaree National Park, an old-growth bottomland hardwood forest in the Upper Coastal Plain of South Carolina during Winter (November-March) 2015-16 and 2016-17 and Summer (May-August) 2015 and 2016. We located roosts through opportunistic cavity searches and tracking radio-tagged bats to roosts. We quantified tree characteristics, the herbaceous layer in front of the cavity opening, the surrounding vegetation, canopy closure, and cavity opening size of roost and random trees. We ran logistic regression models to test which characteristics were the most important for distinguishing all roosts versus random trees, winter roosts versus summer roosts, summer roosts versus random trees, and winter roosts versus random trees. Although we located many canopy roosts during the study, our analyses were conducted only on roosts with basal cavity openings. There were no significant differences between winter and summer roosts or between winter roosts and random trees. Tree stand composition, percent herb cover in front of the cavity opening, and canopy closure were not significantly different between all roost and random trees. However, roost trees had significantly smaller cavity opening areas than random trees ($P = 0.006$), significantly larger diameter at breast height ($P = 0.016$), and smoother cavity interior texture ($P = 0.062$). Cavity opening area and diameter at breast height also differed significantly between summer roost and random trees ($P = 0.024$ and $P = 0.039$, respectively). This suggests that roosts are selected for their cavity properties rather than for their surrounding habitat, perhaps to decrease risk of predation, improve thermoregulation, and provide larger spaces for maternity aggregations.

Reminiscing "Howard's Rock": Harnessing the Power of Clemson Football Memories to Improve Quality of Life of South Carolinians with Dementia

Katie Walker, Taylor Hooker, Brent Hawkins, and Greg Ramshaw
Department of Parks, Recreation and Tourism Management, Clemson University

This project includes the development, implementation, and evaluation of a non-pharmacological, sports-based reminiscence therapy (RemT) kit based on Clemson football's history and heritage for use at an assisted living and memory care facility in upstate South Carolina. Woods et al (2005) describes RemT as "the discussion of past activities, events, and experiences, usually with the aid of tangible prompts (e.g., photographs household and other familiar items from the past, music and archive sound recordings)" (p. 2). RemT is frequently used as an intervention with individuals who have dementia with non-pharmacological approaches becoming increasingly valuable in dementia care (Kolanowski, Fick, Frazer, & Penrod, 2010). Sport is a logical theme for RemT interventions as it creates some of the most resilient ties to personal and collective pasts, and can evoke strong memories and lasting connections between people, places, and communities (Ramshaw & Gammon, 2005). There is growing interest in using the sporting past in health and wellbeing, specifically as a tool for RemT. Given the important and positive role Clemson football has played in the lives of many upstate South Carolina residents, a Clemson football-themed RemT kit may be helpful for dementia care patients and their families. This project consisted of the development of six RemT protocols including stadium, famous individuals, traditions, famous games, attending games, and tailgating themes focused around Clemson football history and experiences. Evaluation data collected at a local memory care community included interviews with residents, staff, and family members; field notes and observation; and pre and post assessment data measuring cognition and dementia-related behaviors. Paired samples T-tests ($N=16$) indicated a statistically significant improvement in quality of life from pre to posttest ($t=-5.40$, $p<.000$), but no statistical differences were observed in cognition. Comprehensive themes from interviews and observations include 1) opportunities for learning and sharing, 2) group culture and tradition, and 3) positive behavioral change.

Extractive Scintillating Resin and Membranes for Plutonium Preconcentration and Isotopic Analysis from Aqueous Sources

James Foster[1], Abenezar Darge[1], Christine E. Duval[1], Valery Bliznyuk[2], Ayman Seliman[2], Timothy A. DeVol[2], and Scott M. Husson[1]
[1]Clemson Chemical and Biomolecular Engineering,
[2]Clemson Environmental Engineering and Earth Sciences

My research is focused on the development of high-selectivity sensor materials that can be combined with analytical techniques for the quantification and isotopic determination of plutonium at ultra-trace levels in ground water. In order to achieve this goal, I will focus my efforts towards two main objectives:
Objective 1: Develop extractive scintillator resins for water-soluble plutonium.
Objective 2: Develop a method that combines an adsorptive ultrafiltration membrane for plutonium preconcentration and sample preparation for alpha spectroscopy in a single step.

Effectiveness of Ultra-High Performance Concrete Coating on the Resistance of Steel Reinforcement to Corrosion

Haitham Z. Hussein, Prasad Rangaraju, and Amir Poursaee
Glenn Department of Civil Engineering, Clemson University

The total annual estimated direct cost of metals corrosion in the U.S. is estimated to be over a trillion dollars accounting for a staggering 6.2% of the nation's Gross Domestic Product (GDP). Corrosion is a common problem in reinforced concrete structures. Although, many solutions have been developed to deal with corrosion of steel in concrete infrastructure such as corrosion inhibiting admixtures, cathodic protection devices, etc. these remain as expensive options to remain effective. One potential long-term solution to control corrosion of steel reinforcement in concrete is using ultra-high performance concrete (UHPC) which possesses many advantages such as extremely low permeability and very high bond strength compared to conventional concrete. However, to use UHPC for the entire structure is an expensive proposition. As an alternative approach to protect steel reinforcement in concrete, coating of steel reinforcement with UHPC grout is explored in this study. Guided by our previous study, the UHPC grout was prepared by using Type III Portland cement with combinations of silica fume, silica flour and ground glass fiber and a powdered high-range water-reducing admixture and steel was coated by this grout. Coated rebar samples were immersed in chloride-free and chloride contaminated simulated Portland cement pore solution and their electrochemical behavior in these solution were examined using linear polarization resistance (LPR) and half-cell potential techniques. The results obtained thus far showed high resistivity for coated samples compared to the uncoated rebars, offering a promise of UHPC coating as a means to enhance life of steel reinforcement in concrete.