

Spring 2013

Clemson GRADS - Graduate Research and Discovery Symposium Program

Clemson University

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CLEMSON GRADS

Graduate Research and Discovery Symposium

Monday April, 8th 2013
Hendrix Student Center
Clemson University

Poster Session
1:00 - 4:00 PM

Awards Ceremony
4:30 – 6:00 PM





Welcome to the 1st Annual Graduate Research and Discovery Symposium (GRADS)! This year's GRADS event is a first for Clemson University. It is the first graduate student led, university wide research symposium in Clemson's history. This year's event will showcase the research of over 100 graduate students from each of the colleges in the University's Graduate School. The event serves as an opportunity for Clemson's graduate students to exhibit their work as well as an opportunity for our graduate community to learn what their peers in other fields are researching, creating and producing. The GRADS Event Committee would like to thank all of the sponsors for this year's event, those who have generously donated their time, effort, and resources toward funding and publicity as well judging, and most importantly, we would like to thank our graduate presenters for their hard work and dedication to their research and studies! We hope you enjoy the graduate presentations and please feel free to stick around for the awards ceremony and social immediately following the poster forum!

-The GRADS Event Team

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Architecture

Door Accessibility: Contemplating the Americans with Disabilities Act at Clemson University

(CAAH 1 - BR 3)

Author: Brian Duffy

Several door thresholds do not meet The Americans with Disabilities Act (ADA) guidelines whereby compromising the ability for a person in a wheelchair to easily pass through a door opening. Utilizing a qualitative research approach, data were collected using simulation methods and face-to-face interviews. Twelve doors were studied to determine if the threshold heights comply with ADA code A4.13.8. Results show that many doors are not meeting ADA code. Recommendations are provided to show how improving door closers, door width, and sill plate design will improve accessibility for those in wheelchairs.

Studio Acoustics: A Study on Clemson University's Design Studio Environment

(CAAH 3 – BR 18)

Authors: Katrina Fumagali and Elise Little

Architecture studio environments are meant to foster cross-pollination but is there a point at which acoustical discomfort hinders a student's performance? The intent of this research is to find out if the acoustics are negatively affecting the architecture studio learning environment at Clemson University. This study compares student perceptions of noise with acoustical benchmarks and site-specific decibel readings. It examines primarily the acoustics of two design studio environments: the architecture studio in Lee III, constructed in 2010, and the architecture + health studio in Lee II, constructed in 1975.

Heat Island Effect: The Unknown Repercussions

(CAAH 4 – BR 26)

Authors: Tanner Sharpe and Miguel Yon Moll

Heat Island Effect is a notable environmental issue that has the potential to negatively impact the built urban environment and adjacent suburban areas. While Heat Island Effect should be an important consideration for anyone studying in the field of architecture and environment, it is a subject that may sometimes go unaddressed in academic settings. The purpose of this research project is to investigate students' familiarity with HIE and to observe whether they consider it during the design process. This information will help to generate the most effective methods for educating and informing students on the topic of Heat Island Effect. We conducted general research on Heat Island Effect based on findings from entities such as the Environmental Protection Agency and United States Green Building Council. This helped us to formulate survey questions that were posed to forty-nine Clemson students in Architecture and Landscape Architecture. We also interviewed two architecture students and one professional landscape designer. Our findings show that 49% of the students were unfamiliar with Heat Island Effect and 63% of survey takers agree that more education on the subject combined with design guidelines could be introduced to bring more awareness on the subject.

Internships: An Academic Requirement?

(CAAH 5 – BR 34)

Authors: Katie Johnson and Nicole Miller

Internships are an important part of an architectural education, and how schools deal with internships is a topic of widespread debate. The goal of this project is to develop a clear understanding of architectural internships and their relationship with architecture schools. The project included an architecture student survey, which provided an overview of advantages, drawbacks, and issues associated with internships. The study also involved research of three

case study architecture schools: Clemson University, the University of Michigan, and the University of Cincinnati. These schools demonstrated varying levels of internship requirements. Based on the findings, recommendations are provided to improve schools' architecture career services.

City and Regional Planning

A Downtown Revitalization Study for Woodruff, South Carolina

(CAAH 7 – BR 46)

Authors: Alyson Leslie and Annemarie Jacques

Woodruff is a small town in South Carolina that has declined since the closing of two major textile mills in the 1980s that once were its economic drivers. Economic decline has led to the physical deterioration of the buildings and streetscape elements on Woodruff's Main Street. The conditions of a town's Main Street reflect the identity of the town as a whole, particularly in a town the size of Woodruff with a total land area of 3.9 square miles. A component specific to Woodruff that emphasizes the necessity for a high quality downtown is the high volume of daily traffic that flows through it due to busy State Highway 101. The objective of this research is to provide façade design, streetscape and infill alternatives to revitalize Main Street Woodruff in a sustainable manner that will give the pedestrian a pleasurable experience and the passer-by motivation to stop and enjoy the amenities that the town has to offer. The methodology includes data gathering, SWOT analysis and a comparative visual analysis using "before and after" renderings of the site. Simple sustainable alterations such as façade improvements, streetscape additions and street narrowing vastly improve Woodruff's downtown environment.

Planning Bicycle Infrastructure Based on Quickest Route Method

(CAAH 6 – BR 44)

Author: Olena Tokmylenko

Current bicycle models assume average speed along the route and among routes and travel time is proportional to distance. There is no method that determines realistic cycling time based on change in speed due to topography. Our research proposes a model for the development of bicycle infrastructure based on reducing travel time and level of difficulty. We identified that topography, human power, and riding speed have strong relationship and we developed bicycle travel time model where speed is a function of human power and topography. We solved the shortest route problem with time impedance where time was computed based on (1) power model and (2) constant speed assumption. We compared the route locations for two scenarios and proposed a location of bicycle ways based on power model quickest routes locations. There is no significant difference in location with very short routes (about 1 mile) or in areas with insignificant uphill slopes. However, in the areas with steep slopes power model allows to predict more realistic travel time based on decreased speed due to topography. Consolidation of all routes into one map has shown that there are some segments of the road network that are more suitable for bicycling than others.

Communication, Technology, and Society

Mediated Competition, Comparison, and Connections: How Mobile

(CAAH 9 – BR 55)

Interactive Fitness Technologies Alter the Cycling Experience

Author: William R. Smith

With 45% of America's adult population using smartphones, it is essential to study how these technologies mediate and affect our experiences, including those connected to human health (Pew Internet Project, 2012). Recent data claim that 60% of adults in the U.S track their weight, diet, or exercise routine, with 1 in 5 adults using a form of technology to aid in tracking (Pew Internet Project, 2013). The interactive fitness technology (IFT) Strava affords a user the ability to track via GPS his or her bicycle ride or run, then upload the data to a website for comparison, competition, and interaction with their self and others. Using a qualitative grounded theory approach, this study examined practices and discourses surrounding the IFT, including the Strava system's texts and technological affordances (Gaver, 1991). After multiple iterations of analysis three themes emerged; competition, comparison, and community. I postulate that these three themes are interacting with one another and leading to a changed experience for the cyclist. The 'changed experience' is characterized by cyclists' perceived need for recording, comparing, classifying, interacting and sharing data with their connections, and an overall transition away from 'riding for the sake of riding.

Official and Viral Apologia: Participatory Culture and the Penn State Scandal

(CAAH 8 – BR 52)

Author: Brandon Boatwright

Tremendous scholarly attention has been devoted to image repair techniques and the role the rhetor plays in its own defense. However, little has been done to address how this ancient genre translates into more modern contexts, particularly social media. This thesis bridges the gap between the traditional rhetorical genre of apologia and the participatory culture characteristic of virtual communities. Using The Pennsylvania State University sexual abuse scandal as a case study, the current research employs a multi-methodological approach to more fully understand the process by which organizational apologia reaches, spreads between, and influences meaning-making within online communities. This research addresses five events of the scandal across three levels: (1) rhetorical analysis, (2) textual analysis, and (3) virtual ethnography. Results indicate that the Penn State apologia functions as self-deception – that is, rhetoric that Downey (1993) calls “contradictory, self-serving motives [that] masks moral responsibility, exploits audience ignorance and emotions while championing the same values breached by the apologist” (p. 58). This self-deception leads to confusion among Penn State's various audiences. More specifically, this provokes the Penn State memes community to debate the group's ignorance, morality, and identity. Major implications and suggestions for future research are discussed as well.

Historic Preservation

Documenting 1,000 Years of History: Historic Preservation Fieldwork of Molana Abbey in Ireland

(CAAH 12 – BR 67)

Author: Rebecca Quandt

As a first-year graduate student in the Clemson University historic preservation program, I was afforded the possibility to participate in a hands-on research project in Ireland this past summer. In June 2012, I, along with six other classmates had the life changing opportunity document Molana Abbey in County Cork, Ireland. Working with archaeologists from University College, Cork in Ireland and Mercer University in the US, our class produced architectural documentation drawings and a conditions assessment report that are integral in the stabilization and repair process to be carried out by the Irish Ancient Monuments Commission. On June 16th, 2012, we began our field work. Spending two weeks completing map of the site as well as plans and elevation drawings of the ruins in an effort to determine how the abbey changed over the course of its one thousand year history. Founded in 501AD, the abbey became an important early center of religious learning. The earliest surviving portions of the abbey are said to date to the 11th century.

Quarters A at the Old Charleston Navy Yard: A Historic Interior Furnishing and Interpretive Plan

(CAAH 11 – BR 65)

Authors: Wendy Madill, Charlotte Causey, Amy E. Uebel, Mary Margaret Schley, Julia Tew

Charleston's Naval Yard resembles a ghost town today, but it was once the city's most active industrial district. It employed thousands of South Carolina workers who built warships and Navy infrastructure throughout the 1900s. When the Admiral presided over this bustling base, he lived at Quarters A. This social epicenter hosted military ceremonies, weddings, and PR visits from celebrities. Charles Lindbergh, Helen Keller, and FDR are some of the notables who walked these halls—halls that are now silent. Since the 1996 decommissioning of the base, Quarters A faces deterioration. Although exterior condition is poor, the interior is well-preserved. The purpose of this project is to raise awareness for the site by creating an interior furnishings and interpretation plan for this house. We combined many sources—Navy furniture allotments, historic photographs, paint sample microscopy, archival research, and oral interviews—to create an accurate picture of what the house once was and what it can be. We propose restoring the building into a public event and reception space that highlights the WWII-era apex of the Navy Yard. It is our goal to provide inspiration for reestablishing Quarters A as a profitable and enriching showpiece in the community.

Landscape Architecture

Cultivating America's Working Lands: A Study of the Sociocultural Value of Family Farms

(CAAH 13 – BR 71)

Author: Katherine Lloyd

Our ability to produce food in a sustainable, healthy and humane manner is threatened, both in the United States and on the global scale. This difficulty is exacerbated by expected population growth, creating a need for 60% more food worldwide by 2050 to feed a population of 9.3 billion. How we produce food affects local economies, the cultural vitality of communities, and the health of regional ecosystems. Industrial or conventional agriculture is damaging all three of these systems by draining local economies through corporate business practices, isolating farmers and contributing to rural population losses, while depleting natural resources and polluting the environment. Additionally, the healthy agricultural lands that remain around cities are being developed at alarming rates in relation to population growth. In response to these threats, as well as inequities in global food supply and distribution, this study is concerned with how family farms that practice sustainable agriculture approach self-sufficiency within their local communities. Through case studies of nine southeastern family farms, this study addresses self-sufficiency from the perspectives of scale, practices, proximity, access, relationship, and engagement. Results of the study help to form design strategies that sustain working lands through conservation, production and education.

Planning, Design, and the Built Environment

CIAS-DM: A Model-Based, Human-Centered Architectural Modeling Method + Tool

(CAAH 14 – BR 74)

Authors: J. Manganelli, Keith Green, Johnell Brooks, Greg Mocko, Ian Walker, Stan Healy

A recent trend in architecture is for the built environment to pro-actively contribute to enhancing human health, well-being, performance, and social interactions in measurable, predictable, and adaptable ways. Buildings are becoming interfaces and digital machines and their roles and capabilities are expanding. Accommodating this trend will require architectural design methods and tools to evolve. Sensing, monitoring, actuation, intelligence, and communication subsystems are now integral components of environmental designers' vocabularies and considerations when designing space and form. At present, the theories, methods, and tools for representing and incorporating these elements during design do not exist. Developing these artifacts is an active area of research. This dissertation focuses on representing the affordances of complex, interactive, architectural systems (CIAS) and proposes, evaluates, and refines the Complex, Interactive, Architectural Systems Design Methodology (CIAS-DM). The purpose of CIAS-DM is to aid designers in making sure they understand the design challenge well at the start of the project. The Validation Square Research Design is used to evaluate CIAS-DM. Results are preliminary, but indicate that using a method similar to CIAS-DM may be useful for helping designers manage the scope of complex, interactive design challenges.

Professional Communication

Reading Experiences, Digital Literacy, and Electronic Textbooks

(CAAH 15 – DP 79)

Author: Chelsie Messenger

Previous research on electronic textbook has produced mixed results, partly because of incomplete methodologies. Too many studies relied solely on qualitative data or imprecise learning outcome measurements. This research study was interested in what type of textbook (print, electronic, or web) helped students perform better on procedural and conceptual tasks. Forty-one first-year composition students at Clemson University were recruited to participate in a hybrid of quasi-experiment and think-aloud protocol. A quasi-experiment was used to gather quantitative data about how the different textbooks influenced performance, and a think-aloud was used to gather qualitative data about the participants' opinions and attitudes. The conclusion of this study was that electronic textbooks confuse students because e-textbooks attempt to reconcile the print and the digital reading experiences. Students bring specific expectations to both experiences; these expectations create a framework for understanding how to use different types of texts. While the website came in second on both the procedural and conceptual tasks, the website was the most efficient in helping the students gain conceptual knowledge. The website was also the text that the students said they would be most likely to use. E-textbooks need to be formatted more like websites to be most effective for students.

Rhetorics, Communication, and Information Design

Ubiquitous Libidinal Infrastructures of Urbanism

(CAAH 16 – DP 84)

Author: Lauren Mitchell

While studied in marketing and packaging design, big-box culture—generally thought of as sprawl—is often suppressed or ignored by the formal and technologically oriented strategies found within architectural design curricula. That is, resistance of big-box culture and market segmentation is typical within the field of architecture. This trans-disciplinary project brings rhetorical scholarship to bear on big-box culture with emphasis on design pedagogy. Doing so offers architects and urbanists an opportunity to design with more awareness about the ubiquitous, what drives it, and why its there. The project develops the concept of ubiquitous libidinal infrastructures, defined as the externalized (physical and/ or digital) manifestations of human desire-driven energy flows. Myrtle Beach, South Carolina and Orlando, Florida are used as primary subjects of investigation through which theories of Jean-François Lyotard and Gregory Ulmer are introduced into the field of urbanism. In turn, this material and spatial re-reading of Lyotard and Ulmer offers the field of rhetoric an important and timely access point into the field of urbanism. This project argues that deeper investigations of big-box culture require disciplinary invention and expansion.

Visual Arts

Alternative Narratives in Westernized Religion

(CAAH 18 – DP 93)

Author: Joel Murray

Research plays an integral role in the conceptual development of this series of graphite drawings establishing an alternative dialogue with westernized religion. Source material ranges from theoretical and fictional texts to popular culture and art history. More specifically, this series recasts the image of Christ in contemporary culture; a new narrative developed by the artist collides with the biblical protagonist. This provocation subverts the viewer's expectations surrounding more traditional and historical representations. Allowing the artist's findings and inferences to congeal in the form of visual art sparks a dialogue between artist and spectator.

Study of Form

(CAAH 17 – DP 89)

Author: Tanna Burchinal

It is the temporal that is sublime for me; it is a profound way of representing life but more importantly existence. My work is a tribute to the struggle of acceptance, and the realization of shortcomings as we navigate the human condition. In the ephemeral, there exists the feeling of letting go, accepting instability and the unforeseeable. That transition is an enlightening act; the journey of reckoning with maturing is what I memorialize in my works. I utilize the ephemeral, the subdued, the neutral by effecting space with media that metaphorically illustrate aspects of the human condition. Making the body as intangible as constructs of identity, is one way I employ my interest in acts of preservation. The things of the here and now, are immediate and then they are gone, but I find them worthy of representation. I represent conditions not in a way of permanence, but in a way that is as evasive as our time spent in the physical world. I expect my viewers to spend time with my installations in reflection of those acts, and conditions. My messages are relatable and broad, but unique to myself through my style, my material choices, and my personal experiences.

College of Agriculture, Forestry and Life Science

Animal and Veterinary Science

Continuous Measurement of Methane Production Before and After Feeding in Continuous Cultures Fed Bermudagrass

(CAFLS 1 – BR 2)

Authors: K.M. Young, J.R. Burgess, C.T. McDonald, T.C. Jenkins

The objective was to design a system that could detect gas concentrations continuously in ruminal continuous cultures to better assess changes in methane (CH₄) occurring before and after feeding. The custom-built system used CH₄ and CO₂ infrared sensors, and an O₂ infrared sensor. Thirty g of Tifton 85 bermudagrass harvested at 35 d of maturity was fed daily in two equal amounts at 0800 and 1600 h for three 7 d periods. For statistical analysis, hourly recordings were used between 0800 and 1600 h on days 5, 6 and 7. Data were analyzed by the Fit Model Procedure in JMP (SAS Institute) with time, day, and their interaction as main effects and period as random effect. Methane production increased (P<0.01) between 0800 and 1600 h (12.1, 12.6, 17.0, 21.9, 23.6, 26.4, 26.9, 27.1 and 28.1 mmol) when averaged across d 5-7. A decrease (P<0.01) in methane production on d 7 (26.1, 23.7, 15.4 mmol/d for d 5-7) is thought to result from repeated opening of the culture vessel to obtain samples. The novel gas analysis system developed for continuous cultures in this study successfully measured changes in CH₄ concentration before and after feeding that were comparable to previously reported values.

Biochemistry and Molecular Biology

Living High on the Hog or Down in the Dumps: How Fatty Acid Synthesis

(CAFLS 2 – BR 8)

Helps African Trypanosomes Survive in Host Environments

Authors: Sunayan S Ray, Ciara Anderson Mcknight, Kimberly Paul

Trypanosoma brucei is a major cause of death in humans (sleeping sickness) and livestock in some parts of Africa. It is caused by a parasite *Trypanosoma brucei*, which is transmitted by the Tsetse fly. Current drugs are toxic and vaccine development is unlikely because the parasites undergo antigenic variation. Antigenic variation involves the switching of Variant Surface Glycoproteins (VSGs), which depends on fatty acids for surface expression. Acetyl-CoA Carboxylase (ACC) catalyzes the first committed step of fatty acid synthesis and hence is a potential therapeutic target. Our studies demonstrated that inhibition of ACC expression causes a growth defect in insect procyclic form (PF) parasites in low lipid condition and reduced mammalian bloodstream form (BF) infection in mice. Under lab growth conditions, we observed regulation of ACC by environmental lipids in PFs but not BF. In BF, we showed that ACC is required for the elevated endocytosis needed for the parasite to avoid antibody-dependent complement-mediated lysis. In sum, we propose that in PFs, ACC is regulated to maintain lipid levels while the parasite undergoes development in the Tsetse fly, while in BF, ACC is always active to support the upregulation of endocytosis needed to evade the mammalian immune system.

Biological Sciences

Fighting for Shelter: Are Aggressive Caribbean Spiny Lobsters the Best Den Competitors?

(CAFLS 3 – BR 16)

Authors: Katherine Heldt and Michael Childress

Caribbean spiny lobsters are highly gregarious and use shelters for protection from predators. In recent years, sponge loss events in Florida Bay have decreased the amount of natural shelters available for juvenile spiny lobsters, and aggressive behaviors exhibited at the den, suggest that den competition may increase after shelter loss events. To determine the influence of habitat loss on denning behavior, twenty juvenile lobsters were collected from eight high and eight low shelter locations. Each group (n=16) was observed daily in a mesocosm with ten crevice shelters. We measured the frequency of den use, den sharing and den fidelity of each individual and determined whether characteristics such as size, habitat type, health, etc. influenced denning behavior. To simulate a sudden shelter loss, five crevice shelters were removed from the mesocosm and behavioral variables were re-measured. Both size and habitat type played an important role in explaining denning behavior. Surprisingly, after shelter loss, den use and den fidelity decreased for large, aggressive lobsters. Understanding the impacts of habitat loss is especially vital for this economically important species, and these data suggest that vulnerability rather than aggression predicts which individuals remain in a den after shelter loss.

Entomology

The Invasive "Kudzu Bug," *Megacopta cribraria* (Hemiptera: Plataspidae) as an Agricultural and Nuisance Pest

(CAFLS 4 – BR 24)

Authors: N. J. Seiter, J. K. Greene, F. P. F. Reay-Jones, E. P. Benson, and P. A. Zungoli

The invasive "kudzu bug," *Megacopta cribraria* (Hemiptera: Plataspidae) is a native of Asia that was found in northeastern Georgia in fall 2009. This insect has since spread rapidly throughout the southeastern U.S., and is abundant in much of South Carolina. *Megacopta cribraria* feed on the vascular fluid of several legumes, primarily kudzu, *Pueraria montana* var. *lobata*, and soybeans, *Glycine max*. These insects enter soybean fields in often alarming numbers, leaving conspicuous lesions on soybean stems and potentially reducing yields. In addition, *M. cribraria* congregate on homes and other structures in late fall as they seek overwintering sites, potentially becoming a nuisance pest where populations are large. We examined *M. cribraria* as a yield reducing pest of soybeans and as a nuisance pest of buildings. Large populations of *M. cribraria* in caged soybean plots resulted in yield losses of up to 59.6%, and yield reductions were similar in both 2011 and 2012. Several professional-use insecticides were effective in controlling *M. cribraria* on a variety of building material surfaces, and in some insecticide x surface combinations activity was maintained 30 days post-application. These results contribute to our still developing understanding of this insect as an agricultural and nuisance pest.

Environmental Toxicology

Fate and Behavior of Titanium Dioxide in Aquatic Ecosystems

(CAFLS 5 – BR 32)

Author: Jason Coral

One common use of TiO₂ particles is use in sunscreen. As a result of aggressive sunscreen campaigns sponsored by the CDC in the early 2000's, sunscreen use is high. As a result, there is concern that the nanoparticles that make these sunscreens effective wash off of sunbathers in the water. The fate and impact of these nanoparticles in aquatic ecosystems is uncertain. Recent research has shown that these nanoparticles form reactive oxygen species (ROS) that may be harmful to aquatic organisms. The objective of this research is to characterize the production of reactive oxygen species created by TiO₂ nanoparticles being exposed to light in fresh and marine waters. ROS will be measured by Electron Paramagnetic Resonance spectroscopy. TiO₂ will be suspended in water that varies in pH, dissolved organic carbon, and salinity. Light treatments will include ultraviolet light, full sunlight, infrared light, and no illumination, for 28 days. Previous research has demonstrated activation of ROS species when TiO₂ was exposed to various light wavelengths but has yet to show a time related studies. In the future, once ROS production is characterized, acute and chronic toxicity will be assessed using standard *Daphnia magna* bioassays.

Food Technology

Antimicrobial Effects of Natural Tenderizing Enzymes on Different Strains of *Escherichia coli* O157:H7 and *Listeria Monocytogenes* on Meat Surface

(CAFLS 6 – BR 42)

Authors: Hanan Eshamah, Inyee Han, Hesham Naas, James Rieck and Paul Dawson

Tenderization of beef meat is widely done for increasing consumer acceptance and enhancing shelf life. This study was conducted on meat surface to determine the efficacy of proteolytic enzymes (papain and Actinidin), meat tenderizer enzymes, on the survivability of multiple strains of *E. coli* O157:H7 and *L. monocytogenes*. Two overnight cultures of three strains of *E. coli* O157:H7 and *L. monocytogenes* were separately suspended in 1% peptone water and were individually inoculated into beef meat surface (ca. 106 CFU/ml). After 5 minutes attachment time different enzyme concentrations were added. Treated samples were then kept for 3 h at 25°C and 35°C and for 24 h at 5°C. Actinidin concentration (700 mg/ml) tested at 25°C against *E. coli* O157:H7 and *L. monocytogenes* was the most effective concentrations tested reducing populations by 2.4 and 1.41 log CFU/ml after 3 h, respectively. Papain concentration of (10 mg/ml) was the most effective concentrations tested at 25°C against *E. coli* O157:H7 and *L. monocytogenes* reducing populations by 1.8 and 0.8 log CFU/ml after 3 h, respectively. These findings suggest that, in addition to the potential for improving the sensory attributes of beef meat, tenderization can enhance their safety and shelf life.

Food, Nutrition and Culinary Sciences

How Clean is a Restaurant Menu? A Study of Bacterial Transfer to and from Restaurant Menus

(CAFLS 7 – BR 50)

Authors: Ibtehal Alsallaiy, Paul Dawson and Inyee Han

Some non-food contact surfaces such as restaurant menus are not routinely evaluated for microbial contamination thus can be a potential contamination risk. The main objectives of this study were to detect bacteria on restaurant menus, test the rate of bacteria transfer from menus to consumers and determine the survival rate of bacteria on the menu surface. Samples collected from local restaurants' menus and analyzed for total aerobic organisms and *Staphylococcus* spp, indicated that menus often harbored detectable levels of bacteria. The average transfer rate was 11.17%, with a high variability between subjects (10.45% standard deviation). Survival rate of bacteria was 1.40% after 24 hrs and 1.34% after 48 hrs, respectively. These results indicate bacteria can transfer from a menu to the consumer's hands and that bacteria can survive on menus even after 48 hrs. This study will inform the general public and restaurant personnel about the importance of menu hygiene. Future research may include standard sanitation procedures to reduce possible cross contamination from menus.

Forest Resources

Development of Integrated Management Practices for the Control of Chinese Tallow (*Triadica sebifera*)

(CAFLS 9 – BR 69)

Authors: Lauren S. Pile, G. Geoff Wang and Patricia A, Layton

Chinese tallow (*Triadica sebifera*) tree is an aggressive, fast growing, highly adaptable invasive tree of the southeastern United States coastal region. Our study is located on Parris Island Marine Corps Recruit Depot (MCRD) in Beaufort County, South Carolina. Parris Island MCRD. Chinese tallow has been managed on Parris Island MCRD since 2001 through the use of herbicides primarily with 'hack and squirt' methodology. In 2010, invasive species presence and abundance on Parris Island MCRD was surveyed in order to monitor the Chinese tallow population and to assess the effectiveness of previous control efforts. Results from this survey suggest there is a need for a more effective management approach because the Chinese tallow population in some areas had increased despite herbicide applications. In this study, we seek to find an effective approach for managing Chinese tallow while, at the same time, promoting native species diversity and restoring the forest ecosystem. We will test several integrated treatments including mechanical, herbicide and fire to determine their efficacy on Chinese tallow control as well as their potential adverse effects on native vegetation. The goal of the study is to determine the most effective integrated treatment of Chinese tallow.

Multitemporal floristic and phenological (flowering) analysis of the shores of Lake Issaqueena, South Carolina

(CAFLS 8 – BR 59)

Authors: R.P. Pamplin, E.A. Mikhailova, C.J. Post, P.D. McMillan, J.L. Sharp

The floristic and phenological (flowering) study of Lake Issaqueena in Pickens County, SC, conducted by William Pamplin in 1970-1971 was reinvestigated in 2011-2012 using the Carolina Vegetative Survey (CVS) natural community sampling methods and photo documentation using a GPS enabled camera to determine floristic and phenological changes for this site during the forty years separating these two studies. Phenological events (flowering) were recorded via photographs taken by a GPS enabled camera on a monthly basis. Photographs were downloaded and organized by sampling date in Picasa 3 web albums and stored in a project Google website. Plants were identified using expert knowledge, existing keys and the USDA plant database. Precipitation in 1970, 2011 and 2012 was below the long-term average and this combined with higher than average air temperature impacted drought severity in the area. Comparison of phenologies indicated 269 plant species blooming in 1970-1971 compared to 203 plant species blooming in 2011-2012 and 149 common plants blooming in both study periods. The blooming period was 11 months in 2011-2012 compared to 8 months in 1970-1971. Majority of plants were blooming earlier and longer in 2011-2012 than in 1970-1971. There appears to be a phenological shift in blooming dates, but it is unclear whether it is due to climatic variation or other environmental changes in the area.

Genetics

Genome-Wide Association Study in Collies Identifies a Novel Locus for Dermatomyositis

(CAFLS 10 – BR 72)

Authors: Rooksana E. Noorai and Leigh Anne Clark

Dermatomyositis (DM) is an autoimmune disease of humans and dogs characterized by an inflammatory response in the skin and muscle. In dogs, the predominant clinical sign of DM is small focal areas of scaling and crusting on the face and/or extremities. While there is no cure for DM, symptoms often can be managed with glucocorticoids. DM predominantly affects the collie and Shetland sheepdog breeds, suggesting the involvement of a heritable factor. Identification of the mutation responsible for DM would enable breeders to reduce the incidence of DM in their lines. To identify genomic regions associated with DM, we generated genome-wide SNP profiles for 42 collies using the Illumina CanineHD Infinium BeadChip. A genome-wide association study comparing 26 DM affected and 16 healthy collies revealed numerous significant SNPs near the centromeric end of chromosome 10 (Praw value $\geq 4.35 \times 10^{-8}$). Evaluation of SNP genotypes revealed a 13.5 Mb haplotype shared by all affected collies. An across-breed approach utilizing genotypes from DM affected Shetland sheepdogs will be used to refine the large candidate region. Simultaneously, positional genes known to have a role in immune response are being investigated for casual variants.

Plant and Environmental Sciences

Transforming the South Carolina Botanical Garden

(CAFLS 13 – DP 87)

Authors: Amy Hackney Blackwell and Patrick McMillan

My dissertation addresses the problem of how to transform a small to mid-sized public garden (in this case, the South Carolina Botanical Garden) into a botanical garden capable of making a significant contribution to science. Botanical gardens have a scientific basis for their collections, record data on the plants in the collection, exchanging plant materials and data with other botanical gardens, and provide educational information to visitors. They may also have missions such as conservation of rare and endangered species, botanical and ecological research, and involvement of the public through citizen science. I have examined ways to make the South Carolina Botanical Garden more effective at research and conservation, to increase SCBG's interaction with Clemson University and the local community, to make the garden more visible to the larger world, and to integrate SCBG into the worldwide network of botanical gardens. My work includes revising SCBG's curatorial practices and policies with a view to joining a national botanical conservation network, involving students in scientific collection-building through a hands-on plant collection class, increasing SCBG's visibility and scholarly presence through a project that digitized and analyzed a historic plant collection, and examining the role of laws in guiding botanical gardens' conservation efforts.

Fatty Alcohol Treatments Control Rootstock Re-growth in Grafted Watermelon

(CAFLS 11 – DP 77)

Authors: Shawna Daley and Richard Hassell

The cost of re-growth control is a major reason for the lack of grafted transplants in U.S. watermelon production. Chemical methods of re-growth control could alleviate this cost and increase the efficiency of watermelon grafting in the U.S. Fatty alcohol solutions are used in tobacco as a contact sucker control, and could be used to burn out the rootstock meristem and control regrowth. This study was conducted to determine the optimal fatty alcohol application rate for rootstock regrowth control. Two fatty alcohol products at six concentrations were applied to Bottle Gourd (*Lagenaria siceraria* cv. 'Emphasis') and Interspecific Hybrid Squash (*Cucurbita maxima* x *C. moschata* cv. 'Carnivor') rootstocks as the cotyledons unfolded. On days 1, 7, 14, and 21 after application, rootstocks were individually rated for both damage and re-growth. Results showed a significant decrease in re-growth as concentration increased up to 7.5% fatty alcohol, while damage increased significantly at fatty alcohol concentrations of 6.25% and above. We conclude that the best control of re-growth with a level of acceptable damage is achieved using an application rate between 6.25% and 7.5%, depending on environmental conditions within the greenhouse.

Characterization of *Phytophthora cinnamomi* from Ornamental Crops in South Carolina

(CAFLS 12 – DP 83)

Author: Simon Schreier

Phytophthora cinnamomi is a plant pathogen infects over 900 hosts. Little is known about variability among isolates of *P. cinnamomi* that attack woody ornamental crops in South Carolina. 142 isolates of *P. cinnamomi* from diseased plant samples submitted to the Clemson University Plant Problem Clinic from 1996-2011 were characterized for growth rate, mycelium growth habit, mefenoxam sensitivity, and mating type. Average growth on PARPH-V8 selective medium was 60 mm in 72 h at 25°C. Mycelium growth habit on PARPH-V8 was classified as aerial, sparse, dwarf, or appressed, and 85% of isolates had aerial mycelium. All isolates were sensitive to the fungicide mefenoxam at 100 ppm. The population was composed of 129 A2 and 13 A1 isolates. The ITS 1 and 2 loci were sequenced, and this region had low diversity with only two genotypes that were different from the majority of the population. One of these genotypes consisted of an isolate matching *P. cinnamomi* var. *parvispora*, and the other genotype included four morphologically diverse isolates. Consequently, there was a high degree of genetic uniformity in the ITS region among these 142 isolates. Host-pathogen relationships for this population were compared to reports in the literature, and 33 new associations were found.

Wildlife and Fisheries Biology

Habitat Mediated Raccoon Response to an Artificial Increase in Coyote Activity

(CAFLS 14 – DP 6)

Authors: Cady Etheredge, Greg Yarrow, Patrick Gerard, Jamie Dozier

Most predator control programs treat species in isolation, never considering how competition between predators as predicted by the mesopredator release hypothesis (MRH) can result in indirect benefits to ground nesting prey. Understanding these dynamics will be especially important in the southeastern United States, where recent coyote invasions may provide systems with a new top predator capable of suppressing booming mesopredator populations. This project indirectly tests the MRH by examining the spatial avoidance of raccoons to areas with artificially increased coyote activity. Radio-collared raccoon home ranges were intensely mapped for one week before and after test plots were treated with coyote urine (impact) or walked but not treated (control). Trials were conducted inside both 50 and 95% fixed kernel contours to test for differential raccoon responses based on potentially habitat mediated tradeoffs between resource availability and predation risk. Habitat variables (habitat type, vegetation density, etc.) were measured at five randomly selected points within each plot as soon as possible after trials ended. No statistically significant differences between treatments were found. This suggests that raccoons do not avoid areas of artificially inflated coyote use, potentially implying that coyotes are not an important source of mortality for raccoons in this system.

Swallow Predation of Fly Pests Around Cattle: Climate Change Asynchrony?

(CAFLS 15 – DP 100)

Authors: Claire Stuyck, Ron Johnson, William Bridges

Barn swallows, cattle, and various fly species have lived in close association for >2,000 years. Flies breed in manure and are harmful pests of cattle. Barn Swallows consume flies (~82% of nesting diet) and likely disturb fly activity. We are investigating whether swallows might be enhanced to offer an additional tool to reduce fly impacts. Climate change, however, may differentially affect flies that respond largely to temperature and swallows that migrate and respond to photoperiod. We are using Barn Swallow nesting records, from citizen science databases, and growing degree-days (GDD) to predict swallow nesting in relation to fly emergence. We expect nesting occurs when sufficient flies are present as a food resource. If GDD indicate high fly populations prior to swallow nesting, then asynchrony between swallows and flies would be suspected. Proportional hazards analysis indicates that GDD are a stronger indicator of when Barn Swallows nest than Julian days. This initial result will allow more precise tracking of swallow nesting and comparisons with fly emergence over time.

College of Business and Behavioral Science

Applied Economics

The Biggest Bang for the Buck: Valuation of Various Components of a Regional Promotion Campaign by Participating Restaurants

(CBBS 2 – BR 12)

Authors: Ran Xie, Olga Isengildina-Massa, and Carlos E. Carpio

Government funded advertising campaigns play an important role in agricultural and food policy around the world. Previous studies of economic value of regional promotion campaigns were limited by their exclusive focusing on the benefits received by farmers. Other potential campaign beneficiaries such as consumers, local restaurants and farmers markets have been largely. Furthermore, regional promotion campaigns are typically analyzed as a whole providing little guidance to policy makers about relative benefits of various campaign components. This study fills these voids by examining how various components of the Certified South Carolina Locally Grown campaign are valued by a generally overlooked segment of participating restaurants. A stated-preference choice experiment was conducted to estimate the average willingness to pay (WTP) for each campaign component using a mixed logit model. Three existing components--Labeling, Multimedia Advertising, and "Fresh on the Menu" were found to have significant positive economic value. Individual WTP was calculated in order to explore the relationship between WTP and participating restaurant characteristics. We found that restaurant image, satisfaction with the campaign, and motivation for participation significantly affected their WTP for "Fresh on the menu" and labeling components.

Option Valuation of Timberland Under Price Uncertainty

(CBBS 1 – BR 4)

Author: Wallace A. Campbell

Traditional methods of forest valuation assume that management behavior is fixed over time: each timber harvest occurs at a fixed future date regardless of the evolution of timber prices. This study incorporates option value - the ability to delay an irreversible decision - into forest land valuation through an adaptive harvesting strategy. When option value is ignored, long term investments are undervalued. The optimal adaptive harvesting strategy increases the net present value of land between 29.7 and 35.1 percent relative to a fixed rotation strategy.

Applied Sociology

The Pathways and Performance of Undergraduate Engineering Transfer Students

(CBBS 3 – BR 20)

Authors: Erin Shealy, Catherine Brawner, Catherine Mobley, Richard Layton

Transfer students account for a large percentage of the postsecondary population. Although several transfer pathways exist, much of the existing literature centers on the vertical track, or student transfer from a two-year to a four-year university, while overlooking the much-traveled lateral pathway between two institutions of a similar type (i.e., from one two- or four-year institution to another). Additionally, few studies exclusively concentrate on the shrinking pool of students majoring in the engineering fields, which may prove problematic for the future of the United States' economy if recruitment strategies are not improved. The present paper, which is part of a larger mixed-method study, presents the results of a descriptive study of the student pathways and performance of undergraduate transfer engineering students at eleven participating universities. We report the initial descriptive characteristics of 126 students at four of the four-year study institutions. Results show that 46% of the students in our sample laterally transferred in from another four-year school, a large percentage compared to the relatively rare consideration of lateral transfer students in the existing literature. The study results should be of interest to faculty, staff and policy makers interested in improving the retention and success of transfer students in engineering.

Economics

Non-Parametric Frontier Estimation of Health Care Efficiency Among OECD Countries, 1993-2006

(CBBS 7 – DP 80)

Author: Richard Gearhart

This paper examines cross-country health care efficiency rankings using modern non-parametric estimators. It re-examines the original analysis on cross country health care efficiency, extending the dataset to include 10 new years and using non-parametric estimators to estimate efficiency rankings and Malmquist indices to determine productivity change over the panel. This paper finds that cross-country heterogeneity leads to different efficiency rankings across OECD countries when using different non-parametric estimators from those used in earlier studies. Similarly, efficiency rankings are highly dependent on the choice of input and output bundles, which may be heterogeneous across countries. This paper finds that cross-country comparisons of health care efficiency are biased by choice of estimator and input-output bundle and may lead to faulty policy conclusions. It also finds that there has been productivity regression in all countries except for the United States, whose productivity improvement is not statistically different from no productivity change. Some of the factors leading to productivity regression may be due to age demographics, lack of a recent exogenous technological shock in the health care field, the costs of reactive (instead of preventive) medicine, and increased spending on end-of-life care.

Securitization, Credit Derivatives and Bank Failure

(CBBS 6 – BR 53)

Author: Danielle Zanzalari

During America's most recent recession, more than 281 banks failed between 2006-2010, roughly 1,200% more failures than the previous five years. In April 2011, asset-backed securities grew to a high of \$11 trillion more than the outstanding value of all U.S. Treasuries combined. My research explores to what extent insurance on asset-backed securities, called credit derivative swaps, led to bank failure. I also explore the determinants leading to bank securitization. Early research indicates that the stock market was able to avoid the pitfalls of asymmetric information when analyzing off-balance sheet items.

The Impact of Horizontal Mergers on Plan Premiums and Drug Formularies in Medicare Part D

(CBBS 4 – BR 28)

Authors: Anna Chorniy, Daniel P. Miller and Tilan Tang

In this paper, we examine the impact of horizontal mergers amongst insurers on competition in the Medicare Part D prescription drug market. Theory predictions about the effect of mergers on price and product quality are confounded by three competing forces: increased cost efficiency, market power, and bargaining power with upstream suppliers. Using panel data for the full set of plans offered by Part D insurers between 2006-2012, we use a differences-in-differences identification strategy to document the effect that merger activity has on plan pricing and drug coverage characteristics. We find that plans affected by a merger experience higher premiums as a result of increased market power. However, for merging insurers that restructure their plan offerings, price falls to offset the market power effect. The results on drug formulary measures show that merging on its own has no effect on the generosity of drug coverage. Yet for restructured plans, there are sizable merger effects on coverage in the form of reduced copay/coinsurance rates and increased scope in the set of covered drugs. The lowered prices and improved drug coverage for restructured plans suggest cost efficiencies and bargaining power with drug suppliers are a major source of gains stemming from mergers.

Measuring the Federal Wage Premium: a Nonparametric Approach

(CBBS 5 – BR 37)

Author: Eric Makela

Recently, the earnings of federal workers have come under renewed scrutiny. Previous research has found evidence of wage premiums for U.S. federal workers ranging anywhere from 0.03% to 18.2%. These estimates however are based on highly restrictive assumptions, and are likely to perform poorly in accounting for differences in age, education, and occupation between the private and federal workforces. This paper utilizes recently-developed econometric techniques which are far less restrictive in order to estimate counterfactual wage distributions. These counterfactuals estimate the earnings of federal workers if they were compensated equal to similar workers in the private sector; likewise, I estimate the earnings that private sector workers would receive if they were compensated as are their federal counterparts. This new method of estimating federal wage premiums finds that the federal differentials are reduced by 4/5 to 4.2% of earnings for men and by over 1/2 to 15.0% for women.

Industrial Organization Psychology

The Effects of Income Adequacy on Job Search Behaviors: A Test of Moderated Mediation

(CBBS 8 – DP 91)

Authors: Janelle H. Cheung and Robert R. Sinclair

The purpose of the current study was to examine the consequences of perceived income adequacy within the nursing population. In order to allow for more effective development of practical interventions, the present study also assessed the underlying mechanisms through which income adequacy affected job search behaviors. Using a sample of 208 nurses in the Northwestern United States, we found that individuals who perceived their income as inadequate for their current wants and current needs were more likely to engage in job search behaviors. Using the Bootstrapping method of analysis, the results showed that physical and mental health symptoms explained the pathways between income adequacy and job search behaviors. Specifically, perceptions of income inadequacy led to unhealthy symptoms (e.g., trouble sleeping, depression), which in turn led to more job search behaviors. However, full mediations occurred only when participants had one or more financial dependents. The significant moderated mediations suggested that individuals with financial dependents were more likely to be affected by income inadequacy and subsequent health problems. These results shed light on how nurses appraise stress relevant to their financial situations and provide valuable information for health care organizations to prevent employees' job search process or actual departure.

College of Engineering and Science

Automotive Engineering

Manual Precedence Mapping and Application of a Novel Precedence Relationship Learning Technique to Real-World Automotive Assembly Line Balancing

(CES 1 – BR 1)

Authors: Kavita R. Antani, Bryan Pearce, Laine Mears, Mary Beth Kurz, Maria Mayorga

An assembly line is a flow-oriented production system where the work pieces visit stations successively as they are moved along the line. An important decision problem, called Assembly Line Balancing Problem (ALBP), arises and has to be solved when (re-) configuring an assembly line. It consists of distributing the total workload for manufacturing any product to be assembled among the work stations along the line. The assignment of tasks to stations is constrained by task sequence restrictions which can be expressed in a precedence graph, which most manufacturers do not have. As a consequence, the elaborate solution procedures for ALBP developed by more than 50 years of research are not applicable in practice. Unfortunately, the known approaches for precedence graph generation are not suitable for the automotive industry. Therefore, we describe a detailed application of a new graph generation approach that is based on learning from past feasible sequences. Experiments indicate that this procedure is able to approximate the real precedence graph sufficiently well to detect nearly optimal solutions for a real-world automotive assembly line. Thus, the new approach seems to be a major step to close the gap between theoretical research and real-world line balancing.

Bioengineering

Glenoid Loading and Stability of the Inlay versus Onlay Shoulder Implant Systems

(CES 4 – BR 11)

Author: Breanne T. Przeszelski

The glenohumeral joint of the shoulder is the most freely moving joint in the body. The large range of pathology associated with the glenohumeral joint has motivated the innovation for the development of new technology. Current options for improved stability of the glenohumeral joint include a total shoulder arthroplasty (TSA), a reverse total shoulder arthroplasty (RSA), a humeral hemiarthroplasty, or a soft-tissue allograft. Each option has its risks and benefits, but when considering a TSA, an additional choice must be made: the onlay or inlay glenoid component. The purpose of this research study is to examine the contact pressures and implant stability associated with fatigue loading of these two types of glenoid components. The current standard of choice is that of the onlay design, which sits proud to the surrounding native bone. This design has a tendency to exhibit a rocking-horse loosening phenomenon as the humeral head articulates across the implant. The inlay design matches the surrounding anatomy with a fit that leaves it flush with the surrounding native bone and should therefore limit the rocking-horse loosening of the implant. Functional comparisons of these two components were made in the present experimental study.

Implantable Wireless Dual-analyte Biosensor for Trauma Patient Monitoring and Management

(CES 2 – BR 7)

Authors: Christian N. Kotanen and Anthony Guiseppi-Elie

Amperometric enzyme-based biosensors are being designed as rapidly deployable, minimally invasive diagnostic, microchip technology for the continual measurement of metabolic markers of trauma, such as glucose and lactate. Dual responsive, multi-disc electrode-array working electrodes consisting of 37 platinum microdiscs ($d=50\ \mu\text{m}$, $d/r=4$) were coated with biosmart hydrogel. Electropolymerization of polypyrrole was used to generate a conducting electroactive polymer ($0.1\text{-}250\ \text{mC}/\text{cm}^2$) that formed an interpenetrating network throughout the biosmart hydrogel while simultaneously entrapping enzymes. Biosensors had a response time of 2-8s. Linear ranges for glucose response of the implantable MDEA system were 1-5 mM and 8-33 mM. A sensitivity of $0.42\ \mu\text{A}/\text{cm}^2/\text{mM}$, a K_{Mapp} of 0.566 mM, and an I_{max} of $5.40\ \mu\text{A}/\text{cm}^2$ were observed. The detection limit was 0.02 mM. A precise dose response within the physiologically relevant range of glucose was observed. Polypyrrole decreased sensitivity to negatively charged interferents with a rejection ratio of 12:1. Interferent response was limited to 3-5% of the total response to glucose at low concentration. The system was stable while stored in PBS and demonstrated increasing sensitivity over 21 days. Dual analyte sensing using a wireless potentiostat was successful with minimal crosstalk between electrochemical cells. Error between cells did not exceed 5%.

Application of Elastomeric Polymers for Bladder Regeneration

(CES 3 – BR 9)

Authors: Srikanth Sivaraman, Jessica Myers, Nicholas Amoroso, William Wagner, Shilpa Sant, Jiro Nagatomi

The urinary bladder is one of the few organs that has been successfully engineered and implanted in humans for a long-term clinical trial. However, scaffolds such as PGA-collagen used in the previous studies possess inadequate mechanical properties for organs that exhibit large deformation. The present study explored the use of biodegradable elastomers, poly-glycerol sebacate-polycaprolactone (PGS-PCL), poly (ether-urethane) urea (PEUU), and poly (carbonate-urethane) urea (PCUU) for urinary bladder tissue engineering since these materials have previously been shown to exhibit high extensibility and cytocompatibility. The present study compared mechanical properties of PGS-PCL, PEUU & PCUU elastomers. PGS-PCL, PEUU and wet PCUU specimens were subjected to uni-axial tensile loads under hydrated conditions (PBS at 37°C) at a rate of 18mm/min until rupture using MTS synergie 100. The mechanical behaviors of these materials were analyzed by comparing the maximum tensions and stretch ratios at failure. The Mechanical characterization indicated that the PCUU may be more suitable for the bladder tissue engineering application than PEUU and PGS-PCL. Further studies, characterizing the stiffness of PCUU sutured rat bladders are currently underway using a custom-made in-vitro pressure-volume device.

Chemical Engineering

Surface Modification of Cellulose Nanocrystals and Their Application as a Reinforcing Material for Polylactic Acid

(CES 7 – BR 17)

Authors: Jose Luis Orellana and Christopher L. Kitchens

Cellulose nanocrystals (CNC) have the potential to serve as reinforcement for polylactic acid (PLA), which has become a widely-used polymer for biodegradable products, but some deficiencies still need to be overcome. The main goal of this work is to improve the properties of the PLA by the addition of surface-modified CNC in the polymer matrix and thus obtaining a polymer with broader applications. CNC were isolated from cotton by acid hydrolysis combined with an esterification surface-modification and further functionalized with different surfactants. Phase behavior of modified CNC was studied in organic solvents by visual examination and polarized microscopy. PLA-CNC films were prepared and characterized by Instron universal testing machine and polarized microscopy. The stability of the surface-modified CNC was significantly improved in organic solvents and was also found to show self-organization at steady and shearing conditions. Modified CNC increased the toughness of PLA by 37%, while maintaining the tensile properties at low CNC contents. The nanocomposites showed remarkable optical properties when increasing the CNC content thus having interesting potential applications. It can be concluded that surface modification of CNC with surfactants improves the interactions of the nanomaterials with organic media and enhances the mechanical and optical properties of PLA-CNC nanocomposites.

A Computational Approach for the Rational Design of Bimetallic Clusters for Ethanol Formation from Syn-gas

(CES 6 – BR 15)

Authors: Ming He, James McAliley and David A. Bruce

A major challenge associated with the synthesis of ethanol from syn-gas is an inability to find a low-cost catalyst that promotes the proper combination of CO dissociation and CO insertion steps, so as to yield ethanol as the primary reaction product and inhibit the formation of methane, methanol, longer chain alkanes, and other coking reaction products. We used quantum mechanical simulations for the rational design of bimetallic catalysts. Several promising 13-atom bimetallic clusters were selected by the identification of key reaction descriptors for ethanol formation reaction. Density Functional Theory (DFT) simulations and Bronsted-Evans-Polanyi (BEP) relations were used to map out the full reaction mechanism from syn-gas to ethanol. Selectivity analysis was conducted including hydrocarbons, methanol, acetaldehyde and ethanol as products. Microkinetic models were built, considering all necessary adsorption and reaction steps as well as the diffusion of intermediate species between different metal surface sites. More general selectivity trends were identified by altering the surface concentrations of various metal sites. These simulations indicate the nature and stability of the various bimetallic nanocatalysts and more importantly identify specific metal combinations that are ideally suited for ethanol production.

Chemistry

Predicting The Reaction Dynamics And The Kinetics Of Fullerene Collisions Using Molecular Dynamics And Density Functional Tight Binding Methods

(CES 8 – BR 19)

Authors: Dulma E. Nugawela and Steve J. Stuart

Fullerene Collisions have been studied experimentally and computationally since 1996 by Campbell *et al.* The reaction cross sections were calculated by colliding a positively charged fullerene ion beam with neutral fullerene vapor for collision energies 50 eV-300 eV. In these studies, achieving the experimental reaction protocol by using an accurate computational method is the major challenge. A density functional based tight binding method(DFTB) and a classical molecular dynamics method using the Adaptive Intermolecular Reactive Empirical Bond Order potential(AIREBO) were used in this study to model the possibilities of the experimental reaction channel and to include the quantum mechanical degrees of freedom. For collision energies beyond the barrier the fusion reaction cross section increases with collision energy to a maximum value at around 100 eV and then decreases at higher energies. AIREBO results agree with experimental results qualitatively and DFTB results agree with experimental results quantitatively. In order to understand the dynamics and kinetics of the reaction at the experimental time scale, a simple Arrhenius based model was used to extrapolate the dynamics. Poor estimations after the extrapolation indicated the essential of a more sophisticated model for the analysis.

Crystal Growth and Study of Unusual Magnetic Anomalies of a Low-Dimensional Iron(III) Oxy-Arsenates

(CES 9 – BR 21)

Authors: Liurukara D. Sanjeewa, Vasile O. Garlea, Pramod Kumar, Dino Sulejmanovic, Shiou-Jyh Hwu

Our most recent studies have been directed towards the synthesis of low-dimensional magnetic materials as these have drawn continued attention in condensed matter chemistry and physics, owing to their diverse electronic and magnetic properties. One example of such a family is $A_2Fe_2O(AsO_4)_2$ where $A = K, Rb$. Further, the $A_2Fe_2O(AsO_4)_2$ series show interesting magnetic anomalies regarding stepped magnetization. Also intriguing are the negative magnetizations observed below the ordering temperature in the field cooling (FC) and zero field cooling (ZFC) susceptibility measurements. We have performed the neutron powder diffraction (NPD) measurements using HB-2A in Oakridge National Lab and BT-1 in NIST. Neutron powder diffraction for $A_2Fe_2O(AsO_4)_2$ were collected at various temperatures ranging from 3.3 K to 35 K. The 35 K data has been adequately described with a nuclear model, previously determined using single crystal X-ray diffraction, indicating a lack of long-range magnetic order. The NPD measurements were also conducted in horizontal fields up to 5 T at 2 K. The field dependence of the spin arrangement was used to explain the negative magnetization observed in $A_2Fe_2O(AsO_4)_2$. The neutron scattering measurements of $K_2Fe_2O(AsO_4)_2$ were also carried out using SEQUOIA—Fine-Resolution Fermi Chopper Spectrometer in ORNL.

Civil Engineering

Finite Element Modeling of Concrete Based on Quantitative Computed Tomography (QCT)

(CES 13 – BR 29)

Authors: Arash Razmjoo and Amir Poursaeed

Models have been used before to predict the mechanical and transport behavior of concrete. In most of these studies, aggregates were considered either circle or sphere and the impact of the aggregates geometry and in-homogeneities in concrete structure is ignored. The objective of this study is to develop a novel method for accurate prediction of the mechanical behavior of concrete using quantitative computed tomography (QCT)-based finite element analysis. Concrete cylinders were cast and cured for 28 days. The QCT scans were carried out on the samples using a clinical CT scanner. An image processing method was applied to detect aggregates, paste content and the air voids. The distribution of each phase then calculated in each image slice (2D) and in the bulk material (3D). The processed QCT images were directly converted into voxel-based 3D FE models for linear and nonlinear analyses. The FE models were generated by conversion of each voxel into an 8-noded brick element. Air void content of the cylinders (2D and 3D) was determined. In addition, the aggregates content was estimated using the image analysis. In both cases, the results obtained by the image analysis and the actual measurement and ASTM method are in very good agreement.

Sustainable Biofuel Supply Chain Planning and Management under Uncertainty

(CES 11 – BR 25)

Authors: Fei Xie and Yongxi Huang

In this study, the concept of “environmental thinking” is integrated in sustainable biofuel supply chain planning and management and a multi-objective modeling framework is developed. It is aimed to seek best-compromise solutions in achieving economic and environmental sustainability in supplying biofuels from cellulosic biomasses and simultaneously satisfying demand, resource, and technology constraints. In addition to the least-cost objective, greenhouse gas (GHG) emission reduction as another objective is integrated into the modeling framework and carbon footprints will be assessed by using GREET model. This ensures that GHG mitigation strategies are factored in the system planning and management. The biomass-to-biofuel conversion efficiency can be highly uncertain due to the uncertainties inherent in the conversion processes. In this study, the uncertainty will be considered in the integrated modeling framework. A multi-objective, mix-integer stochastic programming model is proposed and solved by the compromise method, a subclass of the goal programming method. The model is used to evaluate the economic potentials and environmental impacts for establishing a biowastes based cellulosic ethanol supply chain in California as a case study. It is found that significant trade-offs exist between economic and environmental benefits, and the uncertainty in biomass-to-biofuel conversion technology has substantial impacts on multi-criteria decision making.

Robust Geotechnical Design – A New Design Perspective

(CES 12 – BR 27)

Authors: Lei Wang, C. Hsein Juang, Sez Atamturktur

In routine geotechnical engineering practice, the engineer has to work with a small sample of data due to budget constraint. Because of complexity of soil deposits, it is often difficult to determine correctly the statistics of soil parameters that are required for reliability-based design of foundations. Furthermore, the traditional reliability-based design is sensitive to the variation of noise factors such as uncertain soil parameters. To address this dilemma, the authors present a new design methodology, termed robust geotechnical design. This new design methodology aims to make the response of a geotechnical system immune to, or robust against, the variation of noise factors by carefully adjusting the design parameters. This methodology is realized through a multi-objective optimization, in which all the design requirements such as safety, robustness, and cost are explicitly considered. The results of such optimization are often expressed as a Pareto Front, which defines a trade-off relationship between cost and robustness, whereas safety is guaranteed. This enables the engineer to make an informed design decision according to a target cost or robustness. The significance of new design methodology is illustrated with an example of shallow foundation design.

Application of Simplex-Centroid Design Methodologies to Optimize the Proportions of Ternary Cementitious Blends in High Performance Concretes

(CES 10 – BR 23)

Authors: Sujay Math and Prasad Rangaraju

High performance concrete (HPC) mixtures often contain multiple cementitious components. Optimizing the proportion of these individual components to achieve the desired properties is extremely tedious requiring a large number of trial batches. This process is expensive and time consuming. The use of statistical mixture design technique provides a useful approach where in multiple outcomes can be met with fewer number of test runs. This is particularly true when multiple cementitious components are used in concrete. The research in progress here uses a statistical design of experiments approach, simplex-centroid design, with three cementitious components and seven minimum design points that represent specific mixture proportions. In this study, a ternary mixture blend of portland cement, slag and Class F fly ash was used to prepare concrete mixtures. Fresh and hardened properties of concrete were evaluated, including mechanical properties such as compressive strength and split tensile strength and durability indicators such as rapid chloride-ion permeability and expansion due to alkali-silica reaction. Results from this study suggest that simplex-centroid design method is a valuable tool in minimizing the number of trial batches needed to identify the optimal concrete proportions for achieving the desired properties.

Computer Engineering

Exploring Multiple Levels of Performance Modeling for Heterogeneous Systems

(CES 14 – BR 31)

Author: Vivek K. Pallipuram

One of the major challenges faced by the HPC community today is user-friendly and accurate heterogeneous performance modeling. Although performance prediction models exist to fine-tune applications, they are seldom easy-to-use and do not address multiple levels of design space abstraction. Our research aims to bridge the gap between reliable performance model selection and user-friendly analysis. We propose a straightforward and accurate performance prediction suite for multi-GPGPU systems that primarily targets synchronous iterative algorithms using our synchronous iterative GPGPU execution model. The performance modeling suite addresses two levels of system abstraction: low-level where partial details of implementation are present along with system specifications; and high-level where implementation details are minimum and only high-level system specifications are known. The low-level abstraction models use statistical techniques for performance prediction whereas the high-level abstraction models are composed of existing analytical and quantitative models. Our initial validation results yield high prediction accuracy with less than 10% error rate for several tested GPGPU cluster configurations and case studies. The final goal of our research is to offer a reliable and user-friendly performance prediction framework that allows users to select an optimal performance modeling strategy for the given design goals.

Computer Science

EEGnet: A Web Platform for Collaborative EEG Research

(CES 17 – BR 36)

Authors: Chad G. Waters, Brian C. Dean, Jonathan J. Halford

EEG research is often impeded due to a lack of large-scale standardized data sets that can be used for training and validating algorithms. To address this issue, we have developed EEGnet, a web-based platform that enables a distributed team of experts to assemble and annotate events in large scalp EEG datasets in a streamlined fashion. EEGnet supports most features of modern digital EEG visualization software, such as multiple montages, digital filtering, and gain adjustment. It allows annotation of segments of EEG signals in single channels or annotation of epochs encompassing all channels. EEGnet supports the visualization of short EEG files and also long EEG files, up to 24 hours in length, but only for data in a 10-20 montage (with one EEG channel). Advanced visualization capabilities are provided for displaying the output of automated interpretation algorithms and comparing these results with annotations from human experts. We hope to make the EEG research community more aware of EEGnet as a means of facilitating large-scale collaborative research initiatives.

Exploring Supply Chains from a Technical Debt Perspective

(CES 18 – BR 38)

Authors: J. Yates Monteith and John D. McGregor

Software development has evolved from software development organizations building custom solutions for every need and creating a backlog of applications needed by users to specialized organizations producing components that are supplied to other software development organizations to speed the development of their software products. Our objective is to illustrate how a manager might use supply chain information to evaluate software being considered for inclusion in a product. We investigated the Eclipse platform code to illustrate analysis methods that produce information of use to decision makers. The technical debt of the software pieces was measured using the Technical Debt plug-in to SONAR as one input into the evaluation of supply chain quality. The dependency graphs of uses relationships among files were analyzed using graph metrics such as betweenness centrality. There was a statistically significant moderate correlation between the technical debt for a file and the betweenness centrality for that file. This relationship is used as the basis for a heuristic approach to forming advice to a development manager regarding which assets to acquire.

Caesar: A Response Retrieval System for Conversational Agents

(CES 16 – BR 35)

Authors: Jerome L. McClendon, Naja A. Mack, Larry F. Hodges

A conversational agent is a computer system capable of interacting with a human using natural language as a form of input. Conversational agents have been employed in various domains including intelligent tutoring systems, health care systems, simulation applications and user help systems. This poster presents our approach to creating intelligent conversational agents that are capable of returning appropriate responses to natural language input. Our approach consist of a support vector machine and ten different natural language processing modules used when selecting an appropriate response from the database of possible responses. When tested on a data set consisting of questions and answers for a current conversational agent project, our approach returned an accuracy score of 79.15%, a precision score of 77.58% and a recall score of 78.01%. When compared to database search we found that our approach significantly increased the number of appropriate responses returned by the system.

Visualizing Uncertainty in Predicted Hurricane Tracks

(CES 19 – BR 40)

Authors: J. Cox, D. House, M. Lindell

Although the past 30 years have seen major advances in the scientific understanding of hurricane forecasting, there has been a lack of systematic research on people's comprehension of displays used to show these forecasts. A primary visual aids is the error cone. The center line represents the predicted hurricane track for a five day period. The width of the cone is determined by considering historical forecast errors over a five year sample, and represents a 67% likelihood region for the hurricane track. A primary challenge of this model is that that most people have difficulty in understanding the probabilistic concepts that are used to communicate uncertainty. For example, it tends to give the impression to those inside the cone that they have an exaggerated chance of being in the hurricane's path, while those outside of the cone tend to feel a false sense of security. We have developed a new method of visualizing the possible projected paths of hurricanes using the projected path of a given hurricane as well as the historical data of previous hurricanes. The goal is to maintain a display that shows a range of possible outcomes, while maintaining the statistical characteristics of the error cone.

Surface Shape Perception in Volumetric Stereo Displays

(CES 20 – BR 41)

Author: Meng Zhu

Research studies have shown that specifically designed textures applied on geometrical surfaces can greatly enhance human perception of the shape, orientation and spatial relationships of the surfaces. This is especially so for surfaces in a stereoscopic display environment. However, virtually all practical systems of volumetric rendering use no texture. Previous studies that have looked at this issue used either simple 3D surfaces or terrain surfaces. In this work, we explore the application of textures to more complex surfaces that come from various sources, e.g. an isosurface extracted from a volume dataset. The challenge is to generate uniformly distributed grid like textures on complex surfaces that naturally follow the geometry of the surface. We incorporate the texturing method directly into a fast volume rendering process to enhance the perception of complex surfaces present in a volume dataset. To measure the effectiveness of the texture, we conduct user studies where user is asked to orient a probe to give the estimate of the surface normal at the probe attachment position which will be compared with true surface normal direction.

Large-scale Molecular Dynamics Simulation with Forward Flux Sampling on Hadoop

(CES 15 – BR 13)

Authors: Pengfei Xuan, Yueli Zheng, Sapna Sarupria, Amy Apon

Simulating rare events is extremely difficulty and requires massive computational resources and complex data processing workflow, which is determined by the nature of stochastic systems. To help computational scientists discover hard scientific problems in this area, we built a large-scale molecular dynamics simulation framework integrated with forward flux sampling (FFS) technique on Hadoop ecosystem. In this project, we port the customized FFS workflow to underlying MapReduce-based computing pipeline by using dataflow-driven design pattern and Gromacs application. The early works show that our framework is able to provide a scalable, fault-tolerance and efficient rare events simulation environment over varieties of computing infrastructures, while preserving the flexibility of the original scientific application.

Electrical Engineering

Situational Awareness System for Power Grids

(CES 22 – BR 45)

Authors: Karthikeyan Balasubramaniam and Neville Watson

The continuing increase of demand for electrical energy has resulted in power grids being operated closer to its operating limits. At the same time, integration of renewable energy sources introduces conditions of high uncertainty and high variability. Maintaining power system reliability under these conditions is a challenging task. Development in telecommunications and other advances have enabled more accurate and faster influx of data. However, more data does not equate to more information. With the plethora of data available it becomes necessary to extract information that a control room operator can act upon. Situational awareness (SA) in simple terms is to understand the current state of the system and based on that understanding project how things are to evolve over time. The situational awareness platform presented in this paper extracts information from data for the next time instance i.e. a step ahead of time and maps this data with geographic coordinates of utility assets. The geographic information system (GIS) provides a visual indication of health of individual units as well as that of the entire system.

Low-Temperature Growth of Multiple-Stack ZnO Nanoflower/Nanorod Structures for Flexible and Transparent Electronics

(CES 21 – BR 43)

Authors: Do Yeob Kim, Jae Y. Kim, Young-Jun Park, Hyuk Chang, John Ballato, and Sung-O Kim

Reported here is the low-temperature growth of multiple-stack high-density ZnO nanoflower/nanorod structures on plastic substrates derived from the surface modification of ZnO seed layers using an atmospheric-pressure plasma jet (APPJ) treatment. The plasma treatment could provide several advantages to the growth of multiple-stack ZnO nanoflower/nanorod structures: (i) the surface wettability of the seed layers changes from hydrophobic to hydrophilic, resulting in higher surface energies for the growth of high-density ZnO nanoflowers, (ii) the nucleation sites increase due to the increased surface roughness caused by the plasma etching, and (iii) there is no thermal damage to the plastic substrate from the plasma treatment due to its low-temperature weakly ionized discharge. It was also confirmed that multiple stacks of ZnO nanoflowers were obtained without degradation of the crystal quality or modification to the crystal shape or phase. The ZnO nanoflower/nanorod structures grew by lengths up to 4 μm due to an increased surface roughness of 10% and surface energy 5.5 times that of the seed layers. As shown, the APPJ is a very good method to obtain high-density ZnO nanostructures on plastic substrates below 150 $^{\circ}\text{C}$, as is critical for flexible electronics.

Engineering and Science Education

External Experiences and Student Motivation: Do Student Experiences Outside the Classroom Really Matter?

(CES 23 – BR 47)

Author: Adam N. Kirn

Experiences outside the classroom are thought to shape students' understanding of who they can become and what is needed to reach their goals. Additionally, evidence shows external experiences provide contextualization for academic endeavors, and can increase persistence in engineering. One area that is affected by these experiences is student motivation. Motivation is a dynamic construct linked to student performance in and out of the learning environment. The goal of this work is to determine how the motivations of students who have had external experiences differ from those who have not had those experiences. Students in second year engineering courses in two majors (bioengineering and mechanical engineering) were surveyed on their expectations of major-related tasks, perceptions of future and present tasks/goals within their major, and self-efficacy toward solving problems in their courses. Results indicate that having an external experience correlates to significantly increased self-efficacy, and that students with laboratory research experiences have significantly higher GPAs. Increased student self-efficacy may explain why students persist longer after having an external experience. Findings with respect to students' self-efficacy will guide further qualitative research into students' motivations towards short- and long-term goals/tasks, with interview questions focused on external as well as classroom experiences.

Environmental Engineering and Science

Biological and Chemical Mechanisms for 2,4-dinitroanisole (DNAN) Degradation

(CES 25 – BR 51)

Authors: Jolanta B. Niedzwiecka, Kevin T. Finneran, and Clint Arnett

The insensitive munition, 2,4-dinitroanisole (DNAN), has been used in newly developed explosives as a replacement for the more sensitive munition, trinitrotoluene (TNT). It is important to understand the fate of DNAN in the environment and to establish effective remediation methods due to its high toxicity and potential environmental hazards, should it migrate from Department of Defense facilities in groundwater contamination. We investigated DNAN reduction by aqueous phase Fe(II), organically-complexed iron(II) with several possible Fe(II) ligands, and using model Fe(III)-reducing microorganisms such as *Geobacter metallireducens*. Data demonstrated that DNAN was completely reduced by Fe(II) alone as well as Fe(II)-ligand complexes including tiron, 2,3-DMSA, 3,4-DHBA, 2,3,4-THBA, gallic acid, malic acid and sodium citrate. The pH had a significant effect on Fe(II)-mediated DNAN reduction. The rate of reduction increased from pH 7.0 < 8.0 < 9.0. Fe(II) alone did not reduce DNAN at pH 6.0, but the ligands were most effective at this slightly acidic pH. Hydroquinone (AH2QDS) reduced DNAN at all pH values tested.

Demonstration of the Aging Effects of Sorbed Plutonium Complexes on Savannah River Site Sediments

(CES 26 – BR 54)

Author: Hilary P. Emerson

While it has been noted previously that the reversibility of actinide sorption decreases over time, this study demonstrates the aging effects on 32-year versus 3-day-old plutonium complexes simultaneously using dual isotopes on Savannah River Site sediment exposed to plutonium 32 years ago [Kaplan, et al., 2006]. These experiments demonstrate the aging effects through batch sorption and desorption experiments (for 3, 7 and 28 days) and selective iron extractions in the presence of a variety of inorganic and organic ligands including: NaCl, CaCl₂, Na₂PO₄, NaF, Citric Acid, Fulvic Acid, DFOB, H₂O₂, or NH₂OH.HCl. The resulting average desorption K_d at pH 6.4±0.4 is 51000±40000 mL/g. Despite the variability of the K_d values measured in this study, it is remarkable that the desorption K_d is not more variable with the diverse ligands investigated. The selective iron extractions illustrate an aging effect of the plutonium complexes with 22±2% versus 91±14% of the plutonium removed for the 32-year and 3-day exposures, respectively. While the plutonium isotopes are most likely mobilized by the specific conditions of the extractions rather than being associated with the iron fraction, it shows that the 3-day-old complex is not nearly as strong as that after 32 years of aging.

Sinusoidal Spacers for Mitigating Concentration Polarization in Reverse Osmosis

(CES 24 – BR 49)

Authors: Peng Xie and David A Ladner

To improve the current mesh feed spacer we developed spacers with a geometry that causes sinusoidal flow patterns. These have two main advantages: unobstructed flow and adaptable geometry. First, this design allows unobstructed flow inside the membrane channel so as to minimize longitudinal pressure drop and dead zones. Second, the frequency and amplitude of the sinusoidal (along with the width and height of the flow channels) can be tuned, thus changing the crossflow velocity independent of the total module flow rate. Faster crossflow velocity is achieved with higher amplitude and frequency of the sinusoids. Analysis of the designs was accomplished using computational fluid dynamics (CFD) modeling via COMSOL Multiphysics software. The influence of spacer geometry (e.g. amplitude and frequency), applied pressure, feed velocity, and concentration were investigated to determine how concentration polarization could be reduced while maintaining low longitudinal pressure drop. Modeling data were compared and verified with experimental data to prove the accuracy of the model. Modeling data matched well with experimental data, suggesting the modeling results were reliable. More tortuous sinusoidal channels induced secondary flow in both longitudinal and cross-sectional directions. The secondary flow increased mass transfer, thus reducing concentration polarization and enhancing flux.

Environmental Health Physics

Effect of Aging on the Reversibility of Pu(IV) Sorption to Goethite

(CES 27 – BR 56)

Authors: Jennifer C. Wong, Mavrik Zavarin, James D. C. Begg, Annie B. Kersting, Brian A. Powell

Designing safe remediation and disposal strategies for plutonium (Pu) requires understanding the sorption affinity of Pu for soil minerals. Sorption of Pu(IV) was examined with respect to aging for a goethite system using batch sorption experiments. Sorption of Pu(IV) to iron oxides has been observed to be strong, rapid, and possibly irreversible or hysteretic. These observations may be explained by aging, a surface chemical process happening after initial sorption which causes a change in contaminant surface speciation over time. Measurements of Pu(IV) sorption are often complicated by oxidative leaching of Pu(IV) as Pu(V). Desferrioxamine B (DFOB) is a complexant capable of competing with the proposed strong surface complexes. Additionally, DFOB minimizes oxidative leaching by forming strong Pu(IV)-DFOB complexes, thereby stabilizing Pu(IV) as the dominant aqueous oxidation state. Pu(IV) was reacted in suspensions of 0.1g/L goethite and 10mM NaCl spanning pH 4–7 for various lengths of time (1,6,15,34 and 116 days). Supernatant was replaced with a 1.7µM DFOB solution and, after 34 more days, analyzed for aqueous Pu by liquid scintillation counting. Modeling sorption curves in FITEQL yielded logK values which increased from 0.078 to 0.953 over 116 days, indicating Pu(IV) sorption onto goethite becomes less reversible with aging.

Human Centered Computing

A Participatory Design Process for Developing a Tool to Visualize Classroom Engagement

(CES 29 – BR 60)

Authors: Tania Roy, Melva T. James, Arindam Gupta, Shelby S. Darnell, and Shaundra Daily

Research indicates that student engagement while learning is positively correlated with academic performance. This project aims to design an affective computing system that uses physiological measures gathered via wrist worn sensors to understand student engagement in the classroom. To address any possible social, political, or psychological obstacles to adoption, we have been utilizing a participatory process to co-design a software-based tool to support teachers in visualizing engagement in the classroom. Two groups, consisting of teachers, principals, and administrators are collaborating in this research study. Our focus groups have been divided into three sessions, held with each group. During session one, we first introduced stakeholders to electrodermal activity (i.e., an increase or decrease in sweat) as a measure, as well as the sensors for its measurement. Next, we familiarized ourselves with ways in which the teachers try and understand student engagement in the classroom, and how they could imagine improving their strategies. During the second session, we presented the paper-based prototype and asked for feedback. Based on feedback, we have created a digital prototype that displays color coded engagement data, aligned with video of classroom instruction. We will be going back to the teachers, to continue to refine our design.

The Usability of Commercial BCI Devices: A Comparison for Researchers and Experimenters

(CES 28 – BR 58)

Authors: Joshua I. Ekandem and Juan E. Gilbert

Developments in brain computer interface (BCI) technology has captured a significant amount of media attention within the last half-decade. Though receiving favorable reviews for their commercial potential, the usability of these devices have not been received with similar favor. This poster presents findings of an exploratory within-subjects experiment aimed at examining the feasibility of using two commercial BCI devices the EPOC and the MindWave in a research setting. Feasibility is considered in light of 1) the duration of time needed for an experimenter to prepare the device for use, 2) the reliability of at least 75% signal strength during 15 minutes of use, 3) self-reported comfort rating from participants. The results show that the MindWave (17s.) outperformed the EPOC (116s.) in average seconds needed to prepare the device for use. During the trials, the MindWave maintained signal strength of 75% whereas the EPOC fell below this threshold on a number of trials. However, the EPOC was considered most comfortable by a majority of participants; with over half of the participants reporting that the MindWave caused them discomfort. Based on these results, we suggest that human factor requirements be considered more seriously when selecting a commercial BCI for research and experimentation.

Hydrogeology

Design and Performance of a Pilot-Scale Constructed Wetland Treatment System for Simulated Bangladesh Groundwater

(CES 30 – BR 61)

Author: Jeff Schwindaman

Constructed wetland treatment systems (CWTSs) may offer an effective approach to treating arsenic-contaminated groundwater in Bangladesh. The objectives of the current study were to (1) design and construct a pilot-scale CWTS to reduce the concentration of arsenic in a simulated Bangladesh groundwater from ~200 µg/L to < 10 µg/L, (2) assess arsenic removal performance by determining removal extents, efficiencies, and rates, and (3) evaluate biogeochemical removal processes based on the fate and distribution of arsenic in the CWTS. Two treatment series were designed to promote co-precipitation and sorption of arsenic with iron oxyhydroxides under oxidizing conditions, while two series were designed to promote precipitation of arsenic with sulfide under reducing conditions. Addition of zero-valent iron (ZVI) significantly improved ($\alpha = 0.05$) performance of both oxidizing and reducing series. Arsenic removal performance was significantly greater ($\alpha = 0.05$) in the oxidizing series amended with ZVI than in any other series, with removal extents, efficiencies, and rate coefficients ranging from 5-60 µg/L, 51-95 %, and 0.18-0.77 1/d, respectively. Results of this pilot-scale study demonstrate that a CWTS could be used successfully to reduce the concentration of arsenic in simulated Bangladesh groundwater to below the USEPA drinking water standard of 10 µg/L.

Industrial Engineering

Predicting Team v. Individual Surgical Flow Disruption Recovery in Cardiothoracic Operating Rooms

(CES 32 – BR 65)

Authors: Gary Palmer II and A. Joy Rivera-Rodriguez

Patient safety is a major concern of healthcare organizations and healthcare providers. It is generally, a vital component that most hospitals instill within their culture to prevent sentinel events from occurring. One area of concern that has been a growing topic in literature recently, is the study of surgical flow disruptions (SFDs). SFDs are events that disrupt the flow of the surgical procedure. SFDs are being used as a new metric of patient safety in the operating room (OR), and as the more SFDs occur, the more opportunity there is for errors. Therefore, one way to increase patient safety in the OR is to eliminate or reduce SFDs. In order to do this in an effective manner (i.e., implement interventions that are still compatible with the healthcare providers workflow), more research needs to be completed to understand nuances of SFDs. Therefore, the goals of this research are: to validate a SFD taxonomy that was previously developed after 60 hours of observations in cardiovascular surgeries; and to identify if and by whom (an individual, a team, or none) the SFD are recovered from. These goals will be accomplished by two human factors experts conducting systematic observations during 10 cardiovascular surgical procedures.

Improving the Usability and Security of Digital Authentication

(CES 31 – BR 63)

Authors: Kevin Juang, Joel Greenstein, Marlina Fraune, Sanjay Ranganayakulu

The need for both usable and secure authentication is more pronounced than ever before. Security researchers and professionals will need to have a deep understanding of human factors to address these issues. Due to their ubiquity, recoverability, and low barrier of entry, passwords remain the most common means of digital authentication. However, fundamental human nature dictates that it is exceedingly difficult for people to generate secure passwords on their own. System-generated random passwords can be secure but are often unusable, which is why most passwords are still created by humans. We developed a simple system for automatically generating mnemonic phrases and supporting mnemonic images for randomly generated passwords. We found that study participants remembered their passwords significantly better using our system than with existing systems. To combat shoulder surfing – looking at a user's screen or keyboard as he or she enters sensitive input such as passwords – we developed an input masking technique that was demonstrated to minimize the threat of shoulder surfing attacks while improving the usability of password entry over existing methods. Extending this previous work to support longer passphrases will lead to advancements in the state of digital authentication.

Joint Location and Dispatching Decisions for Emergency Medical Service Systems

(CES 33 – BR 66)

Authors: Héctor H. Toro Díaz, Maria E. Mayorga, Laura McLay

We propose an optimization model for locating and dispatching ambulances. The model captures system busyness by using a queuing model with consideration for different dispatching policies. The model seeks to simultaneously find optimal location and dispatching policies, from different optimization perspectives including efficiency and fairness. A heuristic solution procedure is provided based on genetic algorithms (GAs) with an embedded hypercube queuing model. Several case studies including one with real-world data are presented.

Material Science and Engineering

Effect of Sliding Contact on the Structure of Cu-X Nanolaminates

(CES 36 – BR 73)

Authors: D. Ross Economy, Emilio Jimenez, Bobak Ranjbaran, Brad M. Schultz, Marian S. Kennedy

Structural metallic nanolaminates (coatings consisting of alternating layers of different metals) are being explored for applications ranging from high strength foils to wear resistant coatings due to their relatively high hardness. This study seeks to explore how the nanolaminate structure evolves after deposition due to sliding contact. Using two-component Cu-Nb and Cu-Ag model systems (with 20 and 100 nm individual layers), the scratch and wear behavior was characterized using linear reciprocating deformation testing. It was shown that the damage due to sliding (depth of wear track) and coefficient of friction both increased with increasing layer thickness.

The Synthesis, Characterization and Targeting Ability of Nano-scale Enrichment Polymer Layers

(CES 35 – BR 70)

Authors: J. Giammarco, B. Zdyrko, K. Richardson, V. Singh, A. Agarwal, L. Kimerling, J. Hu, I. Luzinov

Thin polymer films have been utilized as enrichment layers for evanescent waveguide chemical sensors and other analytical techniques. This is due to the fact that the chemical nature of polymers is ideal for trapping chemically similar organic molecules making analysis more convenient. Specifically, research in this area of volatile organic compounds (VOCs) detection, focused has been given to identifying a single polymer film of micron scale thickness to target one analyte. This work focuses on the design and use of multiple polymers in one enrichment layer to target VOCs to facilitate detection. Two distinct layered enrichment systems were synthesized via the "grafting to" approach. The end application is to apply these polymers onto mid-infrared transparent evanescent wave micro-disk or micro-ring resonators. Analysis of the polymer affinity to VOCs and to act as enrichment layers is determined by the thickness increase caused by swelling of the film when exposed to the analyte vapor. Detection analysis was done using attenuated total reflection (ATR) FT-IR spectroscopy. The polymer layered systems were characterized by atomic force microscopy, ellipsometry and infrared spectroscopy. Studies of pure analyte vapors and mixtures were conducted in saturated conditions.

Collective Rotation of Nanorods in Thin Films

(CES 34 – BR 68)

Authors: Yu Gu, Ruslan Burtovyy, Zhaoxi Chen, Fei Pe, Igor Luzinov, Konstantin G. Kornev

In recent years, magnetic nanorods have caught great attention due to their unique features appealing to composite, medical, sensoric, optofluidic, and microrheology applications. In composite manufacturing, when the curing carrier has a time-dependent rheology, the alignment kinetics significantly depends on the processing time and rheological properties of the carrier. We study the kinetics of ordering of an assemble of nanorods suspended in a liquid with time-increasing viscosity. We introduce an orientational distribution function of nanorods and theoretically study the kinetics of nanorod ordering. Different regimes of ordering are revealed and classified. When the liquid solidifies exponentially fast, we show that the nanorods would not always align with the external magnetic field. Some nanorods could be frozen halfway to their equilibrium orientation parallel to the external field. The orientational distribution function of nanorods was analyzed by studying nanorod alignment in evaporating gels. The dark field optical microscopy was employed. Preliminary experimental data support the theory.

Mathematical Sciences

Numerical Study of a Regularization Model for Incompressible Flow with Deconvolution-Based Adaptive Nonlinear Filtering

(CES 40 – DP 82)

Authors: Abigail Bowers and Leo Rebholz

We study a trapezoidal-in-time, finite-element-in-space discretization of a new Leray regularization model that locally chooses the filtering radius using a deconvolution based indicator function to identify regions where regularization is needed. Because this indicator function is mathematically based, it allows us to establish a rigorous analysis of the resulting numerical algorithm. We prove well-posedness, unconditional stability, and convergence of the proposed algorithm, and test the model on several benchmark problems.

Infinite Billiard Tables and Involutive Surfaces

(CES 39 – DP 78)

Authors: Chris Johnson and Martin Schmoll

In the 20th century, mathematicians studied the motion of particles with elastic collisions (called "billiards") as simple examples showcasing a variety of interesting dynamical properties. In the last decade infinite billiard tables have attracted attention because new, interesting phenomena have been observed. Particularly, billiards in infinite billiard tables may have self-similar, fractal-like trajectories. We introduce a new tool for studying these infinite billiard systems, and show how this tool may be used to study billiards in the periodic Ehrenfest wind-tree model. We then provide a condition for determining when this tool can be applied to a given infinite billiard table.

Group testing Models with Unknown Link Function

(CES 37 – BR 75)

Authors: Dewei Wang, Karunaratna B. Kulasekera, Colin M. Gallagher, and Christopher S. McMahan

Group testing through the use of pooling has proven to be an efficient method of reducing the time and cost associated with screening for a binary characteristic of interest such as infection status. A topic of key interest in this area involves the development of regression models that relate the individual level covariates to the binary pool testing responses. The research in this area has primarily focused on parametric regression models. In this poster, we will introduce a new estimation method which can handle multi-dimensional covariates while assuming the link is unknown. The asymptotic properties of our estimators are also presented. We investigate the performance of our method through simulation and by applying it to a hepatitis data set obtained from the National Health and Nutrition Examination Survey.

Congruent Numbers, Elliptic Curves, and a Million Dollar Problem

(CES 38 – DP 76)

Authors: Jim Brown and Rodney Keaton

Number theory is an area of mathematics which is concerned with properties of the integers, and because of this many of the problems in number theory can be stated in a simple way. However, just because a problem has a simple statement does not mean that its solution will be as simple. It is precisely this contrast between simply stated problems and extremely difficult solutions which makes number theory so intriguing. In this poster, we draw a connection between the congruent number problem, the oldest major problem in number theory, and the Birch and Swinnerton-Dyer conjecture, which is one of the Clay Mathematics Institute's millennium problems. In light of this conjecture of Birch and Swinnerton-Dyer, we will present some of our current results which contribute to the understanding of the objects involved.

Mechanical Engineering

Magnetophoretic Particle & Cell Manipulation In Ferrofluid Flows Using Two Magnets

(CES 44 – DP 92)

Author: Jian Zeng

Micro-particle manipulation is often required for many chemical and biological applications. Many methods implementing force fields have been explored such as electric, optical, acoustic, and magnetic. Among these, magnetic forces stand out due to its low cost and versatility. A great advantage of using magnetic field is its absence of fluid heating as seen in optical and electric. In this presentation, I present a method of particle and cell manipulation in ferrofluid flows using a pair of magnets via negative magnetophoresis. By positioning each magnet in certain configurations, particular particle behaviors can be captured and studied that include focusing, trapping/concentration, and separation/sorting. In these projects, particle diameters of 3 to 10 μm are considered and suspended in commercially available ferrofluid. Furthermore, once studies with polystyrene sphere particles are found practical, live yeast cells are employed and results for manipulation and bio-compatibility are verified.

Decision Support System for Assembly Line Planning

(CES 43 – DP 90)

Authors: Rahul Sharan Renu and Gregory Mocko

TVGs are entities that carry assembly process descriptions, assembly time estimations, product workspaces and other meta-information. These TVGs get assigned to workstations during line balancing. In order to ensure that line workers do not intrude upon each other's workspace, product workspaces are needed. Generating and maintaining product workspace information for every TVG is automated by use of the Bauraum Identification Tool developed in this research. All assembly work instructions must have time studies. Methods Time Measurement (MTM) are charts that provide assembly time estimations based on the part information. There are 22 MTM tables and several pieces of information are required to arrive at a time study. Using MTM tables to generate assembly time estimates is an error-prone process. The MTM estimate generator developed provides support by presenting a reduced set of MTM tables. Automated line balancing algorithms have not been able to capture all expert knowledge. The output of these algorithms is unintuitive with regards to allowing manual edits. The Line balancing Visualization and Editing Tool takes in the output of one algorithm and visualizes the information. The tool allows users to edit the assignment made by the algorithm and notifies the user of inconvenient assignments.

Reservoir-Based Dielectrophoresis (rDEP) for Concentration and Separation of Cells/Particles

(CES 42 – DP 88)

Author: Saurin H. Patel

Dielectrophoresis (DEP) is the translation of a particle either along (i.e., positive dielectrophoresis) or against (i.e., negative dielectrophoresis) an electric field gradient if the particle is more or less polarizable than the suspending medium. The polarizability of a particle is dependent on its electrical and mechanical properties. This makes DEP a versatile tool for particle and cell handling, especially in microdevices due to its favorable scaling. Traditional DEP is realized through patterning pair(s) of microelectrodes onto the surface of a micro channel. Recently DEP has also been implemented by the use of channel geometry, which can be the variation in channel cross-section or the curvature of the channel itself. Both methods, however, rely on in-channel electrical or mechanical parts to create electric field gradients, which complicate device fabrication and causes fouling trouble due to electrochemical reactions and electrothermal flow effects etc. Reservoir-based dielectrophoresis (rDEP) is a newly developed microfluidic method that exploits negative dielectrophoresis induced at the reservoir-microchannel junction to manipulate particles inside a reservoir. As the rDEP focusing, concentration and separation of particles all take place inside a reservoir; the entire microchannel can be spared for pre- and post-analysis. This makes the rDEP method perfectly positioned for lab-on-a-chip applications.

In vitro Patient-Specific Study of the Norwood Procedure

(CES 41 – DP 85)

Author: Tianqi Hang

Hypoplastic left heart syndrome (HLHS) is a congenital heart disease where there is a rudimentary left ventricle so that systemic perfusion solely depends on the right ventricle ejecting to the systemic circulation. The Norwood procedure represents the first of the three procedures, in the surgical management of children with HLHS. The goal of Norwood procedure is to allow mixing between blood in the systemic circulation with blood in the pulmonary circulation by inserting a shunt between the aorta and the pulmonary arteries. The dimension of the shunt is critical because congenital deformations of each patient are different. Norwood procedure is known for chronic complications and low survival rate due to its complexity. In vitro patient specific study of Norwood procedure is a new tool that can be used in planning and improving Norwood surgical treatment, testing new medical device and the training of physicians. A mock circulatory system is built around a lumped parameter model to the circulation and the 3D aortic teats section with shunt. The system elements are set to patient-specific values, under which flow rate and pressure signal are collected. System function are verified against the analytical model on which it is based by analyzing the data collected.

Physics

Spectral Transformations of Novae in Andromeda Galaxy

(CES 47 – DP 99)

Authors: Amanpreet Kaur and Dieter H. Hartmann

Nova outburst is the nuclear explosion on the surface of a white dwarf, which is caused by mass accretion from its companion star in the binary system. It is commonly believed that novae in Andromeda Galaxy (M31) separate into two distinct populations: bulge and disk in the galaxy. These spatial distinctions in the galaxy appear to correlate with the two spectral types of novae (FeII type and He/N). However, recent observations of novae in our own galaxy, Milky Way has demonstrated spectral transformations from FeII to He/N and vice-versa, which calls the spectral distinction between two source classes into question. However, for M31 only one such case is known. Multi epoch spectroscopy is needed to address the questions whether novae in M31 also undergo spectral transformations and whether spatial distinction in the galaxy has any correlation with the spectral type of novae. We construct a spatial distribution model of the stars in M31 and its disk/bulge nova population in order to investigate possible selection effects during observations, that could play a role in spectral-spatial correlations.

Thermoelectric Phenomenon: An Overview, Selection Criterion and Challenges

(CES 46– DP 97)

Author: Pooja Puneet

Among various static energy conversion technologies, the thermoelectric (TE) energy conversion has gained the most interest due to their ability to directly convert waste heat into electricity. TE materials can be used for power generation as well as cooling applications. NASA has been using high temperature TE materials (PbTe, SiGe, etc) for several years to power radioisotope thermoelectric generators (RTG) in space missions. On the other hand, Bi-based materials have been of great interest to the TE community with optimum efficiency near room temperatures for cooling and low temperature power generation applications. One of the main objectives to design an efficient TE material is to suppress the phonon conduction without significantly deteriorating electrical conduction through the system. A brief discussion of the selection criterion to achieve this goal and challenges will be presented along with the traditional as well as newer approaches for optimizing performance of these materials.

In Silico Modeling the Effects of Missense Mutations Causing Snyder-Robinson Syndrome and Rescuing the Effects by Small Molecules Binding

(CES 45 – DP 95)

Authors: Zhe Zhang, Charles Schwartz, V. Martiny, D. Lagorce, Y. Ikeguchi, Maria A. Miteva

Snyder-Robinson Syndrome (SRS) is an X-linked mental retardation disorder. Three missense mutations (G56S, V132G and I150T) on human spermine synthase (SMS) were reported to cause SRS. SMS is an important enzyme which converts spermidine into spermine, both of which are two polyamines controlling the normal cell growth and development. In vitro experiments showed that the dimer conformation played a crucial role on the SMS function. Our in silico studies including energy calculation, pKa calculation and molecular dynamics (MD) simulation based on the available 3D structure of SMS revealed that these mutations affected SMS function by affecting the dimer affinity, monomer stability or hydrogen bond network. One of the above sites, G56S, is accessible from the water phase, thus it provides the opportunity to rescue the disease-causing effect by binding an appropriate small molecule to the vicinity of the mutation site. Currently we run MD simulation to generate multiple receptor conformations and identified two potent binding pockets. Then two programs, Surflex and Autodock Vina, were applied for structure-based virtual screening (SBVS) and a consensus list of about 200 common compounds selected by both of the programs was created, and these compounds were tested experimentally by our collaborators.

Polymer and Fiber Chemistry

The Effect of Magnetically Induced Colloidal Arrangements on the Biomedical Applications of Magnetite

(CES 48 – DP 101)

Authors: Steven Saville, Roland Stone, Bin Qi, Robert Woodward, Mike House, Tim St. Pierre, O. Thompson Mefford

The design, functionalization, characterization, and applications of magnetic nanoparticles have garnered significant interest over the past several decades. However, even though using magnetic nanoparticles to accomplish these goals has been the subject of intense study; the fundamental properties of these systems remain poorly understood. Specifically, it is not well known how the formation of clusters and linear aggregates affects the properties of these materials and their applications. It has been recently reported that for some suspensions of magnetic nanoparticles the application dependent properties of the sample is a function of the time exposed to a magnetic field. This time dependence has been linked to the formation of linear aggregates or chains in an applied magnetic field. In this work we examine the relationships between colloidal stability, the formation of these linear structures, and changes observed in the proton transverse relaxation rate and heating rate in magnetic hyperthermia of aqueous suspensions of magnetic particles. Our results indicate that varying the ligand length has a direct effect on the colloidal arrangement of the system in a magnetic field, producing differences in the rate and size of chain formation, and hence systematic changes in transverse relaxation and heating rates.

College of Health, Education and Human Development

Administration and Supervision

Fostering Leadership Capacity in Three South Carolina High Schools: An Exploratory Study

(CHEHD 1 – BR 5)

Authors: Hattie L. Hammonds, Hans W. Klar, Kristin S. Huggins

Some states include fostering teacher leadership in principal evaluations, so principals need to provide opportunities and mentor or coach their staffs to assume leadership roles. Yet, less is known about the specific ways principals develop the leadership capacities of others. In this exploratory study we examined how principals in three South Carolina high schools intentionally fostered the capacities of leaders to enhance their schools' organizational capacities. Our research questions were: 1) How are emerging leaders identified and selected by their principals? 2) How do principals foster leadership capacity in these leaders? Data collected for this multi-site qualitative study consisted of artifacts and semi-structured 60-90 minute interviews. All interviews were transcribed and analyzed by the research team inductively and deductively using NVivo 10. Our findings indicated that principals selected leaders who: indicated a desire to go into formal leadership roles; had good interpersonal skills and rapport with students and parents; demonstrated persistence and willingness; were effective teachers; had strong personalities; and had a particular skill or knowledge. Our findings for the second question indicate that principals fostered leadership by: mentoring and coaching others to leadership; scaffolding opportunities to lead; and trusting leaders to make the right decision.

Curriculum and Instruction

Context Beliefs' Effect on Content Knowledge of Rural Environmental Science Teachers

(CHEHD 3 – BR 22)

Authors: Daniel M. Alston and Brandi L. Kamp

Conceptual change theory shows that an increase in content knowledge is aided by a person's previous conceptions. Rural community schools often have limited intellectual resources that could aid in conceptual change. This year-long project intended to provide intellectual resources to rural environmental science teachers in the southeastern United States by increasing their content knowledge. This study used a mixed methods model to correlate pre-content knowledge and context belief scores to post-content knowledge. Context beliefs were measured using the CBATs instrument; an environmental content test was used to measure content knowledge; and semi-structured blogs were used to allow participants to expound on their beliefs. Blog entries focused on teacher beliefs about science teaching and learning to better understand the correlation found between context beliefs and post-test content scores.

Understanding Young Children's Attitudes and Dispositions Toward Informational Text

(CHEHD 2 – BR 14)

Authors: M. Deanna Ramey and Heather McCrea Andrews

After more than a decade of research suggesting that young children would benefit from increased exposure to informational text it would make sense that contemporary children have more experience with non-fiction than did children at the turn of the millennium. With the advent of the Common Core State Standards and its emphasis on young children's comprehension of the structure and content of informational text, increasing children's exposure to this genre is practically mandated. Through the analysis of participant interviews, parent and teacher questionnaires, observational notes, and related artifacts, this case study examines young children's attitudes and dispositions toward informational and narrative text and identifies factors that potentially impact children's exposure to, and familiarity with, informational text. Our study suggests that young readers likely have significant exposure to informational text, as children across the early grades consistently recognized the features of informational text. When books from both genres were presented to the children and they were asked which books they preferred, the children selected informational texts at almost the same rate as narratives. When asked to identify preferred books from recall however, narrative titles were named at a far greater rate than informational texts. Potential reasons for this discrepancy are explored.

Educational Leadership (Higher Education)

The Effects of a Political Culture of Fear on Libyan Student's Perceptions of Leadership

(CHEHD 5 – BR 39)

Authors: Amin Mohamed and Russ Marion

This study analyzes the effects of political culture of fear on perceptions of leader-member exchange (LMX) relationships between student and faculty, and perceptions of the nature of leadership in Libyan universities. Data were collected by survey from 237 students from 7 different Libyan universities. Factor analysis, confirmatory factor analysis (CFA), and structural equation modeling (SEM) were used to analysis the data. The results of this study show that LMX relationship between faculties and students is classified into three factors: professional respect, affect, and loyalty, culture of fear is classified into three factors: fiction, force, and fealty-finance, and leadership items grouped into 6 factors: Charismatic I, Charismatic II, Autocratic, Malevolent, Team Oriented, and Self Protective. According to the structural equation modeling analysis, Culture of fear affects all LMX and 5 leadership factors and LMX affects 5 Leadership factors.

Access to Higher Education and the College Choice of Rural Low-Income Students

(CHEHD 4 – BR 3)

Author: Chinasa A. Ordu

The viability of obtaining a college education is being challenged. As higher education has been touted as the means for increasing one's economic mobility, financing a college education can be a deterrent for those from low-income backgrounds. Past research has highlighted that financial aid offered in the form of grants as having a great impact on the college enrollment patterns of students from underserved, low-income backgrounds (Leslie & Brinkman, 1988); however with the financial aid shift from grants to loans, student loans are being used primarily by this group to fund their education. Unfortunately, student loan debt has soared over \$1 trillion dollars (Fields, 2011). Thus, there is a rising concern on the affordability and access of higher education. This study seeks to unearth the experiences of rural, low-income students' college choice in an effort to discover how their perceptions of financing college impacts their enrollment into higher education.

Educational Leadership (P-12)

Looking, Seeing, Knowing: Documenting the Doctoral Experience through Photomethods

(CHEHD 6 – BR 48)

Author: Kenyae L. Reese

Matriculating in and through a doctoral program is complex and nuanced and often requires a change in occupational roles and professional priorities (Hall & Burns, 2005). Students may also experience shifts in identity as they navigate through and between their professional and academic identities during the doctoral experience (Dobrow & Higgins, 2005). Given that the success of doctoral students is largely contingent on relational and systemic factors, students must be resourceful and able to navigate the political and social dynamics within their respective departments and universities, as well as with their peers (Sweitzer, 2009). Nevertheless, recent literature suggests that more needs to be done to understand the experiences of and challenges faced by graduate students (Austin, 2009; Golde, 2008). This research study uses photomethods, such as photography, to document the student journey to systematically matriculating through an educational leadership doctoral program at a large research university. Findings confirm the value of using photomethods to examine the doctoral student experience. Moreover, participants indicated that the opportunity to reflect on their experience using photographs increased their capacity to be reflective agents and sharpened their focus on the cognitive demands and support systems required to grow from apprentice researcher to doctoral candidate.

Healthcare Genetics

Teaching Tools Used To Incorporate AACN Essentials Into Healthcare Genetics Course For Undergraduate

(CHEHD 7 – BR 62)

Authors: Annamalar Jeyasehar and Julia Eggert

Purpose: Utilize innovative teaching tools to engage students in learning the genetics genomics content emphasized by American Association of Colleges of Nursing (2008). Including expected outcomes as described in Essentials I, V, VII, IX of Baccalaureate Education for Professional Nursing. Organizing Framework: In addition to traditional classroom techniques, innovative strategies include interactive video patient case scenarios (related to ethics, genetic conditions), web-based genetic educational sites, and three generational pedigree projects. Determine tools appropriate for genetic/genomic content in each Essential to integrate AACN essentials into NURS 333 Healthcare Genetics course. Students were engaged in learning genetics/genomic content for application in clinical settings. Course evaluations were positive about the learning strategies used. Conclusions: Students were able to utilize genetic/genomic information in classroom learning activities Clinical Relevance: Selective teaching/learning tools that were used to integrate genomics/genetics knowledge and clinical nursing scenarios is helpful to enhance learning outcomes among Sophomore II nursing students. These tools can prepare the nursing students to face the challenge of understanding the continuously growing information from the genomic era upon entering the workforce.

Middle Grades Education

Developing a College State of Mind at The Greenville Early College

(CHEHD 8 – DP 81)

Author: Erin Lyons

Stop by and explore the journey of three Clemson MAT interns at the new Greenville Early College (GEC). During their practicum experience during the fall of 2012, these three Clemson graduate students went "all-in" to meet the educational needs of about forty rising sixth graders in a personalized learning environment that provides students with the tools and skills to assist them towards becoming the first in their families to attend college. Housed at The University Center of Greenville, GEC is a partnership between Greenville County Schools, Clemson University, Furman University, and USC Upstate. This unique, "college connection" introduces and provides the inaugural sixth grade class with college experiences, enrichment, and academic activities to motivate students towards the path of college attendance.

Nursing (Adult/Gerontology Nurse Practitioner)

Exploring mHealth as a New Route to Bridging the Nursing Theory-Practice Gap

(CHEHD 9 – DP 86)

Authors: Scott Emory Moore, Bonnie Holaday, Nancy Meehan, Paula J. Watt

The purpose of this poster is to discuss the use of mHealth as a tool for research and development of nursing theories. Mobile health (mHealth) is one of the most promising new advances in healthcare technology. mHealth is defined as the use of mobile technology in the provision of healthcare delivery or health promotion (Qiang, Yamamichi, Hausman, & Altman, 2011). The need for innovative and effective interventions for the prevention and management of chronic illness is evident. The use of mHealth interventions in the treatment and monitoring of chronic illness is still young but shows great promise. Currently the public health and psychological sciences are using their theories to guide interventional studies by operationalizing concepts through mHealth's multi-faceted capabilities for patient interaction. Outcomes measures from chronic illness-mHealth studies are thematically evaluated by using theoretical nursing outcome-related concepts of Meleis' Transitions theory and Mishel's Uncertainty in Illness theory. Despite a small number of articles available for review, there are strong themes of activation and engagement of the patient through mHealth. The application of nursing theory in mHealth offers a new method to operationalize theoretical concepts, test theory-based interventions, and gain new contextual insight into the health-illness patient experience.

Parks, Recreation and Tourism Management

An Examination of Twitter's Role in Sports Allegiance Formation Using the Revised Psychological Continuum Model (PCM)

(CHEHD 11 – DP 98)

Authors: Sukjoon Yoon, Sheila J. Backman, James Sanderson, Bryan E. Denham, Gregory Ram

The purpose of this study is to investigate the Twitter's role in the formation of team allegiance through the revised Psychological Continuum Model (PCM) by creating James and Funk (2006). Although collegiate sports programs are using social media to communicate with their fans, little research about how social media impacts the formation of team allegiance has been done. The primary focus will be to analyze how individuals interact with a sports team via Twitter and how those interactions form allegiance. Twitter, a new communication technology platform, is, at present, one of the most popular sites and communication technologies among both individuals and organizations (Clavio, 2011). Twitter also offers a beneficial platform as a strategic marketing tool, enabling fans to elevate team allegiance within the sports realm. This study will also specifically determine whether observing people's interactions on Twitter is an effective way to study the developing relationship between individuals' awareness and emotions related to watching sports games and their allegiance toward specific sports team. This research will also help sports marketers learn about sports consumers' behaviors, needs, and motivations online, which will help shape internet marketing communication.

Interdisciplinary Studies

Policy Studies

The Effect of CO₂ Abatement Policies on TFP Growth

(CIDS 1 – BR 6)

Author: Serife Elif Can-Sener

The measurement and interpretation of economic growth has always been of extreme importance to both economics and policy-makers. Growing national production means higher income as well as higher living standards, but it cannot entirely be explained by the higher use of capital and labor. Even taking into account the accumulation of these conventional factors of production, a portion of the output growth still remains unexplained, and illuminated with the notion of Total Factor Productivity (TFP) growth. Environment is an indispensable factor of the production process, therefore contributes to countries' economic growth. In this study, the environment is taken into consideration in TFP growth measurement, focusing on the role of environment as well as environmental policies in the economic growth of countries. The objective is to estimate TFP growth allowing for CO₂ emissions along with capital, labor, and technical change for 31 OECD high-income countries between the years 1992 and 2008. Once TFP growth rates are calculated, this analysis will involve: (i) observing the effects of CO₂ on TFP growth through a dynamic decomposition analysis, and (ii) suggesting/stimulating CO₂ abatement scenarios to hitting the targets established by the United Nations Framework Convention on Climate Change.

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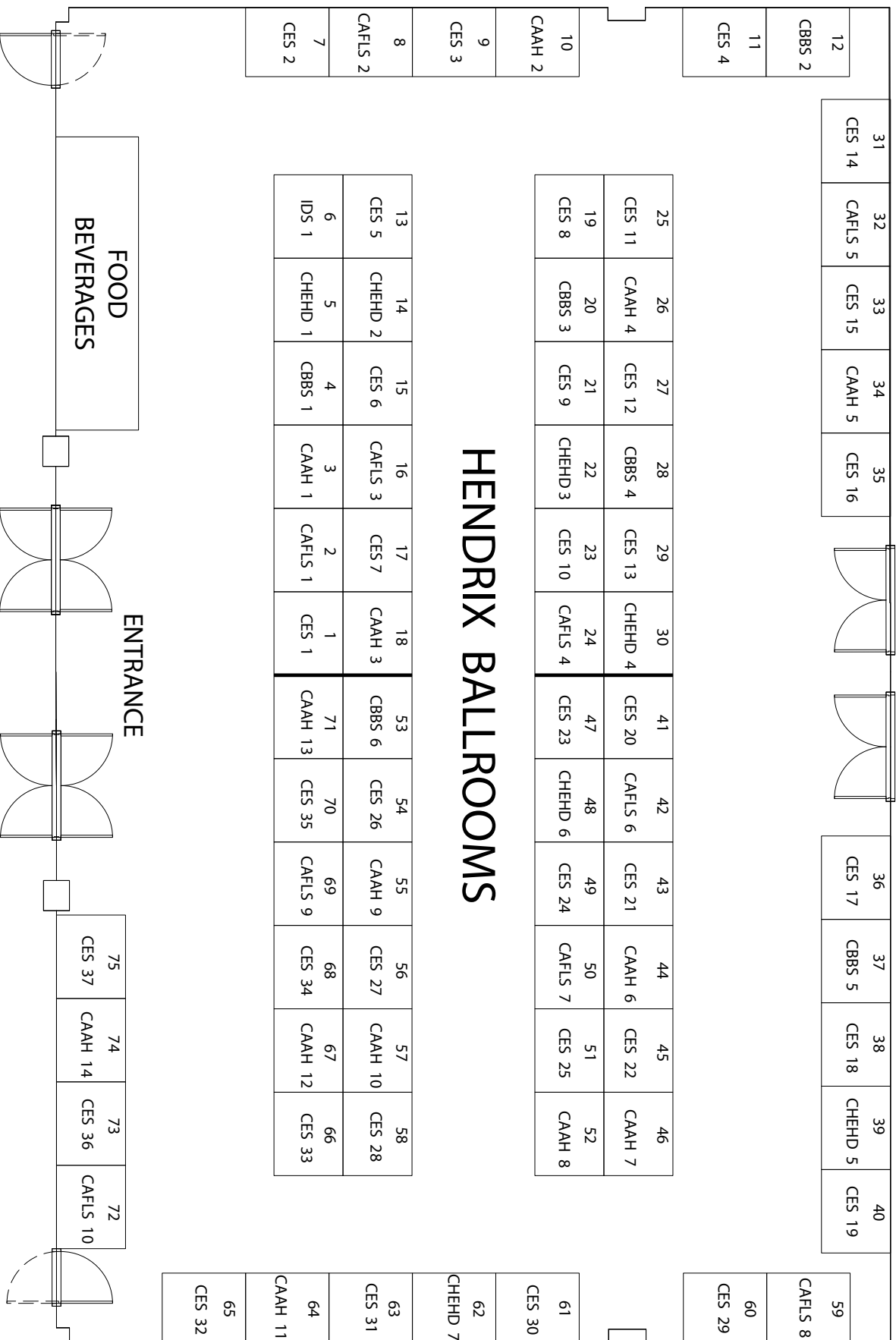
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31	32	33	34	35	36	37	38	39	40
CES 14	CAFLS 5	CES 15	CAAH 5	CES 16	CES 17	CBBS 5	CES 18	CHEHD 5	CES 19

12	11	10
CBBS 2	CES 4	CAAH 2

25	26	27	28	29	30	41	42	43	44	45	46
CES 11	CAAH 4	CES 12	CBBS 4	CES 13	CHEHD 4	CES 20	CAFLS 6	CES 21	CAAH 6	CES 22	CAAH 7
19	20	21	22	23	24	47	48	49	50	51	52
CES 8	CBBS 3	CES 9	CHEHD 3	CES 10	CAFLS 4	CES 23	CHEHD 6	CES 24	CAFLS 7	CES 25	CAAH 8

9	8
CES 3	CAFLS 2

13	14	15	16	17	18	53	54	55	56	57	58
CES 5	CHEHD 2	CES 6	CAFLS 3	CES 7	CAAH 3	CBBS 6	CES 26	CAAH 9	CES 27	CAAH 10	CES 28
6	5	4	3	2	1	71	70	69	68	67	66
IDS 1	CHEHD 1	CBBS 1	CAAH 1	CAFLS 1	CES 1	CAAH 13	CES 35	CAFLS 9	CES 34	CAAH 12	CES 33

61	62	63	64	65
CES 30	CHEHD 7	CES 31	CAAH 11	CES 32

FOOD
BEVERAGES

ENTRANCE

89 CAAH 17	88 CES 42	87 CAFLS 13	86 CHEHD 9	85 CES 41	84 CAAH 16	83 CAFLS 12
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DAVID PEEBLES

90 CES 43

91 CBBS 8

92 CES 44

93 CAAH 18

94 CHEHD 10	101 CES 48
95 CES 45	100 CAFLS 15
96 CAFLS 14	99 CES 47
97 CES 46	98 CHEHD 11

82 CES 40

81 CHEHD 8

80 CBBS 7

79 CAAH 15

78 CES 39

77 CAFLS 11

76 CES 38

**FOOD
BEVERAGES**