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Architecture

Arch Around the Clock - A Study of Nocturnal Studio Culture in Lee Hall

Authors: Adam Windham, Keith Richey, Brian Betz
PI/Advisor/Mentor: Dina Battisto
The proverbial studio “all-nighter” is an intrinsically associated phenomenon inherent to the culture of the architecture student. Long hours spent from dusk ‘til dawn laboring away ahead of a looming deadline with only coffee and a fading sense of self-preservation to keep them going towards that final push. Though a popular image of beleaguered architecture students, how much truth is there to it? Are architecture students truly the creatures of the night that the collective studio culture would have us believe? And if so, then why is that? A mixed method research approach, involving a survey geared towards the undergraduate and graduate architecture students of Clemson University—whose responses were gathered, analyzed, and reported—coupled with a literature review into the subject of late-night studio culture and first-hand design ethnography within the studio culture was employed to answer our research question—Why do architecture students work late at night in Lee Hall studios? A preliminary survey was given to better understand the work habits of Clemson’s architecture students and find if Clemson’s architecture students actually do work at night; a second survey was given to delve into exactly why students choose to work late specifically in Lee Hall studios.

Solar Grove Pavilion

Authors: Alex Libengood
PI/Advisor/Mentor: Dustin Albright
This project aims to re-imagine precast concrete and create a pavilion that provides atmospheric and environmental benefits similar to that of a forest – one that not only exists to support, but to educate and improve. Kaolin Clay contains a mineral high in aluminum silicates called Kaolite. Sodium Hydroxide from wood ash reacts with the aluminum silicates to cure as polymerized concrete. Compared to concrete from Portland Cement, this geopolymer concrete shrinks less, requires less energy, and produces less CO2 emissions. Titanium dioxide, also extracted from Kaolin Clay, is used as an admixture in the canopy turning the concrete into a bright white photocatalyst, accelerating the natural process of UV decomposition, and stimulating chemical transformations without being consumed. Under sunlight, the concrete becomes a semiconductor; causing rapid decomposition of pollutants into harmless compounds that collect on the surface until rainwater washes them away. Rainwater is directed down the surface of textured columns intended to collect dirt and age intentionally. The contrast of the white canopy and the “aging” columns serves as an educational tool that poetically discerns the condition of our environment. This concrete pavilion -like a forest- responds to the elements; soaking up sun, cleaning the air, and harvesting rain.

Water + Farm

Authors: Ellis Taylor & Brian Duffy

PI/Advisor/Mentor: Sallie Hambright-Belue

We were asked to design a sustainable urban farm for Los Angeles County. Since water is essential for a farm, we asked what are the issues regarding water in L.A.? Using a quantitative research approach, data were collected that reveal the extent/effects of saltwater intrusion, toxic chemicals, waste, and food deserts. From a mapping of these data, we chose the city of Paramount for a farm site due to the adjacency of the L.A. River and the fact that 65.52 million gallons of water suitable for vegetation is dumped annually. We propose a closed system, where our farm cleanses the polluted L.A. River water, puts the water back in the water table, and gives potable water and food to the community. Our farm uses 96% of the water dumped annually by Paramount.

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How Open Floor Plans Affect Perceived Student Productivity

Authors: Elizabeth Cooney, Aaron Peter

PI/Advisor/Mentor: Dr. Dina Battisto

The purpose of this research study is to determine if an open floor plan in an educational laboratory setting leads to a higher level of user satisfaction and perceived productivity. The focus of the research is on the Life Sciences Building at Clemson University, which provides improved access to research opportunities for university students pursuing biological sciences, pre-med and pre-veterinarian studies. Our research methodology followed a post-positivist approach through a quantitative web-based questionnaire. The target audience was university students. In addition to the questionnaire, we conducted observations of three key types of spaces used within the

building: Atrium/Lobby, Teaching Laboratory, and Open-Floor Laboratories. The floor plans were mapped based on the workflow structure of individual labs and annotated as to which spaces are shared between labs. We converted our survey results to statistical data and used them in comparison with literature and observational research. Our findings identify elements within an open floor plan that are satisfactory or can be enhanced, including the connection between the open labs and supporting spaces. Additionally, travel distances and the quality of surface materials seriously affect user satisfaction and comfort. It is important to interview the end user about their specific needs in the lab.

Coffee Culture: A Study of How Satisfied Students are with the Design of the Café Environment at Starbucks with Respect to Perceived Student Performance

Authors: Justin Miller (Student) and Dr. Dina Battisto (Professor)
PI/Advisor/Mentor: Dr. Dina Battisto

This study examines how satisfied students are with the design of the café environment at Starbucks with respect to perceived student performance. There is a movement within universities all around the world in which students are working on their school related tasks in the local coffee shops on and around campus. This raises the question of why are students choosing to work in these noisy environments for socialization, rather than the quieter and more intimate environment of the designated study spaces within the universities? The objective of this study is to measure the students' perceived performance on school related tasks with respect to the Outcome of Space Functionality and the Dimensions of Flexibility and Connectability. This study uses evaluative research with both qualitative and quantitative research methods to collect data at the Starbucks in the Student Union at Clemson University during a selected week of time. Results of this study show that students who work on school related tasks at this particular Starbucks are generally satisfied with the space functionality of the facility, and are also satisfied with their performance and productivity while utilizing the design of the built environment.

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How do Individual Personalities Impact Productivity during a Design Charrette?

Authors: Tyler McLemore + Braden Reid
PI/Advisor/Mentor: Dr. Dina Battisto

Design Charrettes are a common tool in the architecture profession, used for generating a design solution within a condensed period of time, typically 3-5 days. A notable benefit of the Design Charrette method is collaboration between designers with varied skill sets. Given the intense time period within which the Charrette typically occurs, effective communication is essential to healthy collaboration. This study began with applying the Myers-Briggs Personality test to a body of architecture students, to determine whether one personality type was dominant in the architecture field. Following this broader study, the focus narrowed to four architecture students currently engaged in a three-day Design Charrette. This led to a more fine-grained investigation of how personality types were influencing the Charrette process. Sleep-deprivation is a common phenomenon in the Design Charrette process; a review of the literature showed that diminished sleep leads to increased stress levels, which negatively impacts effective teamwork and productivity. These trends held true for the four students observed in this study. An open-ended survey showed that personality type and collaboration played a larger role than individual skill sets in perceived team design success. The dominant Myers-Briggs personality type amongst architecture students is INTJ (Introversion, Intuition, Thinking, Judging).

Going to the Restroom: Way-finding in Lee III

Authors: Nick Irmen, Trey Meyer
PI/Advisor/Mentor: Dina Battisto

The proposed project is a response to direct observations of fl_aws in the design of Lee III Hall. The purpose of the research is to determine how e_effective the design of Clemson University's Lee III is in facilitating easy way-fi_nding throughout the building, with a focus on the restroom locations. The research collected and interpreted should identify specifi_c design factors of Lee III, particularly concerning the restrooms, with alternative solutions being off_ered in the conclusion of the project.

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Effectiveness of Different Studio Teaching Models: Multi-Instructor vs. Single Instructor

Authors: Michael Beveridge and William Craig
PI/Advisor/Mentor: Dina Battisto
Architectural education has traditionally been taught as a single instructor studio course. Recently architectural education has introduced a multi-instructor model which introduces a collaborative environment to design. This exploratory research study will help identify strengths and weaknesses in relation to creativity, learning, and productivity in comparison to the single-instructor studio model.

Communication, Technology & Society

Re-shaping Our Vision of Domestic Violence; A Qualitative Analysis of Survivors' Reaction to Existing Campaigns

Authors: Alex Neal
PI/Advisor/Mentor: Dr. Melinda Weathers
This study seeks to investigate victims’ responses to health communication campaigns targeting intimate partner violence (IPV). Several health organizations have identified IPV as a major public health issue, yet the effects of campaigns aimed at the prevention of this violence are rarely tested on their target audience (i.e., victims of IPV). Approximately six print advertisements from current national and international domestic violence campaigns were chosen for this study and were categorized by various types of IPV (e.g., physical, verbal, psychological, and sexual) represented in the

advertisements. Questions for the focus groups were broken down into sections, each representing one component of the Health Belief Model (i.e., susceptibility, seriousness, benefits of action, barriers to action, and likelihood of taking recommended preventative action). It was hypothesized that victims would react negatively to the print ads they were shown, describing them as inaccurate in their overall portrayal of IPV. Further, it was hypothesized that victims would express interest in seeing messages of hope and a brighter future, rather than those depicting women in the thralls of violence. The early results of this study suggest an overall failure of IPV awareness and prevention campaigns to successfully reach the audience most affected by the issue.

English

Blighting the Landscape: Dystopian Cities of Science Fiction Film

Authors: Joshua R. Newberry

PI/Advisor/Mentor: Armando Montilla

Often taken for granted, the way a director depicts the world of their film can be read in useful ways. Cities can be seen as a reflection of the time period from which they are envisioned, as a mirror through which the audience is invited to see the real world they will return to after the credits roll. Indeed, the visual component of film especially invites us to consider the architecture we are presented within the context of the historical moment in which the film is created. This paper, then, seeks to look at a subtype of film and draw out the implications of the choices that were made in presenting specific conceptions of the city within the larger context of movements occurring in the architecture community. It establishes a connection between the architecture of dystopian cities from the 1970's through the early 21st century, looking at the change over time which occurs in the depiction of the undesirable society. In doing this, the paper traces a common trait between our depictions of dystopia: the reaction to the architecture experienced in the real world and taken to often frightening extremes in the world of the film.

Rhetorics, Communication and Information Design

Irony, Cynicism and Stases

Authors: Kathy Elrick

PI/Advisor/Mentor: Dr. Victor J. Vitanza

Irony and cynicism are prevalent not just in Hipster culture, but in the now semi-institution of The Daily Show. The range of political topics and jabs catch the attention of the audience as well as are re-used by politicians and news anchors. However, TDS's satirical approach adds something publicly aired objectivity and the study of it won't: a punchline. This humor, and indeed the dialectic style of the interviews of TDS, gives more perspective in 21 ½ minutes than the 24/7 cable news. This perspective is through irony and cynicism. Audiences respond to it but also can understand on more levels than just the news networks' pursuit of objectivity (Truth?), the failure of which in itself becomes the material of TDS's satire. Yet what makes the irony, cynicism and discussion in TDS particularly important come out in the

2012 election cycle. Candidates talked past each other, and the debates were nit-pick fests. However “The Rumble”, between Jon Stewart and Fox News’ Bill O'Reilly crystallized ideological claims. This kind of example, perspectives from irony and cynicism as seen in something like TDS, aids objectivity as well as can aid the American audience in better understanding politics and the news.

AutoBioGraphies: Visual Analyses of HumAnimal Material Creativity

Authors: Hayley Zertuche

PI/Advisor/Mentor: Victor Vitanza

Following theories of new materialism and complexity science, this visual project argues for the continuity of agency and creativity across biological bodies—particularly animal bodies—and the role of human creativity in marking and moving through the organic, permeable barriers between the categorical “human” and “animal” in (dis)order to embrace animals (and our own animal bodies) in a life-affirming way. Recognizing the (biological) creative agency of animal bodies responds to a long tradition in Western philosophy and science privileging mind and/or soul over the separate and morally base or irrelevant (animal) bodily nature, which has served as justification for the marginalization of nonhuman others. Imperative to this learned embrace is a remembering of our own AutoBioGraphies. How do we perform our own biological/animal narratives? Visual analyses of images illustrating animal creativity will be presented as well as analyses of human artists who use their bodies and materiality within the world to bring visibility to the permeability of “human” and “animal” ontologies.

Visual Arts

Belief and Disbelief

Authors: Alexandra Giannell

PI/Advisor/Mentor: Greg Shelnutt

I am working with fellow MFA student, Hilary Siber, also studying painting, to create a gallery exhibition aiming to link our artwork both aesthetically and conceptually. The goal is to creatively, effectively, and sensitively curate a two-person show with a strong, influential visual flow, captivating the viewer. The goal of this collaboration is to create an atmosphere that draws the viewer in from different intellectual angles, engaging them, proposing they question, contemplate, and respond to the subject matter and presentation. The artworks, combined, address the human condition as it is rooted in our physicality, while also exploring ephemerality and the notion of afterlife, or, what is beyond. This merging of our work for such an exhibition intends to instill investigation of thought, specifically pertaining to religious beliefs, where navigating one\'s own path of uncertainty is encouraged and highlighted. The gallery setting is intended to act as an incubator for the collision of our theoretical thinking as well as provide a space, which we have critically carved out, for such self-reflexive contemplation of one\'s own belief or disbelief. This approach allows the artwork to be seen, testing the potency of the work as a trigger for this questioning and reflection.

Changing Identities

Authors: Ali Hammond

PI/Advisor/Mentor: Greg Shelnutt
My work researches how materials are used in a traditional sense (function) and how they can be juxtaposed to create a sculpture (form), creating a new identity. Changing the surface and identity of an object is an important part of the work I make. I adorn and tend to these forms to create a surprising, unexpected result. I am interested in how this reflects labor and what questions it can raise about gender roles. Do Ho Suh, Ana Mendietta, Deidra Nelson, and Liza Lou are other artists I am influenced by.

Belief and Disbelief

Authors: Hilary Siber
PI/Advisor/Mentor: Greg Shelnutt
As beings with physical bodies we are aware of our existence because of the countless avenues of understanding through physical, psychological and phenomenological experience. As a painter my research utilizes a visual language to explore the elusive and scientifically unknown aspects of our being. This work specifically roots itself in the intangibility of faith and the inevitability of death. At this intersection I probe my own understanding of my personal belief system and challenge others to do the same. This reciprocity is a means of understanding that prompts deconstruction through sef-reflexivity and awareness. Here, too, fellow colleague and MFA candidate, Alexandra Giannell, poses similar questions within her own visual artwork. Together, we propose making collaborative mixed media drawings that will both physically and conceptually challenge one anothers own research and understanding of our existence. After the work has been made, we will present the work to regional galleries as a collaboration between artists that are exploring the same subject through two polarities.

Nothing Gold Can Stay: Investigating the Temporal Aspects of Celebratory Activities

Authors: Lindsey Elsey
PI/Advisor/Mentor: Greg Shelnutt
In our lives, we experience certain moments that are set apart from the ordinary- moments of celebration. These occurrences are distinguished by elaborate preparation and met with a high degree of anticipation, yet no matter the level of investment, we recognize they must inevitably draw to a close. In an elegant tea party, one consumes not only confections, but time as well. After the celebration is over, one may retain memories, or even pictures and recordings, but the experience as a whole, unbroken unit cannot be repeated. I am creating a series of ceramic and performance work that investigates our attachment to unique, unrepeatable experiences. The disposable solo cup is the form I build upon to explore the possible varieties of retention of special occasions, wherein our perception of time is heightened beyond existence mired in the mundane and everyday. After we consume an event, how do we deal with the fragmented remains in a satisfying manner? Do we hold on so tight that it seems to us it was never broken? Do we acknowledge the holes and gaps, or do we construct something entirely new? These questions are the crux of my investigation.

CAFLS

Biochemistry and Molecular Biology

Investigation into the Xfp-Ack Pathway in Cryptococcus neoformans

Authors: Tonya Taylor, Christopher Nguyen, and Kerry Smith
PI/Advisor/Mentor: Kerry Smith

The opportunistic pathogen Cryptococcus neoformans is the most frequent cause of fungal meningitis, resulting in approximately 625,000 deaths per year worldwide. Acetate is shown to be a major fermentation product during infection, and genes encoding enzymes from three putative acetate-producing pathways are shown to be upregulated. This suggests that acetate production may be a necessary and required part of the pathogenic process. One possible pathway for acetate production is the xylulose 5-phosphate/fructose 6-phosphate phosphoketolase (Xfp) - acetate kinase (Ack). We propose that Xfp-Ack functions as a modified pentose phosphoketolase pathway to produce acetate and ATP during infection. To investigate the metabolic and physiological role of this pathway in C. neoformans, XFP1, XFP2 and ACK knockouts, including double knockouts, have been generated and are being tested under a variety of conditions in vitro and in vivo. To gain a better understanding of the role Xfp plays in C. neoformans, I will investigate the biochemical and kinetic properties of Xfp1. Construction of a tandem affinity purification tagged version of C. neoformans XFP1 is in progress and will facilitate the purification of Xfp1 directly from C. neoformans. This will be the first investigation into the role of the Xfp-Ack pathway in fungal metabolism.

Biological Sciences

Conserving the Land of the Giants

Authors: Christie Sampson, Peter Leimgruber, and David Tonkyn
PI/Advisor/Mentor: David Tonkyn

Protected areas are providing some of the last refuges for Asian elephants in the wild. Scientists know little, however, about elephant habitat use in these protected areas. We used dung counts as an indirect measure of elephant presence to quantify habitat use in Udawalawe National Park and Hurulu Forest Reserve in Sri Lanka. These two protected areas contain some of the largest grasslands, but are threatened by fire suppression, the invasive and toxic plant Lantana camara, and illegal grazing of livestock. We conducted over 50-km of dung transect surveys and surveyed 197 vegetation plots stratified across three habitat types in the two reserves. Our results show elephants prefer grasslands but will use shrub and forest habitats. Lantana was found at low densities but pervasive across all three habitat types. Livestock are found almost exclusively in grasslands where they may compete with elephants for food either directly or indirectly, and may suppress grass recoveries from fire. Local habitat and vegetation, especially the presence of grasses, best predicted elephant habitat use. We conclude that grasslands are important habitat for Asian elephants in Sri Lanka and that conservation efforts should focus on managing fire and lantana, and

stopping illegal grazing in protected areas.

Entomology

Task Allocation of Asian needle ant, Pachycondyla chinensis (Emery), workers during nest emigration

Authors: Hamilton Allen, Pat Zungoli, Eric P. Benson, Pat Gerard
PI/Advisor/Mentor: Pat Zungoli

Ant colonies are constantly moving due to nest disturbance, climate fluctuations, and resource availability. Recruitment of workers during the emigration process is vital to ensuring that individual members are moved to the new nest site. As a form of recruitment during emigration worker ants may singly or in combination employ chemical trail following, tandem running, or adult transport. In a laboratory study, I investigated the recruitment behavior of the Asian needle ant, Pachycondyla chinensis during nest emigration. Test results containing colony subsets of 200 workers showed that worker ants were ten times more likely to participate in adult transports during nest emigration when compared to colonies not participating in nest emigration. However, task allocation of worker ants during the nest emigration was not investigated. Investigation of the tasks carried out by P. chinensis during emigration can elucidate whether or not specific ants participate in adult transport or if carrying is a non-specific behavior conducted by all ants. In the current study, task allocation of worker ants during nest emigration was observed and recorded. Preliminary results suggest that a select number of individuals are involved as transporters during emigration. Additionally, the role(s) of non-transporting nestmates during nest emigration are reported here.

Environmental Toxicology

The Chronic Toxicity of Chloride, Sulfate and Bicarbonate to Ceriodaphnia dubia

Authors: Katherine A. Johnson, William C. Bridges Jr, and Stephen J. Klaine
PI/Advisor/Mentor: Stephen J. Klaine

Total Dissolved Solids, commonly referred to as TDS, are naturally found in aquatic environments. However, anthropogenic activities such as agricultural irrigation, road salt runoff, and coal-fired power plant effluents can increase TDS concentrations of freshwater systems ultimately increasing the salinity. Freshwater organisms must actively maintain a balance between their external and internal environment. When this delicate balance is altered, these organisms must allocate more energy towards ionoregulation, thus reducing energy for other important biological functions such as reproduction. While research exists on the acute toxicity of elevated TDS, few evaluations of chronic effects have been reported. Through a series of 8-day static renewal assays, C. dubia were exposed to chloride, sulfate and bicarbonate individually and in mixtures; mortality and reproduction were quantified. Results from single anion assays agree with those concluded from previous studies (Cl- > HCO3- > SO42-). Anion mixture results from this study indicate the potential for synergism between anions, especially mixtures including bicarbonate. Sulfate had a significant contribution with concentrations above the EC30. Overall, the results from this study suggest

that these anions act in a greater than additive manner, which should be taken into consideration when developing predictable models for environmental exposures.

Food Technology

Studying and Educating Preschooler's: Because Nutrition is Important at a Young Age

Authors: Ibtehal Alsallaiy
PI/Advisor/Mentor: Katherine Cason

Nutrition and healthy eating habits are important abilities for young children, and this is as early as 3 years old when food preferences start to form, and recognition of different flavors, colors, textures and smells of food begins. Objective: To study food preferences of preschool age children at childcare centers, and to analyze foods served and consumed. Secondly, to develop and test an educational program for children that focuses on food choices and how it is possible to eat delicious and healthy foods at the same time. Also, to develop and test an educational program, for childcare providers about what they feed the children and how they can choose foods that will be appealing and nutritious. Methods: Observational study of childcare centers in Upstate South Carolina during breakfast, snack and lunch times of what foods are offered and served, what foods the children choose and consume, as well as other mealtime behaviors. Using the information obtained in the observational study, an educational program that contains tools, games, and explanations that will impact the children's food preferences and encourage them to eat the healthy food that the childcare providers have given them will be developed and the impact will be measured.

Genetics

Functional Characterization of Arabidopsis thaliana Protein kinase AtLRPK Gene Family that Responds to Abiotic Stress

Authors: Ning Yuan, Zhigang Li and Hong Luo
PI/Advisor/Mentor: Hong Luo

Many abiotic stresses such as drought, salt can limit plant growth and development. Understanding molecular mechanisms underlying plant response to adverse environmental conditions will provide information to develop molecular strategies for genetic improvement of crop species. Here, we report a newly identified leucine rich repeat (LRR) protein kinase gene family AtLRPK responds to salt and drought stresses intensely. No any other research group has reported this novel AtLRPK gene family before. In our research, GUS and GFP reporter systems, T-DNA insertion mutant analysis and RNAi interference approach were adopted to elucidate the function of AtLRPK gene family. Based on the results, family member AtLRPK1 was mainly expressed in Arabidopsis seedling vascular and trichome, and AtLRPK1 protein was localized on plasma membrane. Salt treatment analysis with T-DNA insertion mutants and RNAi line indicated that suppression of expression of AtLRPK genes led to enhanced salt tolerance of Arabidopsis, suggesting their importance in plant abiotic resistance mechanism. In Further studies, we will use over-expression approach to elucidate the function of AtLRPK gene family, and try to identify co-regulators of AtLRPK proteins. Our

study will lead to enhance performance of agriculture crops species under adverse environmental conditions by developing a novel molecular strategies.

Small RNAs, big impacts: How microRNAs help plant survive under adverse environmental conditions

Authors: Shuangrong Yuan, Zhigang Li, Dayong Li, Qian Hu &Hong Luo
PI/Advisor/Mentor: Hong Luo

Environmental and nutritional stresses are limiting factors in plant growth and development, especially for the agricultural productivity. Due to the sessile nature of plants, these stresses are unavoidable. To enhance stress resistance of plant, numerous stress responsive genes encoding for particular functional proteins have been identified. However, the comprehensive understanding of plant response to these stresses remains unclear due to the complexity of the stress responsive network. The discovery of plant microRNAs, a class of endogenous small RNAs, sheds light on this question for the reasons that 1) they coordinately regulate multiple genes; 2) they control diverse biological processes, including plant responses to environmental and nutritional stresses. To determine how microRNAs help plant survive under adverse environmental conditions, we generated the transgenic turfgrass with constitutively expressing of a miRNA gene and evaluated its performance under conditions of soil salinity and nitrogen deficiency at morphological, physiological and molecular levels, respectively. Our data demonstrate that transgenic plants exhibit improved tolerance to salt stress and nitrogen starvation. To understand the underlying molecular mechanisms, five abiotic stress responsive genes have been identified as targets of the miRNA. The results indicate the potential of manipulating plant miRNA in improving plant resistance to environmental stresses.

Microbiology

Magnetic Hyperthermia Mediated Enhanced Inactivation of Enterotoxigenic Escherichia coli in Presence of Bio-Functionalized Iron-Oxide Nanoparticles

Authors: Yash Raval, Roland Stone, Bin Qi, O. Thompson Mefford, Tzuen Rong J. Tzeng
PI/Advisor/Mentor: Tzuen Rong J. Tzeng

Increasing incidences of multi-drug resistant bacteria is posing a serious threat in current clinical and healthcare settings. Bacterial attachment onto specific mammalian cells, which is one of the foremost events taking place in host-pathogen interactions, is mediated by carbohydrate binding proteins known as adhesins. If these binding interactions are inhibited, then the chances of getting infection are greatly reduced. Rapid advancement in the fields of nanotechnology and glycotechnology offers potential new therapy options for treating bacterial infections. Here, we report the synthesis and characterization of iron-oxide nanoparticles (IONPs) coated with polyethylene oxide (PEO-IONPs) and functionalized with carbohydrate glycoconjugate Neu5ɑc(ɑ2-3)-Gal-(β1-4)Glcb-sp (GM3-IONPs) that exhibited high specificity towards adhesin of Escherichia coli ATCC 13762, which expresses K99 antigen (E. coli K99). When E. coli K99 was mixed with GM3-IONPs in appropriate ratio and exposed to alternate current magnetic field,

approximately 2-log reduction in colony forming units (CFU) of E. coli K99 was achieved in 60 minutes of hyperthermal treatment. In contrast, only 1-log reduction in CFU of E. coli K99 was observed when hyperthermal treatment was given with PEO-IONP's. These findings suggest that such carbohydrate bio-functionalized IONPs mediated hyperthermal treatment offers an excellent alternative therapy for inactivating bacterial pathogens.

Packaging Science

Understanding Polymer Chain Diffusion During Heat Seal

Authors: Russell T. Cooper
PI/Advisor/Mentor: Dr. Duncan Darby
Heat sealing is one of the most commonly utilized methods to close plastic packaging. No matter how well a product is prepared or how suitable the packaging material is, a compromised seal creates a risk of product contamination or damage. Preliminary testing was conducted to confirm that elemental analysis can be employed to measure and track the polymer chain entanglement distance in a heat seal interface. Thin films were cast extruded from low density polyethylene (LDPE) and polyethylene-co-acrylic acid (EAA). LDPE was heat sealed to EAA with a hot bar sealer at varied heat seal conditions. Cross sectioned seal interfaces were analyzed with Scanning Electron Microscopy (SEM) and Energy-dispersive X-ray Spectroscopy (EDX). The oxygen species within EAA were exploited in an attempt to measure the distance that EAA polymer chains diffused into LDPE polymer chains. Ultimately, elemental analysis was useful in measuring the presence of oxygen species. However, the weight percentage differential of oxygen between EAA and LDPE was not large enough to track polymer chain diffusion. Changes in methodology are to be explored as well as different methods such as charged-tip atomic force microscopy. SEM imaging of stained seal interfaces will be utilized to supplement SEM and EDX results.

Wildlife and Fisheries Biology

Land Cover Influence on South Carolina Alligator Densities Derived from Nightlight Surveys (1971-2013)

Authors: Abigail J. Lawson
PI/Advisor/Mentor: Kate McFadden
The American alligator (Alligator mississippiensis) is an iconic species of the southeastern U.S. of cultural and ecological importance. In South Carolina, habitat loss and fragmentation are considered prominent threats to alligator populations. I identified habitat features that influence alligator abundance and evaluated temporal and demographic differences. Alligator nightlight surveys were conducted by boat on rivers and lakes between 1971-1977 and 2011-2013. I examined land cover patterns within 1, 3, 5, and 10 km of each survey route. I used linear regression to identify land cover categories that best described juvenile, adult, and total alligator densities for each time period. Average density increased from 0.48 ± 0.54 (SE) alligators per km during the 1970s to 2.84 ± 2.03 for current surveys. Urban land cover proportion within each route area during the 1970s positively influenced total alligator densities (β: 0.21, 95% CI: 0.16-0.26), though current total alligator densities were negatively influenced by agriculture (β: -0.60, 95%

CI: -0.29 - -0.97). Interestingly, the best explanatory variables for juvenile density differed among survey periods, and from variables that best described adult and total densities. Identifying potential mechanisms that explain these observed patterns is essential for effective broad-scale alligator conservation planning in a changing landscape.

Gradients in breeding Brown Pelican foraging radius, chick condition, and diet across the Northern Gulf of Mexico

Authors: Juliet S. Lamb, Patrick G.R. Jodice
PI/Advisor/Mentor: Patrick Jodice

Unlike many seabirds, the Brown Pelican (Pelecanus occidentalis) relies on coastal habitats for both breeding and foraging. Although pelicans may benefit from supplemental feeding and from prey aggregations around energy installations, they are also vulnerable to contaminants exposure, experience disproportionate oil spill mortality, and represent an important planning and mitigation target. Recent contamination events, notably the Deep Water Horizon spill, have highlighted the need to understand how pelicans use the marine environment; however, published data on Brown Pelican movements are extremely limited. During summer 2013, we fitted 63 breeding adult Brown Pelicans with GPS transmitters at 6 colonies across the northern Gulf of Mexico. We also measured 3-4-week-old chicks at each colony and obtained diet samples from adults and chicks. Preliminary results indicate that breeding-season foraging radius of adults increased from east (Florida Panhandle) to west (southern Texas), while chick body condition declined along the same gradient. Diet composition also differed between colonies: although menhaden (Brevoortia patronus) predominated in all regions, Florida diets contained a higher variety of prey species than central and western areas. This information will guide further investigations into how diet, individual characteristics, environmental factors, and anthropogenic development influence pelican demography and year-round movement patterns.

CBBS

Applied Psychology

Who you are vs. how strong the signs are: What predicts how you see situations?

Authors: Alice M. Brawley
PI/Advisor/Mentor: Cynthia L. S. Pury, Ph.D.

Many modern psychologists agree that human behavior is a result of not only a person's personality, but also their perception of the features of the particular situation in which the person is behaving. Our research has focused on situational affordances, or features of a situation that either allow (i.e., afford) or prevent certain types of behavior. Comparing individual personality to situational affordances, we have found several interesting relationships. For example, more extroverted or outgoing individuals are more likely to perceive affordances for sharing information, while more agreeable individuals are more likely to perceive affordances for considering

other people. Other recent research has also highlighted situational strength - that is, the strength of cues for appropriate behavior in a situation - as an important predictor of situational perceptions. Our preliminary findings indicate that, overall, situational strength is a stronger, more reliable predictor of situational perceptions than is personality. For example, this is particularly true when individuals perceive affordances for needing to act immediately: personality predicts 0.7% of these situational perceptions, but situational strength predicts 14.1% of these perceptions. Understanding what causes particular situational perceptions is a key step in understanding behaviors that result from these perceptions.

Economics

Impact of selection method of Insurance Commissioner on insurance markets

Authors: Ghanshyam Sharma

PI/Advisor/Mentor: Dr Robert Tollison

Insurance Industry is regulated at the state level by an Insurance Commissioner. Each state has an Insurance Commissioner. In some states, Insurance Commissioner is elected (through direct ballot) by the people, in other states Insurance Commissioner is apppointed by the Governor. States in which Insurance Commissioner is elected by the people have significantly lower car insurance premiums as compared to states in which the Insurance Commissioner is appointed - about $300 less for a period of six months. Appointed Insurance Commissioners extract lower tax revenues from the Insurance industry as compared to Elected Insurance Commissioners. This is because public officials respond to the incentives they face. Elected regulators are directly answerable to the people and hence create conditions which lead to lower insurance premiums for the people. Appointed regulators are not directly answerable to the people. So they dont care about people that much. In fact they are pro-industry. They can extend favors to the industry - allow them to charge higher prices and extract lower taxes in return for favors like campaign contributions.

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

Authors: Richard Gearhart

PI/Advisor/Mentor: Paul Wilson

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 by the WHO (2000) and Evans et al. (2000), extending the dataset to include 10 new years and using new 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. It finds that the United States is not nearly as inefficient as previous studies, ranking between fourth and eighth, from 1993 to 2005, among the 30 OECD countries. This paper supports previous findings that cross-country comparisons of health care efficiency are biased by choice of

estimator and minimal changes in the input-output bundle, which 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. These highlight the difficulties in cross-country efficiency comparisons, and the need for reliable estimates that policy can be derived from.

Human Factors Psychology

The potential for thermal stressed driving detection technology

Authors: Drew M. Morris

PI/Advisor/Mentor: June J. Pilcher

Exposure to uncomfortably cold environments can induce cold stress in short periods of time. Cold stress has been shown to result in systematic cognitive and physiological error from distracting effects and curtailed dexterity. Due to the dangerous nature of impaired driving, factors that may affect the ability to drive safely should be explored, though few have researched detection technology associated with vehicle control under cold stress. The current study (N=20) found that sleep deprived drivers produced systematic error based on sleep deprivation intensity due to cognitive and physiological detriments ($p<.001$). A thesis study will use these methods to explore the effects of cold stress by way of skin cooling on driving simulator performance, and evaluate the potential for a thermal stressed advanced driver assistance system. Participants (N=30) will complete three conditions with a high fidelity driving simulator under increasing cold stress. The study will control for reaction time, attention, dexterity, and body temperature. Driving error due to cold stress is expected to vary with intensity similarly to drowsiness, supporting the viability and relevance of such technology.

Industrial/Organizational Psychology

Employee Work Outcomes: Context Matters

Authors: Anna C. McFadden

PI/Advisor/Mentor: Thomas W. Britt, Ph.D.

There is a large body of research linking both individual differences and work stressors to well-being and performance outcomes. However, organizations often cannot change or reduce work stressors, or spend the time or money changing individual differences within employees. Yet, employers do have some degree of control over the work environment itself. The context of work is often ignored in the literature, with researchers more focused on individual relationships. Ignoring the effects of the work environment can lead to a breakdown of initiatives aimed at the individual. By focusing efforts on aspects of context, employers can help improve both employee and business outcomes. Researchers have defined “context” as a set of situation-based opportunities and constraints that can impact the way behaviors are perceived and performed at work, as well as the relationship between two variables. Context can have far reaching effects at multiple levels within the organization. Therefore, context does not only impact the individual, but can have an effect within the work group, department, or organization as a whole. The current collection of research examines how context within the work-unit can affect both employee well-being and performance outcomes in

populations such as military personnel, university employees, and lone workers.

Satisfaction with work-family balance: Why support may matter more than conflict

Authors: Brooke A. Baker

PI/Advisor/Mentor: Dr. Robin Kowalski

Previous research suggests that work-family conflict is associated with negative attitudinal and health outcomes. However, few empirical studies have examined the ways in which employee work-family conflict may decrease another important attitude, satisfaction with work-family balance. Prospective antecedents and outcomes of perceived satisfaction with work-family balance were examined among 523 graduate student employees. Graduate student satisfaction with work-family balance was strongly and positively related to life satisfaction and moderately, negatively associated with turnover intentions. Results also indicated that work-family conflict mediated and moderated the demands-satisfaction relationship, and that mentor work-family support affected how work-family conflict influenced satisfaction with work-family balance. Results suggested that graduate student satisfaction with work-family balance is affected in several ways, and that mentors who are supportive of their protégés' work-family situations may enhance graduate student satisfaction—even in the face of conflict.

Awake at Night: Implications on Working Memory

Authors: Janet Donnelly

PI/Advisor/Mentor: Dr. June J. Pilcher

Working memory (WM) plays a critical role in performance of many tasks. The purpose of the current study is to examine the effects of sleep deprivation on accuracy in WM tasks. Participants included 76 college students (49 males, 27 females) in a total sleep deprivation study. Participants stayed awake all night and completed a series of tasks during four testing sessions. The AX task required participants to view a string of letters containing distractor letters and indicate if the presented set of letters began with "A" and ended with "X". Two tasks from the Automated Neuropsychological Assessment Metrics (ANAM) were also used. In the Code Substitution Immediate, participants had to recall a key of numbers and symbols from their practice session and indicate if the provided symbol matched the stimulus displayed. In the Continuous Performance Test, participants were presented with 179 single-digit numbers and performed a 1-back task. Results from three repeated measures ANOVAs assessing the accuracy of responses for each of the tasks throughout testing sessions indicates that accuracy on all three WM tasks significantly decreased across the night ($p<.000$). Since WM and sleep play a critical role in performance, this research can be applied to the working population.

Who Benefits from Family Support? Work Schedule and Family Differences

Authors: Kristen Jennings, Robert Sinclair, Cynthia Mohr

PI/Advisor/Mentor: Robert Sinclair

Many workers struggle with balancing work and family life. Consequently, organizations commonly create policies and initiatives to support work-family

balance; however, benefits of formal efforts may be minimal if employees do not also perceive their organization as family-supportive. The present study examined relationships between family supportive organizational perceptions (FSOP) and health outcomes, as well as how those effects may depend on work schedule and family differences. Using a sample of 330 nurses, the findings indicated that FSOP predicted several health and well-being outcomes. Further, the effects of FSOP depended on some work schedule and family differences. In terms of family differences, FSOP was most strongly related to life satisfaction for those who cared for dependent adults and the effects of FSOP on health outcomes were stronger for those with dependent children. Regarding schedule differences, the effect of FSOP on life satisfaction was strongest for those on non-standard (evening/night) shifts as compared to day shift; however, there were no differences in FSOP effects by hours worked per week. The findings demonstrate that FSOP may benefit some employees more than others. Such differences need to be incorporated into future work-family theory development and into efforts to document the effectiveness of family-supportive practices.

CES

Automotive Engineering

Online Parameter Estimation Using SR-UKF in Turning of Slender Bar

Authors: Farbod Akhavan Niaki

PI/Advisor/Mentor: Laine Mears

In this work square root unscented Kalman filter (SR-UKF) for online estimation of process parameters is proposed. UKF may diverge in some nonlinear processes with large difference in order of magnitude for covariance matrices. In this case taking square root of covariance matrix is suggested. SR-UKF can accurately predict the process parameters with 5.92 root mean square error. While it has been suggested by some authors that the feed exponent in nonlinear force feed equation is constant, the results shows change in the mean values of parameters including feed exponent. In addition, the filter estimates a stationary covariance between parameters, which indicates the constant correlation of parameters through the cutting time.

Characterization of Flow Drill Screwing Process Parameters on Joint Quality

Authors: Jamie D. Skovron, Laine Mears, Durul Ulutan, Duane Detwiler, Boris Baemler, Laurence Claus

PI/Advisor/Mentor: Laine Mears

A standard for aluminum-to-aluminum joining in the automotive industry is resistance spot welding. However, spot welding may degrade the structural performance through heat affected zones created by the thermal joining process. Also, achieving the double sided access necessary for the spot welding gun may limit design flexibility. A recently introduced technology called Flow Drill Screwing (FDS) does not have these limitations as through-part connections are formed by one-sided access using a thermo-mechanical

flow screwing process with minimal heat. FDS is an automated continuous process that allows multi-material joining by utilizing a screw as both the tool and the fastener. The process uses the friction caused by the rotating screw to pierce and extrude the material. Threads are then created in this formed bushing and allow the fastener to clamp together the sheets of material. This study explores the quality design space as represented by resultant joint geometry as a function of the critical process parameters of downforce and rotational speed profiles. The candidate material for this study is Al5052 with the stackup composing of two 1.5mm sheets. Feasible design space regions for this 3mm combination are explored to determine optimal process parameters, and strength testing performed to validate the findings.

A Comprehensive Assessment Methodology Based on Life Cycle Analysis for On-board Photovoltaic Modules in Vehicles

Authors: Mahmoud Abdelhamid, Imtiaz Haque, and Rajendra Singh
PI/Advisor/Mentor: Imtiaz Haque (Adviser), Rajendra Singh (Co-Adviser)
Transitioning to a low carbon economy necessitates the use of sustainable and clean energy sources to ensure US energy independence and low environmental impact by manufacturing fuel-efficient automobiles. The continuous technological advances have increased the efficiency and reduced the cost of photovoltaics (PV) solar modules, which in turn has accelerated their inclusion into the automobile applications. However, many challenges must be resolved before a PV powered automobile can be manufactured on a large scale. For that, the authors have developed a comprehensive novel life cycle assessment model, with a particular emphasis on energy, emissions, and cost, for using different PV options on-board to power automobiles to determine the efficacy of use of PV technologies in reducing fuel consumption for meeting corporate average fuel economy standards through 2025. The model is useful for comparing green solar vehicles with other types of vehicles in different geographical locations. This investigation also establishes a decision-making methodology for evaluating and selecting the optimal PV module type for vehicle application. The present study will be useful in assisting automobile designers to build the next generation of PV powered automobiles and will offer a reference framework for future research to the deployment of a sustainable transportation system.

New Stochastic Method for Fault Detection

Authors: Sara Mohon
PI/Advisor/Mentor: Dr. Pierluigi Pisu
Technological systems are becoming more and more vulnerable to faults that may lead to damage of property or human lives. Therefore, detection of faults is extremely important. Most systems are dynamic systems and can be studied using cell-to- cell mapping. The dynamic state space of the system is gridded into cells that the system may occupy as time evolves. Using this framework, the probability of cell transitions can be computed using various approaches. Transition probabilities are important because if a system transitions to a cell that has low probability then a fault may be occurring. The most common approach to calculate transition probabilities is the Monte Carlo method. The movements of many initial random points inside a cell are calculated. These points will move to new cells or stay within the original cell

and the probability of cell transitions are calculated. The new stochastic method proposed by the author uses the flow within the system vector field to predict transitions. Only the flow through the perimeters of the cell are considered and transition probabilities are constructed. The advantage of the new method is it can be performed during system operation and can detect faults quicker than the Monte Carlo method.

Bioengineering

Human Serum Albumin coating for enhanced Hemocompatibility and Drug Delivery

Authors: Astha Khanna1, Igor Luzinov2, Fehime Vatansever2, Eugene M. Langan III3, Martine LaBerge1 1Departme
PI/Advisor/Mentor: Dr. Martine LaBerge, Professor & Chair of Bioengineering

Restenosis and thrombosis are two major clinical complications of endovascular stents. In this study, a novel bio-polymeric coating is proposed as a drug delivery system reducing both neo-intimal hyperplasia by inhibiting smooth muscle cell (SMC) proliferation as well as shielding fibrinogen (Fg) adsorption and platelet adhesion thereby reducing thrombosis incidence. It can also be used as a drug delivery coating for the controlled release of a bisphosphonate Alendronate Sodium mitigating neointimal hyperplasia. 10% Human Serum Albumin (HSA) is grafted on PGMA modified 316 SS discs by annealing at 150C for 1 hour. Differential Scanning Calorimetry(DSC) and Thermogravimetric Analysis(TGA) have shown that degradation of HSA (260°C) is virtually unaffected by the compression molding process, also confirmed by FT-IR analysis. HSA-PGMA coating decreased rat aortic SMC proliferation (25 ± 1.8%; data presented as mean±SD,n=5) for 10 days as compared to bare SS. It shields the adsorption of human plasma fibrinogen (90±9.8ng/mm2) which expedites platelet adhesion. Adherent platelets from bovine platelet-rich-plasma on fibrinogen adsorbed HSA coating were quantified using the LDH assay. Results showed minimal platelet adhesion (2.73±1.2%). High Performance Liquid Chromatography(HPLC) depicts that HSA-PGMA layer can mediate slow release of a drug Alendronate Sodium which mitigates neointimal hyperplasia.

Advanced Application of Wear Testing Simulator for Gait Activity Simulation for Evaluating Performance of TKR Devices

Authors: Xin Xie, John D. DesJardins, Roy Rusly, Frank Voss, Martine LaBerge
PI/Advisor/Mentor: Martine LaBerge, PhD

The evaluation of the total knee replacement (TKR) device within the mechanical condition during simulated in vivo daily activity is necessary to quantitatively assess its performance prior to realistic surgical implementation. The current study provided a versatile method of extending the application of a wear testing simulator, based on combined use of experimental observation and computational modeling. A force-controlled standard gait simulation test was conducted using the Stanmore knee simulator and a commercial TKR device. Femoral and tibial motion views were video recorded during the testing. The experimental set-up was equivalently converted to finite element (FE) models for the simulator and a

full-scale human knee joint, with the real-time marker positions during the gait cycle assigned as displacement boundary conditions. Quadriceps muscles and surrounding soft tissue responses were collectively and passively estimated. The tibiofemoral contact pressure peaked at heel strike, flatfoot and toe off of the gait cycle, and the quadriceps force was closely correlated with flexion angle, with maximum reached 1600 N at 60° femoral flexion within swing phase. This approach comprehensively assessed TKR implant performance from aspects of both implant mechanics and tissue responses so that design optimization for the implant can be conducted in the early stage.

Chemical Engineering

Synthesis and Characterization of Extractive Scintillating Resin for Ultra-Trace-Level Quantification of Alpha- and Beta- Emitting Radionuclides in Aqueous Media

Authors: Duval, C; Seliman, A; Bliznyuk, V; DeVol, T; Husson, S;
PI/Advisor/Mentor: Scott Husson

Traditional methods of quantifying alpha- and beta-emitting radionuclides in environmental water samples involve time-intensive, batch style analytical techniques that utilize bulky instruments. A recent development in environmental sensing is a portable, flow-cell detector that utilizes extractive scintillating resin. The extractive scintillating resin serves the dual purpose of (1) concentrating the radionuclide of interest and (2) serving as a radiation transducer. Nowadays, such resins are produced by physically absorbing organic extractants and fluorophores into a polymer matrix. Unfortunately, this approach yields resins with poor stability as the active components leach from the resin over time. This contribution describes our work to synthesize a new class of extractive scintillating resin in which the fluorophore is incorporated into the polymer matrix during particle formation and the extractive ligand is bound covalently within the matrix. Suspension polymerization was used to prepare porous poly[styrene-co-divinylbenzene-co-(4-vinylbenzyl chloride)] resin beads with DM-POPOP as the fluorophore. The resin was functionalized with a uranium-selective bisphosphonate ligand. FTIR was used to characterize the functional groups, confocal laser scanning microscopy to observe the distribution of the fluorophore, and titrations to quantify the accessible binding sites. The binding capacity and uptake kinetics were investigated for both the bisphosphonate and bis(phosphonic acid) functionalized resins.

Engineering responsive hybrid promoters for metabolic engineering in oleaginous yeast, Yarrowia lipolytica

Authors: Murtaza Shabbir Hussain
PI/Advisor/Mentor: Mark A. Blenner

Yarrowia lipolytica is a non-conventional, strictly aerobic oleaginous yeast that grows on numerous substrates, including glycerol, fats, and other hydrophobic carbon sources. As an efficient producer of fatty acids, Y. lipolytica has gained attention as a bio-production organism. Metabolic engineering of Y. lipolytica requires a set of inducible promoters that specifically regulate gene expression levels. The engineering fatty acid synthesis and metabolism is of great interest, and little information is

available on the molecular details of fatty acid regulated gene expression. Through a series of promoter truncations of two fatty acid responsive genes, we aim to identify key elements in fatty acid regulated promoters including upstream activating sequences (UAS) and core promoter elements that confer fatty acid responsiveness. Using GFP as a reporter protein for gene expression, we measured cell fluorescence using flow cytometry and plan to measure gene expression levels using real-time PCR. This research elucidates our study of the effect of oleic acid on gene expression. Our goal is to create new synthetic hybrid promoters of well-defined strength that have fatty acid response profiles. With new well-defined inducible promoters, metabolic engineering of fatty acid regulated pathways will increase yield, productivity, and scope of molecules produced by Y. lipolytica.

Chemistry

Novel LSPR Sensor Combining Sharp Resonance and Differential Optical Measurements

Authors: Daniel Willett
PI/Advisor/Mentor: Dr. George Chumanov

Optical sensors based on localized surface plasmon resonance (LSPR) exploit the dependence of the resonance frequency on local refractive index. Here, we present a new approach to measuring the shift in the LSPR spectra by monitoring the extinction of a plasmonic structure at two different wavelengths, on either side of the peak. When the LSPR peak shifts in either direction, the extinction at one wavelength will increase while the other will decrease and we look at the differential of these. The uniqueness of our approach comes not only from real time differential measurements, but also from using an LSPR substrate with an exceptionally sharp resonance originating from plasmon coupling in a self-assembled 2D array of closely spaced silver nanoparticles. A typical array of 100 nm AgNPs exhibits a FWHM as narrow as 15 nm. As a result of this sharp peak, small changes in its position result in large changes in the differential measurement. Differential measurements hvs allowed us to detect changes, in bulk refractive index of solutions, down to 1.4E-5 measured with a S/N of 8.77 giving us a estimated LOD of 6.4E-6. This approach provides advantages such as increased sensitivity, reduced detection limit, and real time analysis.

Mapping bacterial growth through tissue with functional X-ray luminescence tomography

Authors: Fenglin Wang, Yash Raval, Tzuen-Rong J. Tzeng and Jeffrey N Anker
PI/Advisor/Mentor: Jeffrey N Anker

It is challenge to diagnose and monitor treatment of bacterial infections on implanted medical devices (IMDs) with high spatial and temporal resolution in situ. Here guided by recent advances in X-ray luminescence tomography and functional X-ray excited optical luminescence, we develop a functional X-ray luminescence tomography technique (fXLT) for mapping chemical concentration (proton ions) on implant surface to monitor implant-associated bacterial infection and treatment through thick tissue. Our pH sensor films consist of a layer of radioluminescent particles and a layer of pH indicator dyes, and a nearby reference point is used to account for the spectral

distortion caused by wavelength-dependent absorption and scattering in the tissue. This technique provides high spatial resolution images mainly limited by the X-ray beam width with minimum increase from X-ray scattering in the tissue. With fXLT, we monitored the pH decrease during normal bacterial growth and the pH return to the bulk value during antibiotic treatment (ciprofloxacin) over the course of hours with millimeter of resolution. Overall, fXLT provides a novel approach to noninvasively image surface pH to diagnose implant infection and assess treatment.

Towards Luminescent Sensors for Strain Detection on Implanted Medical Fixation Devices

Authors: Melissa M. Rogalski, Nakul Ravikumar, Joshua Lake, Donald Benza, Ian Adkins, Dakotah Anderson, Jonat

PI/Advisor/Mentor: Jeffrey N. Anker

Internal fixation devices including dynamic compression plates and orthopedic screws maintain proper bone alignment and share load with bone as a fracture heals. We are developing optical sensors to evaluate strain on the surface of these devices to aid in detection of hardware fatigue (e.g. load sharing, implant loosening, and non-union). The strain sensors contain two components: (1) a substrate patterned with alternating colored lines, the “encoder,” and (2) a transparent substrate patterned with opaque lines that overlays and masks a portion of the encoder below. Displacement of the encoder relative to the mask results in a color change that is monitored by digital camera. The images are analyzed in MATLAB. We have tested our sensors using an Instron materials testing system and have observed strain on the order of 0.1 - 1 millistrain. The strain gauges have also been incorporated into prototype polycarbonate and stainless steel screws. In order to analyze strain through tissue we have fabricated a sensor with a dye patterned encoder that overlays an x-ray scintillator film. The dye absorbs a portion of the luminescence spectrum in a position dependent manner. The sensors provide a non-invasive method for strain analysis through tissue.

Predicting the effect of point mutation on protein stability through conformational sampling and multiple dielectric model

Authors: Tingting Han & Brian Dominy

PI/Advisor/Mentor: Dr. Brian Dominy

Mutations could affect protein stability. This project aims to develop a method to calculate changes of the folding free energy of proteins upon single point mutations, and is achieved by applying conformational sampling and molecular dynamics simulation. The approach is applied to 150 mutants to estimate the effect of mutations on protein stability. The alternative protein conformations are generated via the program CONCOORD, and changes of protein stability are evaluated by the Molecular Mechanics/Poisson-Boltzmann Surface Area (MM/PBSA) method. The important role of conformational sampling is determined by comparing the methods of using a single minimized structure, a Concoord/minimized ensemble, and a Concoord/MD ensemble. Based on born radii of alpha carbons and the solvent accessible surface area of the amino acid, a protein is categorized into three regions: interior, partially exposed, and surface regions. Previous studies have shown that dielectric properties of different

regions of proteins are different. In our current model, the optimal dielectric constant of the interior region is 4, and is lower than the outer part, where the value is 5 or 6. The three dielectric constant model results in a correlation coefficient of 0.71 and the standard deviation of 1.99kcal/mol between the computational and the experimental value.

MM/PBSA studies on the evolution of catalytic function in family 4 Uracil Dna Glycosylase

Authors: Yinling Liu, Brian N. Dominy
PI/Advisor/Mentor: Brian N. Dominy

The use of classical molecular mechanics models can investigate the effect of a large number of mutations on enzyme activity, which fills a vital role in complementing more time-consuming quantum mechanical calculations. In this study, questions involving the physicochemical mechanisms underlying the evolution of family 4 Uracil Dna Glycosylase (UDG) are addressed through homology modelling, molecular dynamics (MD) simulations, and a subsequent analysis of thermodynamic properties related to the activity of the enzyme using MD trajectories. Specifically, a classical molecular dynamics simulation and molecular mechanics/Poisson-Boltzmann surface area (MM/PBSA) analysis were applied to investigate the impact of 24 single amino acid mutations on the binding affinity and catalytic activity toward the UDG/dna complex. We found that family 4 UDG recognizes and removes uracil specifically from double stranded DNA through a mechanism similar to that of the family 1 UDG. A detailed analysis of calculated binding affinity and catalytic activity data suggests that both ground-state destabilization and transition state stabilization could be contributing factors in the evolutionary optimization of family 4 UDG. The structural and quantitative viewpoint obtained from this study provides valuable information in understanding the repair of deaminated DNA damage.

Civil Engineering

Development of Integrated mixture proportioning and workability characterization technique for pervious concrete

Authors: Betiglu E. Jimma, Prasada R. Rangaraju
PI/Advisor/Mentor: Prasada R. Rangaraju

Pavements such as airport runways, highways, parking-lots, and sidewalks are important infrastructure systems. The construction of pavements involves compaction and densification, this compaction effort makes the pavement sections and the underlying ground stiff and impermeable preventing the natural flow of precipitation. Therefore, runoff from pavement surfaces is currently a major environmental concern. Recently, engineers have developed new type of pavement systems to mitigate pavement related environmental Issues. Pervious concrete pavement is one these pavement systems; its high porosity allows water to pass through to the substrate ground. The high exposed surface area allows some pollutants such as oil to stick on its internal pores and to be decomposed by oxidation and bacteria. Utilizing pervious concrete for pavement application restore the natural condition of water flow to the ground to recharge the ground water system. However, the strength and other mechanical performances of pervious

concrete have several limitations. Therefore, the purpose of this research is to improve the performance of pervious concrete by improving its mixture proportioning techniques. The improved mixture proportion technique proved to improve the construction process of pervious concrete pavement.

Development of Real Time Velocity Prediction Model using Car-Following Theory and Application to Plug-In-Hybrid Electric Vehicle Energy Management System

Authors: Sakib Mahmud Khan
PI/Advisor/Mentor: Mashrur Chowdhury

For tremendous environmental, political and economic pressures under which the transportation sector currently operates, we have expended much national efforts to create alternative fuel vehicles to meet ever-increasing US energy demands. In order to minimize energy consumption of transportation sector, my proposed graduate study focuses on developing a strategy for predicting real-time velocity profiles of vehicles at a microscopic level, validating the strategy trough field tests, and evaluating the impacts of the model. With the help of my supervisor, we will develop a velocity profile prediction strategy by utilizing the Optimal Velocity (OV) car-following model. Later we will utilize our Transportation Mobile Research Laboratory (TMRL) to validate the velocity profile prediction strategy. Field experiments will be carried out to modify the velocity profile prediction strategy. Finally we will use an energy flow based vehicle simulator of a Plug-in Hybrid Vehicle (PHEV) developed using a MATLAB SIMULINK environment to analyze the impact of different energy management strategies. Significant outcome of this research will be a fundamental understanding of the future potentials in the use of car-following models for real-time speed prediction. Also some of the immediate positive impacts include a transportation system that can reduce energy consumption and environmental pollution.

Computer Engineering

Taxonomy Cube: A Multi-Dimension Application-to-Architecture Mapping

Authors: Karan Sapra
PI/Advisor/Mentor: Dr. Melissa C. Smith

High application performance greatly depends on the choice of accelerator for the given application. In this paper, we propose an Application-to-Algorithm (A2A) Taxonomy Cube, that maps an application from the algorithm space to an appropriate accelerator in the architecture space for optimal performance. The Taxonomy Cube is based on four major application performance factors, labeled performance dimensions, including computation-to-communication ratio, FLOPs (floating-point operations) to Non-FLOPs, device memory accesses, and Non-Uniform Memory Accesses (NUMA). We aim to evaluate the accuracy of A2A mapping by executing diverse representative applications on target architectures and formulation of performance models that will allow developers to further fine-tune their applications, once an appropriate A2A mapping is identified. The final research goal is to provide a set of guidelines for optimal A2A in the form of a Taxonomy Cube.

A network interface for long distance bulk data transfers

Authors: Nicholas Mills, Bradley Settlemyer, and Walter Ligon
PI/Advisor/Mentor: Walter Ligon
There are many instances in which it is desirable to perform the bulk transfer of data over a long distance. Often the transfer is motivated by a desire to move datasets from the compute resource that generated them to the compute resource most useful for processing them. Because of the large communication delay over a long distance network the techniques that were effective for transferring data over a short distance are no longer appropriate when those data are transferred over a long distance. We present our network interface, XNI, that is designed with the issues of long distance bulk data transfers in mind. Our network interface layer is integrated into the production file transfer tool XDD. We present the design of our interface and its performance using 10 gigabit Ethernet over an emulated long distance network. We compare the performance to the legacy XDD networking layer and find that performance of our network layer is superior over a long distance network.

Computer Science

Corl8: A System for Analyzing Diagnostic Trees in Wireless Sensor Networks

Authors: Loren Klingman, Jason Hallstrom
PI/Advisor/Mentor: Jason Hallstrom
Due to increasing demands for monitoring the physical world, researchers are deploying wireless sensor networks more than ever before. These networks comprise a large number of sensors integrated with small, low-power, wireless transceivers used to transmit data to a central processing and storage location. These devices are often deployed in harsh, volatile locations, which increases their failure rate and decreases the rate at which packets can be successfully transmitted. We present Corl8, a system for analyzing diagnostic traces in wireless sensor networks. Our method relies on diagnostic data that is periodically transmitted to a network sink as a part of the standard sensor payload to enable fault diagnosis. corl8 does not require any specific data to be present in the system, making it flexible. Our system provides an interactive environment for exploring correlated changes in diagnostic measures within an individual node or on a batch level, to flag interesting correlations. The system's flexibility makes it applicable for use in any wireless sensor network that transmits error information. The analysis methods are user-configurable, but we suggest settings and analyze their performance with data from five real-world deployments.

Towards a Framework for Building Maneuverable Applications

Authors: William Clay Moody, Amy Apon
PI/Advisor/Mentor: Amy Apon
Maneuverable applications are distributed and parallel applications that take advantage of the addition and removal of resources within the computing system, giving the perception of movement. These resources can be computing, network, or storage resources, or can be the application itself. The perceived movement of the maneuverable application is deliberate and skillful with the objective to gain system advantages. Some of the

advantages are optimal provisioning of resources, optimizing of applications, and improved cyber security. This poster describes our work to date on building, designing, and modeling maneuverable applications within shared computing resources. Furthermore, we discuss applications of maneuverability and potential enhancements.

Electrical Engineering

Manufacturing of Next Generation of Photovoltaic Modules

Authors: Githin F. Alapatt and Rajendra Singh
PI/Advisor/Mentor: Rajendra Singh
Photovoltaics (PV) is emerging as the cheapest and most sustainable source of electricity generation and will revolutionize the energy industry in a manner similar to the information technology revolution created by the integrated circuit. The cost of PV generated electricity has decreased considerably in the last decade to about $0.05/kWh. To further decrease PV cost, improvements in efficiency can be obtained by integrating a copper-oxide (Cu2O) based thin film cell in to the existing popular silicon (Si) cells to create a multi-junction multi-terminal cell architecture. Cu2O, being an earth abundant material just like Si and can result in decreased cost of PV, down to even $0.02/kWh. This research focuses on the growth of Cu2O using a photo assisted chemical vapor deposition technique. Results from electrical and analytical measurements suggest that Cu2O grown using our technique has the potential of meeting future needs of the PV industry.

Engineering and Science Education

Validation of Survey to Assess Motivation and Perceived use of Metacognitive Strategies in First-Year Engineering Students

Authors: Courtney Faber, Adam Kirn, Lisa Benson
PI/Advisor/Mentor: Lisa Benson
The purpose of this study was to evaluate the construct validity of a survey designed to assess engineering student motivation and perceived use of metacognitive strategies. The 82-item survey was composed of four parts. Parts one, two, and four was based on multiple achievement motivation frameworks and part three was based on a metacognition framework. The survey was administered at two time points (beginning and end of the semester) to students in a first-year engineering course. Exploratory factor analyses (EFA) were calculated for each part of the survey using responses collected at the beginning of the term. Several items in each part of the survey loaded below 0.4 and were removed from future iterations of the survey. Confirmatory factor analyses were utilized for parts of the survey that loaded during the EFA using the responses received at the end of the semester to confirm that the hypothesized model provided a good fit to the data. Part four of the survey did not load initially; the EFA was redone using the end of the semester results. Overall, these items loaded as a factor using these end of the semester responses. These results are part of larger study to be presented elsewhere.

Environmental Engineering and Science

Jointly Managing Biofuel Production and Food Production to Optimize

Economic Returns to Land in Thailand: A Regional Mathematical Programming Approach

Authors: Watcharapol Pumkaew

PI/Advisor/Mentor: Dr. David Willis, Dr. Cindy Lee

Given the dual concerns of dwindling energy supplies and the need to preserve the environment, biofuel production has emerged as alternative energy source that is a renewable and environmental friendly. Most biofuel crops are grown to serve as feedstock for biofuel production. However, crops that are produced for food and feed consumption can also be used as biofuel feedstock and thus the competition between food and biofuel is inevitable. Thailand, one of the world's leading producers and exporters of agricultural products, is now confronted with the problem of how much land should be allocated to agricultural crops versus feedstock production. Corn, sugarcane, cassava and palm oil, are the main potential biofuel crop feedstock in Thailand. The research objective is to determine the economically efficient allocation of land between producing crops for biofuel versus human consumption. An economic optimization model that maximizes economic returns to land will be used. Expected results will answer the following questions: how will the increases in biofuel energy production impact the food security of Thailand?; what are the impacts of increasing biofuel production on labor demand?; and what is the optimal allocation of crop use that will minimize the potential conflict between biofuel and food production?

Environmental Health Physics

Development Of A Fast Neutron Activation Counter Using the Cherenkov Effect

Authors: Matthew Millard

PI/Advisor/Mentor: Timothy DeVol, Zane Bell

A criticality accident is a nuclear fission reaction which releases significant amounts of neutron radiation. A radiation dose from a criticality accident can be lethal to humans that are in the area. In this research project, neutron detectors utilizing the Cherenkov effect were exposed to a fast neutron flux to quantify detector response and applicability as a criticality monitor. The detection system is designed as an active fixed nuclear accident dosimeter (FNAD) which will allow for quantification of the neutron flux without the need for retrieval of the detector. It consists of an optically clear medium, composed of select target nuclei, coupled to a light detection device. The radiation from the resultant reaction products of the target nuclei produce Cherenkov photons within the medium which can then be detected. Cherenkov photons are emitted by a medium when charged particles travel faster than the speed of light in that medium. Example media include SiO_2, ZnS, Al_2O_3, and $MgAl_2O_4$ which were irradiated with a fast neutron source, Californium-252. Monte Carlo simulations were performed to quantify the neutron flux within the media. The response of the SiO_2, Al_2O_3, and $MgAl_2O_4$ samples was measurable, and the counting efficiency for each sample was calculated.

Industrial Engineering

Improving Sports Performance By Using Industrial Engineering Tools

Authors: Dotan Shvorin
PI/Advisor/Mentor: Dr. Kevin Taaffe
How can we improve our athlete's performance? This is a legitimate question for any sports manager when trying to achieve better results from the team. This research demonstrates the use of industrial engineering tools in order to establish improvement methods based on performance measurements and decision making criteria. These procedures can help the manager shape the recruiting process, improve the training program, design a game plan, and solve real time decision making problems.

Bi-criteria Metaheuristic for an Integrated Automotive Supply Chain

Authors: Sherif A. Masoud; Scott J. Mason
PI/Advisor/Mentor: Dr. Scott J. Mason
The automotive industry is one of the most important manufacturing sectors in the world due to several factors, such as its economic impact and technological complexities. We model the tradeoff between cost and service level and present a bi-criteria heuristic optimization methodology for a two-stage, integrated automotive supply chain. Our problem contains sequence-dependent setups on parallel machines and auxiliary resource requirements. We use the proposed method to solve a set of problem test instances that are based on real-world problem settings. The proposed method generates approximately efficient (non-dominated) solutions in a timely manner for industry use.

Materials Science and Engineering

Gradient Films from Shape Memory Nanofoams for Unattended Sensing

Authors: Anna Paola Soliani, Yuriy Galabura, Bogdan Zdyrko, Spencer Novak, David Musgraves, Kathleen Richards
PI/Advisor/Mentor: Igor Luzinov
The current research focuses primarily on the development of polymeric nanostructured foams that can selectively sense the immediate chemical environment and retain memory of the specific exposure event(s). These functional polymer materials show a strong interplay between the tailored structure of the system and the functionality of the material. Specifically, 50-300 nm thick polymeric nanofoams with a gradient chemical composition along the sample have been obtained. The nanofoams possess the behavior of a shape memory material. At room temperature, the nanofoams are thermodynamically unstable, but kinetically trapped in a porous shape. Upon exposure to various analytes, the polymeric coatings locally and irreversibly change their internal structure at the nanolevel. Active changes in the optical characteristics of the nanofoam coating can be used to monitor the permanent alteration in the film nanostructure. Consequently, these nanofoams will be efficient and highly sensitive coatings for diverse evanescent waveguide- and resonator-based optical monitoring systems. It is expected they will have a broad usage in unattended sensing applications.

Electrochemical formation of long nanosharp tungsten tips

Authors: Maryana Nave, Binyamin Rubin, Victor Maximov, Stephen Creager and Konstantin G. Kornev

PI/Advisor/Mentor: Konstantin G. Kornev
This work was concentrated on exploring how electropolishing of long nanosharp tungsten probes can be controlled by choosing different pathways of thermodynamic transformations of metal to metal oxides and hydroxides. Currently, convection-limited electropolishing (CLE) is used were the wire electrochemically etched until it breaks up, in the meniscus region, into two pieces. We introduce a newly developed technique, transport-limited electropolishing (TLE), where etching proceeds along the immersed part of the wire with tip formation at the end of the wire rather than in the meniscus region. This is due to presence of the thick micron size porous shell that was formed due to a more complex electrochemical reaction and played a significant role on the tip formation kinetics. The length of the tip can be made more than 6 mm with a radius of curvature less than 30 nm. These tips were successfully used for single cell piercing.

Mathematical Sciences

Linear Programming Insights into Solvable Cases of the Quadratic Assignment Problem

Authors: Lucas Waddell
PI/Advisor/Mentor: Warren Adams
The quadratic assignment problem is an NP-hard discrete optimization program that has been extensively studied for over 50 years. It has a variety of applications in many fields, but has proven itself extremely challenging to solve. As a result, an area of research has been to identify special cases which admit efficient solution strategies. This work examines four such cases, and shows how each can be explained in terms of the dual region to the continuous relaxation of a classical linear reformulation of the problem known as the level-1 RLT representation. These explanations allow for simplifications and/or generalizations of the conditions defining the special cases.

Analysis of data concerning coed versus single gender classrooms

Authors: Michael Finney, Billy Bridges
PI/Advisor/Mentor: Billy Bridges
A hot topic currently in education is whether or not presence of the opposite gender in the classroom affects the learning process. Data has bee collected from various South Carolina schools experimenting with coed versus single gender classrooms. Because the data is observational and contains confounding factors, elementary statistical analysis will not work. We explore several methods to analyze the data, including general linear mixed models, repeated measures, and propensity scores.

Efficient decoupling of a fluid-structure interaction problem via optimization

Authors: Paul Kuberry, Dr. Hyesuk Lee
PI/Advisor/Mentor: Dr. Hyesuk Lee
Fluid-structure interaction (FSI) models describe how a fluid and structure exert forces against and deform one another. FSI describes the flow of blood through arteries, air over a wind turbine blade or airplane wing, or even ink moving through a printer head. The development of efficient algorithms for numerically simulating this physical phenomenon are necessary in order to

make their adoption realistic in engineering design. Bringing the fluid and structure into contact with one another and then enforcing that their velocities and stresses match along their interface of contact brings a host of algorithmic issues not faced by either fluid or structure solvers alone. We propose an approach to efficiently and robustly decouple the FSI problem into an optimization problem, which will never require solving the entire FSI problem at once. We introduce a control which plays the role of the stress along the interface and then we optimize over that control until we also satisfy the continuity of velocity. This approach allows the user to continue using the software and algorithms that have been developed for solving either the fluid or structure system, for which there is a large body of research, and with which they are familiar.

Polar codes constructed using algebraic geometric code kernels

Authors: Sarah E. Anderson and Gretchen L. Matthews

PI/Advisor/Mentor: Gretchen L. Matthews

In recent groundbreaking work, Arikan developed polar codes as an explicit construction of symmetric capacity achieving codes for binary DMCs with low encoding and decoding complexity. In his construction, a specific kernel matrix G is considered and is used to encode a block of channels. As the number of channels grows, each channel becomes either a noiseless channel or a pure-noise channel, and the rate of this polarization is related to the kernel matrix used. Since Arikan's original construction, polar codes have been expanded to q-ary DMCs, where q is a power of a prime, and other matrices besides G have been considered as kernels. Recently, Reed-Solomon and BCH codes have been considered as kernels of polar codes. We implement more general constructions with algebraic geometry codes as kernels, specifically codes from maximal and optimal function fields.

Mechanical Engineering

Microfluidic electrical sorting of particles based on shape in a spiral microchannel

Authors: John L. DuBose, Xinyu Lu, Saurin Patel, and Xiangchun Xuan

PI/Advisor/Mentor: Xiangchun Xuan

We demonstrate in this experiment a continuous-flow electrical sorting of spherical and peanut-shaped particles of similar volumes in an asymmetric double-spiral microchannel with a single inlet reservoir and three outlet reservoirs. This experiment differentiates particle species based principally on shape. Shape is an intrinsic marker of cell cycle, an important factor for identifying a bio-particle, and also a useful indicator of cell state for disease diagnostics; therefore, shape can be a specific marker in label-free particle and cell separation for various chemical and biological applications. The double-spiral geometry exploits curvature-induced dielectrophoresis to initially focus particles to a tight stream in the first spiral without any sheath flow. Particles are subsequently displaced to shape-dependent flow paths in the second spiral without any external force. We also develop a numerical model to simulate and understand this shape-based particle sorting in spiral microchannels. The predicted particle trajectories agree qualitatively with the experimental observation.

In Vitro Multi-domain patient specific coarctation study of the Norwood patients

Authors: Tianqi Hang
PI/Advisor/Mentor: Richard Figliola

OBJECTIVE: The object of this study is to understand the impact of coarctation on the Norwood patients, hence providing information during coarctation treatment. METHOD: A multi-domain mock circulatory system (MCS) function was verified and validated against 5 patient specific clinical data sets to ensure its function. The system was tuned to patient specific conditions to study two patients: one with a dilated transverse arch and another with harmonious transverse arch. Aortic coarctations were created on the aortic isthmus of both of the patients with coarctation severity range from 1.0 (none) to 0.3 (severe). Preliminary points of interest are: investigating the cause of hemodynamics difference between two patients, association between hemodynamics variation and coarctation severity, quantifying the resistance of coarctation, energy dissipation caused by coarctation, recovery of the pressure after coarctation, coarctation's effect on flow arrangement and sensitivity study between change of stenosis ratio and hemodynamics.

Experimental Investigation of Particle Scavenging by Ultrasonically Excited Water Sprays

Authors: Weiyu Ran
PI/Advisor/Mentor: John R. Saylor

Sprays are commonly used to remove pollutants from smokestacks, to reduce coal particle levels in mines, and in dust suppression applications. For typical conditions, it is difficult for a spray to remove micron size particles from the air. Unfortunately this is the size which is most harmful to human lungs. The acoustic radiation force generated by an ultrasonic field can be used to move particles and spray drops, and we hypothesize that by forcing a particle laden flow and a spray into an ultrasonic field, particles and drops will be concentrated, thereby increasing the effectiveness of particle removal by sprays. Experimental data is presented which supports this hypothesis. The mechanism behind this improved particle removal is also investigated by analyzing the trajectories of particles and drops within the ultrasonic field.

Wall-induced non-inertial lift in electrophoresis for continuous particle separation

Authors: Xinyu Lu
PI/Advisor/Mentor: Xiangchun Xuan

The efficient separation of discrete particle (both synthetic and biological) species is a topic of interest in numerous research fields for its practical application to problems encountered in both academia and industry. We demonstrate in this work a novel continuous-flow method for electrokinetic separation of both a binary mixture and a ternary mixture of colloidal particles based on size. This method utilizes for the first time the wall-induced non-inertial lift force to deflect a sheath flow-focused particle mixture to size-dependent positions in a straight microchannel. A numerical model is also developed to understand this separation and to study the parametric effects on it. The numerical predictions are found to agree

reasonably with the experimental observations.

Physics

Cosmic Ray Production in Supernova Remntants

Authors: Joshua D Wood
PI/Advisor/Mentor: Dr Dieter Hartmann
Cosmic rays, subatomic particles that move at nearly the speed of light, are believed to be created in the ejecta of galactic supernova remnants. These particles are drawn from a supply of low-energy particles in the circumstellar medium and accelerated to relativistic speeds by a process called diffusive shock acceleration. As the particles are accelerated, they extract energy from the remnant, affecting its dynamic evolution which, in turn, affects the ability of the remnant to accelerate the particles. We present results of a self-consistent treatment of supernova remnant evolution with non-linear cosmic ray feedback, using an advanced hydrodynamics code, AstroBEAR.

CHEHD

Curriculum and Instruction

I Can't Read That: Reading Recovery's Impact on Reading Level and Motivation to Read

Authors: Anastasia Homer
PI/Advisor/Mentor: Linda Gambrell
Reading Recovery is a short-term intervention targeted at the lowest achieving readers in first grade. During the course of the program, students receive daily one-on-one instruction in reading and writing in an effort to accelerate their learning. In this pilot study, changes in reading level and reading motivation of 13 students participating in Reading Recovery are compared with 14 students identified as below-grade level but who did not qualify for the Reading Recovery program. Reading Recovery reading levels and My Motivation Reading Profile scores were taken before and after program duration for students in both groups. Analysis of the data indicates that students identified and served through Reading Recovery have lower initial reading scores than the comparison group. Yet after participating in Reading Recovery, those lower scoring students are at the same reading level or slightly higher than their peers, who did not participate. The data collected regarding motivation levels are inconclusive. Results associated with reading level improvement from this pilot study support the identification and progress of Reading Recovery students. Repeating this research on a larger scale may clarify the impact of Reading Recovery on reading motivation and provide additional information regarding Reading Recovery's efficacy.

Educational Leadership (Higher Education)

Understanding Facilitation: A Study of Knowledge, Skills and Behaviors in Intergroup Dialogue Facilitation

Authors: Leasa Kowalski Evinger

PI/Advisor/Mentor: Tony Cawthon, Cassie Quigley, Cheryl Warner, Leslie Gonzales

Intergroup dialogue, which “combines experiential learning and dialogic bridge-building methods with critical analysis of socially constructed group differences and the systems of stratification that give rise to intergroup conflicts and social injustice,” has been utilized in academic settings to further social justice education (Dessel & Rogge, 2008, p. 10). While there is a body of research related to diversity outcomes experienced by dialogue participants (Dessel, Rogge, & Garlington, 2006; Gurin, Dey, Hurtado, & Gurin, 2002; Gurin, Nagda, & Lopez, 2004; Gurin, Nagda, & Sorenson, 2011; Gurin, Nagda, & Zúñiga, 2013; Holley, Larson, Adelman, & Trevino, 2007; Miller & Donner, 2000), there is a dearth of research on dialogue facilitation. This study utilized a qualitative case study approach to understand how Peer Dialogue Facilitators articulate and demonstrate knowledge, skills and behaviors necessary for dialogue facilitation. Observations, interviews, and focus groups were conducted during Fall 2013. The main findings discuss knowledge, skills, and behaviors that Peer Dialogue Facilitators demonstrated and articulated were necessary for effective dialogue facilitation. Knowledge, skills and behaviors had some discrete codes, but the majority of findings indicated overlaps. The integration of these themes is essential to the facilitation of a fluid and dynamic environment for effective dialogue facilitation.

Nursing

Maternal Health in Developing Caribbean and Latin American Populations

Authors: Charise Guidinger, RN BSN

PI/Advisor/Mentor: Lisa Duggan, PhD, RN, FNP-BC

Purpose: The objective of this paper is to complete an integrative literature review on maternal health in developing Caribbean and Latin American (CLA) nations, focusing on the disparities within the healthcare systems of these countries and the necessity for both maternal health awareness and promotion models. Methods: An integrative literature review search was conducted using EBSCO, Academic Search Complete, CINAHL, Medline Plus, PubMed, and Women’s Studies International indexes. Key phrases used were “maternal health,” “Latin American and Caribbean,” “healthcare access,” and “women’s health and developing countries.” Search results were refined for peer-reviewed journals, between the years 2005 and 2013, with regional selection of CLA nations, and articles pertaining to maternal and reproductive health. Fifteen articles were selected and reviewed for synthesis. Results: Using Madeline Leininger\'s Transcultural Nursing Theory, the articles were grouped into three categories: contextual factors affecting the healthcare in CLA populations, income-based disparities in women’s health among CLA populations, and specific maternal health issues among this population. Conclusions: Implications for nursing education, research, policy, and practice are discussed based on the literature review. As advanced practice nurses strive to improve maternal health in CLA, maternal health awareness will increase both regionally and globally.