

Mountain Lion Research Day 2014

Abstract Book



Gallogly Events Center

UCCS Campus

Friday, April 11

Mountain Lion Research Day 2014 Schedule	2
Abstracts.....	4
Beth-El College of Nursing and Health Sciences.....	4
Graduate Nursing	4
Health Sciences.....	5
Undergraduate Nursing.....	9
College of Engineering and Applied Sciences.....	10
Computer Science.....	10
Electrical and Computer Engineering	10
Mechanical and Aerospace Engineering	13
College of Education.....	17
Leadership, Research, & Foundations.....	17
Special Education.....	17
College of Letters, Arts, and Sciences.....	18
Anthropology.....	18
Biology	18
Chemistry and Biochemistry.....	20
English.....	25
Geography and Environmental Studies.....	29
Physics	30
Psychology	31
School of Public Affairs	35
Undergraduate Research Academy.....	40
Centers	44
Biofrontiers.....	44
Center for Science, Technology, Engineering and Math Education	44
Trauma, Health and Hazards	44
Featured Speakers.....	51
Keynote Speaker.....	52

Presenter Registration	7:30-8:30 a.m.	
Welcome & Announcements	8:30 a.m.	Posters are available for viewing all morning
Poster Presentations	8:30-11:30 a.m.	
Featured Speaker	9:00 – 9:15 a.m.	Cheryl Kelly Buening <i>Physical Activity & Health: The Role of the Environment and Related Policies</i>
Featured Speaker	10:00 – 10:15 a.m.	Lisa Hines <i>Vision & Change in STEM Education: Reality or a Pipe Dream?</i>
Featured Speaker	11:00 – 11:15 a.m.	Jugal Kalita <i>Design and Evaluation of Soft Keyboards for Brahmic Languages of India</i>
Luncheon Welcome	11:45 a.m. – 12:00 p.m.	Kelli Klebe
Inventor of the Year Award		
Keynote Speaker	12:00 – 1:00 p.m.	Chris Jenkins <i>Bio-Inspired Engineering: Nature and the Revolutionizing of Design</i>



Sponsored by the Office of Research and the El Pomar Institute for Innovation and Commercialization (EPIIC)

Welcome to the 2014 UCCS Mountain Lion Research Day.

It is our pleasure to welcome you to Mountain Lion Research Day. This event is held annually to showcase the best and brightest research from UCCS faculty, staff and students.

The objectives of Mountain Lion Research Day are to:

1. Create an opportunity to connect colleagues and community members through a unique networking event,
2. Exhibit the breadth and depth of exciting research being conducted at UCCS, and
3. Provide a venue for campus researchers, students in particular, to gain experience presenting and explaining their work to a diverse audience.

We are grateful to the UCCS faculty, staff and students who are presenting at this year’s Mountain Lion Research Day for their preparation and hard work. We invite our visitors and guests to enjoy and discover!

The El Pomar Institute for Innovation and Commercialization (EPIIC)

Dr. Terry Boulton
Chair of Innovation
and Security



Dr. Tom Duening
Chair of Business and
Entrepreneurship



Dr. Michael Larson
Chair of Engineering and
Innovation



Abstracts

*Posters represent the research of UCCS faculty, staff, and students and external collaborators (E.C.)

Beth-El College of Nursing and Health Sciences

Graduate Nursing

Academic Self-Efficacy and Psychological Distress in Undergraduate Nursing Students

Kerry A. Peterson, DNP; Susan L. Garrett, MSN; Melissa J. Benton, PhD

There is a high prevalence of psychological distress, including anxiety, depression, and low self-esteem among college students in general and nursing students in particular. Among nursing students, high anxiety has been linked to poor critical thinking, impaired learning ability, and academic problems. The purpose of this pilot study was to evaluate the relationship between academic self-efficacy and indicators of psychological stress among undergraduate nursing students. Twelve Junior-level nursing students (age: 21.4 ± 0.3 years) completed the Nursing Academic Self-Efficacy Scale (NASES), the Depression Anxiety and Stress Scale (DASS), and the Rosenberg Self-Esteem Scale (SES) during week two of the semester. Mean scores were calculated for NASES (172.9 ± 9.0), DASS (depression: 6.2 ± 1.4 ; anxiety: 8.8 ± 1.6 ; stress: 14.9 ± 2.1), and SES (22.1 ± 1.1). Stress was strongly and positively related to depression ($r = 0.7, p = 0.01$) and anxiety ($r = 0.8, p = 0.002$), but not to self-esteem or academic self-efficacy. Academic self-efficacy was related only to self-esteem, and as self-esteem increased, academic self-efficacy also increased ($r = 0.7, p = 0.01$). Although increased stress may influence anxiety and depression in Junior-level nursing students mid-way through the baccalaureate program, academic self-confidence is not affected. Instead, general self-esteem may play an underappreciated role in academic success in nursing school. These data may be useful for educators in developing curricula to promote success among nursing students.

Evaluation of Two Dating Violence Prevention Programs on a College Campus

Kerry Peterson, DNP, PMHNP; Catherine Kaukinen, PhD; Ráchael Powers, PhD (E.C.); Carrie Baatz, BA

The purpose of this study was to evaluate the effectiveness of two dating violence prevention education programs on a college campus. The study had a quasi-experimental pre-test/ post-test design. It compared a traditional awareness violence prevention education program to a bystander education program in order to determine which was more effective in changing attitudes, beliefs, and behaviors in college students. Longitudinal assessment also occurred 2 months post-intervention. The sample consisted of 1,001 predominantly freshmen students. Measures included the following: 1) Illinois Rape Myth Acceptance Scale-Revised (IRMA-R), 2) Gender Violence Scale (GVS), 3) Bystander Efficacy Scale (BES), 4) Brief Intention to Help Scale (BIH), 5) Readiness to Help Scale (RHS), 6) Bystander Behavior Scale (BBS), 7) Social Desirability Scale-17 (SDS-17), 8) Abuse Assessment Screen (AAS), 9) Sexual Experienced Survey (SES), and 10) Demographics. The results indicated that both programs were effective in decreasing acceptance of rape myths and gender violence and increasing efficacy, intention to help, and actual pro-social bystander behaviors. However, the bystander program was overall more effective both at immediate post-test following the education and 2 months later. Findings from this research study contribute to an enhanced understanding of effective primary prevention strategies for dating violence in college students.

Health Sciences

Content Analysis of Eating Disorder Policies and Procedures of Collegiate Institutions

Spenser Bowers

Background: In 2008, the National Athletic Trainers' Association (NATA) Position Statement on preventing, detecting and managing eating disorders (ED) recommended that collegiate health care teams should create and implement ED policies to assist at-risk athletes. It is not clear that this is happening. Purpose: The purpose of this study was to evaluate compliance with the NATA recommendations through the existence of and content included in ED policies of collegiate institutions. Methods: Stratified random sampling of 219 NCAA and NAIA collegiate institutions was completed, with 50 institutions participating. Participants were asked to submit their written ED policy. Fifty-one units of analysis within five categories (early detection/recognition, intervention/management, treatment, consequences, roles and responsibilities) of recommendations were determined based on the NATA Position Statement. Institutions (n=219) were asked to submit their written eating disorder policy. A second reviewer was utilized for validation of the analysis. The researcher evaluated policy content based on the NATA position statement recommendations. Each unit of analysis was coded according to inclusion, mention of or full description of the units of analysis. Data Analysis: Frequencies were used to evaluate the outcome. Results: Of the 50 participating institutions, 28% (n=14) had established written eating disorder policies while 72% (n=36) indicated that they did not have a written eating disorder policy. Of the policies provided, only eight policies (57%) included establishment of a university ED team (medicine, nutrition, mental health, athletic training, and administration) to assist in treatment and management of a suspected ED. Ten policies (71%) did not define screening methods for early detection and recognition. Under the intervention and management category, 100% (n=14) of the policies included intervention of an athlete with a suspected ED as well as appropriate referrals to health care providers. Thirteen policies (93%) discussed medical treatment and mental health treatments, whereas 10 of the policies (71%) mentioned nutrition treatment. When evaluating consequences to participation, 57% of the policies (n=8) mentioned athlete suspension for noncompliance with the care plan and only 28% (n=4) of institutions mentioned implementing a contract for the athlete outlining repercussions if an athlete refused the necessary treatment. Conclusions: Based on the results of this study, we conclude that there are a large number of institutions failing to implement the recommended ED prevention and management policies as demonstrated by both a lack of written policy and lack of key components within the existing written policies.

Does Handedness Predict Side of Groin Strain Injury in Rough Stock Riders?

Kelli Ferguson

Of all traditional rodeo sports, rough stock events accounted for 88.2% of all injuries recorded by the Justin Sports Medicine Team (JSMT) from 1981-2005 and in the years 1981-1990, the thigh/groin region was the number one most injured location for bull riders and number four for saddle bronc riders.^{1,2} No groin strain mechanism of injury has been proposed specifically for rough stock riding, and no research has been done attempting to find a correlation between riding hand and side of groin strain injury. Purpose: The purpose of this study was to examine if the riding arm of rodeo rough stock riders could be an indicator for side of groin strain injury. Methods: The Justin Boots Sports Medicine Team provided blinded data from 2011 and 2012 for analysis. A total of 41 groin injuries were included in the analysis. Analysis of data included: Chi-square comparing riding hand to side of groin strain injury, Chi-square comparing riding hand to side of groin strain injury with a covariant of mechanism of injury (MOI), and lastly, a Chi-square comparing riding hand to side of groin strain injury with a covariant of rough stock event. Results: Results of the Pearson's Chi-square test comparing riding hand to side of groin strain injury found no significance ($p=.169$, $n=38$). Both Chi-square tests comparing riding hand by injury side with the covariant of MOI and riding hand by injury side with a covariant of event found no significance ($p=.118$, $n=37$; $p=.118$, $n=36$, respectively). Conclusion: Due to the lack of significant findings, researchers believe the missing link regarding groin strains in rough stock riders is related to other factors, such as the movement of the animal at the time of injury. Future research should include a prospective study on groin strains in rough stock riders to include collection of height, weight, and other biomechanical markers, as well as the assessment of the movement of the animal at time of injury.

Challenges Female Athletic Trainers Face As Parents

Katlin Hickerson

In every profession there are unique sets of responsibilities, challenges, and rewards. A common challenge that every person must make is how to create a balance between home life and work life, so that one aspect of a person's life does not consume the entirety. Athletic training is a profession that has a unique set of stressors with a variety of factors that increase work-family conflict and burnout. Female athletic trainers combat not only negative psychological responses, but the desire to be present as a parent as well. The ability to do both adequately and sufficiently is difficult and oftentimes not viable, regularly resulting in the complete departure from the field. Currently there is no research being conducted regarding female athletic trainers and the specific challenges they face regarding decisions about family and work-family balance. This research was conducted in order to find the stressors that female athletic trainers face while trying to be present as a parent and work as an athletic trainer.

The Effects of a Plyometric Training Program on On-Ice Jump Performance in Collegiate Figure Skaters

Jennifer Hunnicutt

Jumping is one of the crucial components for success in the sport of figure skating. The purpose of this study was to evaluate the effects of plyometric training on on-ice jump performance in figure skaters. It was hypothesized that the plyometric training program would improve all on-ice and off-ice jump performance variables. Fourteen collegiate figure skaters volunteered to participate. Six skaters underwent a 6-week plyometric training program consisting of low to moderate intensity exercises, while 8 participants served as the control group. All variables were measured both before and after the 6-week training period. Researchers video recorded subjects while they performed waltz jumps, which consist of rotating one-half revolution in the air. On-ice vertical height, horizontal displacement, and flight time of the waltz jumps were analyzed via Dartfish software. Off-ice variables included vertical jump height and standing long jump distance. This is the first study to evaluate the effects of plyometric training on jump performance in figure skaters.

The Flying Carrot, Food Literacy Educational Model

Nuwanee J. Kirihennedige

In recent years, since obesity and chronic diseases became prevalent public health concerns, many nutritional education models and approaches have been implemented in the hopes of modifying and optimizing lifestyle efficacy in the United States. This case report demonstrates the educational model used in The Flying Carrot Food Literacy Education Project, a collaborative effort between the Pikes Peak Community Foundation and the Sport Nutrition graduate program at the University of Colorado at Colorado Springs. The Project is an innovative mobile project that fosters food awareness while empowering individual well-being, the community, and the planet by providing creative hands-on food experiences, building cooking skills, and improving access and awareness to local, seasonal, and sustainable food and food systems. This project hopes not only to bring the community to the farmers who grow their food together but also to bring awareness of how people share the food around the table in social cultural and environmental context. Audio and video footages have been collected for analysis on the efficacy of the educational model and its impact in the community. This comprehensive and skill-based approach of food education may be more effective in health-related behavioral modifications and be able to take the traditional, nutrient-based educational models to a different direction, back to the roots.

Effectiveness of Active Recovery Interventions on the Athletic Performance of Professional, Collegiate, and Competitive Level Adult Athletes: A Systematic Review

Robert O. Ortiz Jr

In the realm of modern athletics, grueling training regimens combined with condensed competition schedules have restricted the amount of recovery time athletes obtain in-between sessions. As a result, post-exercise recovery interventions have now become accepted methods of facilitating a balance between training, competition and physiologic recuperation. Strategies such as active recovery (AR) have been implemented with the objective of maximizing athletic performance via rapid physiological revitalization since the early 1980's. Eastern European countries such as Russia, Poland, and the Czech Republic pioneered the utilization of AR in weightlifting, track and field, and other power sports to achieve swifter physiological recovery for their athletes. Since then AR has steadily gained recognition as a restorative technique with the ability to effect athletic performance. Despite the pervasive use of AR as a restorative technique, its effectiveness has not been objectively measured. Articles were collected via online database and cited reference searches. Articles were restricted to those printed in English language journals between 1998 and December 2013. The online databases utilized included MEDLINE, PEDro Database, PubMed, and SPORTDiscus. Key words, EBSCO thesaurus, and MeSH terms were used. Key words related to the question included active recovery and recovery exercise. While key words relating to the subject population included sports, athletics and performance. No key words for comparison or outcome measures were employed. This search produced twenty-five published cases for review. Although AR is a commonly used performance based recovery tactic with supportive anecdotal evidence, additional evidence-based research is necessary to determine its efficacy if we are to refute claims that AR is not effective in influencing performance or physiological recovery. Therefore, the purpose of this systematic review is to determine the efficacy of AR interventions on the athletic performance of professional, collegiate, and competitive level adult athletes.

Motivations for Participation in Community Gardens

Sean Svette

The purpose of this study was to examine the motivations of individuals for choosing to participate in community gardens in Colorado Springs. Telephone surveys were administered to a group of 14 adult community gardeners in Colorado Springs belonging to a non-profit organization Pikes Peak Urban Gardens. The survey contained a mix of open-ended and multiple choice questions. Results of the survey showed that growing organic food, strengthening surrounding communities, and living in close proximity to a garden were among the key themes of motivation for participation in community gardens.

The Impact of Recess Before Lunch on Student Plate Waste, Academic Performance, and Discipline Rates

Elizabeth Tucker

Research has shown that students who have Recess Before Lunch (RBL) consume more of their food and have higher academic performance than students who have recess after lunch. Each year, thousands of dollars are lost to school lunch food that is thrown away uneaten. Students then return to the classroom without proper nourishment and are at a higher risk for poor attention and disciplinary referral. Additionally, academic performance standards are extremely important for students, and also for teachers who receive compensation under the District's Pay-for-Performance Plan. The overall health and well-being of students needs to be considered at every level. Therefore, the primary aim of this study was to assess how much food students waste when they have recess before lunch compared to when they have recess after lunch. Participants included first, second, fourth and fifth grade students at two low-income Harrison School District Two elementary schools (77% of students eligible for free/reduced lunches). Plate waste was measured during several lunch periods and comparisons made between schools and grades with different recess and lunch schedules. The results suggest providing lunch at certain times of the day may be more beneficial to the students. This study provides valuable information to the school district in regards to the most beneficial scheduling for elementary-aged students.

Undergraduate Nursing

Differences in Academic Self-Efficacy and Self-Esteem in Beginning and Experienced Baccalaureate Nursing Students

Deborah Pina-Thomas, MSN; Kerry A. Peterson, DNP; Susan L. Garrett, MSN; Melissa J. Benton, PhD; Maura C. Schlairet, EdD (E.C.); Kynthia L. James, MSN (E.C.); Laura E. Carter, MSN (E.C.)

Self-esteem increases academic success, promotes development of professional values, enhances well-being, and decreases attrition among nursing students. A possible mechanism may be its relationship to self-efficacy, which independently influences academic achievement in undergraduate students. Greater learning experience may promote self-efficacy, but evidence is limited. Therefore, our purpose was to evaluate differences in academic self-efficacy and self-esteem in beginning and experienced baccalaureate nursing students. Beginning students (BS) were recruited at the beginning of the first semester of a four-semester program ($n = 11$), and experienced students (ES) were recruited at the beginning of the fourth semester of a six-semester program ($n = 12$). Self-efficacy was measured with the Nursing Academic Self-Efficacy Scale (NASES) and self-esteem was measured with the Rosenberg Self-Esteem Scale (SES). There was no difference in age between groups (BS = 20.6 ± 0.4 years; ES = 21.4 ± 0.3 years). Self-esteem was significantly greater in beginning students compared to experienced students (SES: BS = 26.6 ± 1.0 ; ES = 22.2 ± 1.1 ; $p < 0.01$). Self-efficacy was also greater in beginning students, but the difference did not achieve significance. Among all students there was a positive relationship between self-esteem and self-efficacy ($r = 0.64$, $p < 0.01$). In this group of baccalaureate nursing students, greater experience did not promote greater confidence or self-esteem. Instead, experience in nursing school appears to diminish psychological characteristics that may have a positive effect on academic success. This may place more experienced students at risk and should be of concern to nurse educators.

College of Engineering and Applied Sciences

Computer Science

Vulnerability and Risk Analysis of Two Commercial Browser and Cloud Based Password Managers

Rui Zhao and Chuan Yue

Web users are confronted with the daunting challenges of managing more and more passwords to protect their valuable assets on different online services. Password manager is one of the most popular solutions designed to address such challenges by saving users' passwords and later auto-filling the login forms on behalf of users. All the major browser vendors have provided password manager as a built-in feature; third-party vendors have also provided many password managers. In this work, we analyze the security of two very popular commercial password managers: LastPass and RoboForm. Both of them are Browser and Cloud based Password Managers (BCPMs), and both of them have millions of active users worldwide. We investigate the security design and implementation of these two BCPMs with the focus on their underlying cryptographic mechanisms. We identify several critical, high, and medium risk level vulnerabilities that could be exploited by different types of attackers to break the security of these two BCPMs. Moreover, we provide some general suggestions to help improve the security design of these and similar BCPMs. We hope our analysis and suggestions could also be valuable to other cloud-based data security products and research. This work has prompted the vendors of these two BCPMs to make some important changes.

Electrical and Computer Engineering

Cell Voltage Monitoring with MATLAB

Katrina Brandau

Lithium-ion battery packs are used in many modern day systems, such as HEVs (hybrid electric vehicles). In this project, MATLAB's serial communications package is used to write a program to monitor the individual cell voltages of similar battery packs. A USB serial controller (DC590) is connected to a number of cell monitoring boards (LTC6803). Each LTC6803 board can monitor up to twelve cells, and up to ten boards can be linked together for a total of 120 cell voltage readings. In this example, two boards will be connected, each with six lithium-ion cells. The design process, roadblocks that were overcome, and final product will be discussed.

Reduced Order Modeling Lithium Ion Cell Degradation

Lukas Aldrich

The amount of battery applications in daily life has exponentially increased recently. Lithium-ion cells and battery packs are subject to limited life cycles due to aging and degradation effects. Thus, the batteries will eventually require replacement. By understanding the causes of the degradation, we can apply an intelligent control strategy to minimize the degradation effects and extend the overall cell life.

Current literature of lithium-ion cell chemistries proposes partial differential equations of the physics-based degradation mechanisms. Our research proposes methods to reduce the order of the complex equations while maintaining high fidelity agreement. The resulting reduced-order degradation models utilize the five variable cell model previously developed at UCCS. These models enable insight into battery status enhancing battery application.

3D Sound Imaging with Head Tracking

William Fitzpatrick, **Mark Wickert**, and **Sudhanshu Semwal**

In Virtual Reality (VR) applications, an important measure of quality is the extent to which the user believes he is a part of (or immersed in) the virtual world which is being simulated. In this paper our focus is sound that is emanating from a source positioned in a particular 3D location in the real world. The ability to determine the 3D position of a sound source is called sound localization. A key element in localization is the Head Related Transfer Function (HTRF) and the associated impulse response. Here we use the U.C. Davis HTRF database along with a real-time DSP engine to implement the localization filters. By detecting the pose of the listener's head, the apparent position of a sound source relative to the listener is adjusted to accommodate the movement of the listener's head, thereby making the sound source appear to be at a fixed position in 3D space.

An Approach to the Active Defense of Wireless Radio Networks

Jeffrey Thomas Guido

Wireless capability is a widely accepted technology that is continuously being appropriated for new uses. The extensive infrastructure that has grown as a result of this technology's acceptance has allowed users to have near instantaneous access to an incalculable amount of information. Among the many areas that benefit from this wireless utility, two areas that stand out in the context of this thesis are emergency response and military operations. In both areas, operational commanders analyze a great amount of data so that they can make informed and timely decisions. Wireless technology is growing to meet that need and, once its utility is established to these professionals, it can be projected that the information will be relied upon by them. Even though wireless communications can be a great tool, it also has a great potential for vulnerability through Denial of Service (DoS) Attacks and needs to be protected. A method for protection is the goal of this thesis; to propose a method that not only avoids DoS attacks, but is able to actively counter them. The concept of software defined radio, or cognitive radio (CR), provides the capability for this intent.

To improve network robustness, CR concepts, such as cooperative sensing, would be used so that legitimate wireless users can recognize an attack, identify the malicious user and notify the network's defensive infrastructure. The defense infrastructure would activate a Network Enforcer that would disrupt the effectiveness of the malicious user while maintaining an acceptable level of communication throughput for legitimate users.

Frequency, Key and Mode Detection in Music

Tony Ortiz

In this research project, we attempt a type of music analysis using frequency detection and pattern recognition based on music theory. As a source, a musical piece in either a .wav or .mp3 file format is our observation space. The music file is then imported into MATLAB and frequency analysis is performed to search for signal peaks above a chosen normalized threshold in the frequency range of interest. The range of interest is defined by the piano note range. Most instruments used in a song (guitar, bass, keyboards and vocals) also fall within this range. All other frequencies outside this range will be excluded from our frequency analysis. A running accumulation of peak detections within the frequency range are maintained with each time interval processed. The total frequency detection count within the song is then classified and analyzed to determine pattern matching defined by music theory. Frequencies with the highest detection count will help us establish the musical key. The frequency category that was most detected sets the mode of the music piece. Each music mode has an emotional description in music theory which in turn can assist us in the mathematical detection of emotion in a musical piece.

Research in Battery Management and Control

Gregory Plett and M. Scott Trimboli

Advanced engineering solutions are required to propel the U.S. automotive industry irrevocably to the next level: the electrified drivetrain. Because of their greater efficiencies and potentially greater driving performance versus conventional-drivetrain vehicles, hybrid-electric, plug-in hybrid-electric and electric vehicles will eventually dominate. However, costs are still high.

In particular, the battery pack is the most expensive part of the electric drivetrain. This is in part because present battery packs are conservatively designed to guarantee life and performance in the face of current uncertainties in battery technology. This poster will introduce research we are doing in advanced modeling and optimal controls to extend battery life and reduce the needed battery pack size.

Automatic Dependent Surveillance-Broadcast: A Low-Cost Prototype Receiver

Robert C. Roller

The Automatic Dependent Surveillance-Broadcast (ADS-B) system is a technology currently being used by many commercial and private aircraft in the United States. The methods employed by this system facilitate surveillance and awareness between participants both in the air and on the ground by broadcasting aircraft location data (obtained from GPS) at periodic intervals. The Federal Aviation Administration will require most aircraft in the United States to utilize ADS-B by the year 2020. With the advent of low cost devices that can be adapted for software defined radio applications, the ability to easily acquire these signals has become an enabler for new software-based systems that can process and decode the information contained in ADS-B messages. Resulting from efforts of the open source community, devices such as those based on the RTL2832U have been unleashed for use by radio hobbyists who have otherwise never before had access to these capabilities at such a low price point. In this project, I leverage some of the work of the open source community to propose a prototype ADS-B receiver that uses a RealTek RTL2832U-based device and custom developed software to extract and decode location data from the transmissions of local area aircraft. The design and implementation of this system is explored, and the performance of the resulting prototype is demonstrated. This project will show that low-cost devices that enable software defined radio applications can be viable options for the purpose of exploring this new technology.

Model-based Estimation of Lithium-Ion Cell Internal Physical State

Kirk Stetzel

Lithium-ion cells are used in many of today's mobile electronics as well as hybrid-electric vehicles and battery electric vehicles. In order to reduce the aging process of these lithium-ion cells, full-order physics-based mathematical models are created for computer simulation and estimations. These full-order models provide very accurate representations of actual electrochemical process parameters within the lithium-ion cell, but are very computationally intensive. Reduced-order state-space system models are developed to reduce the complexity of the model and allow access to the actual state variables, which represent the electrochemical parameters of the cell. These electrochemical parameters are used in calculations for state-of-charge (SoC), state-of-health (SoH), and many other important aspects of the lithium-ion cell. Many of the important electrochemical parameters are non-linear in behavior and require additional mathematical techniques for accurate estimation. This research applies non-linear Kalman filters to the already developed reduced-order models in order to estimate the non-linear electrochemical parameters that are not visible to the outside world.

Radio Receiver Signal Processing using Hands On Hardware Experiments

Les Tekamp and Mark Wickert

A first course in communications theory requires students to take seriously Fourier theory and spectral analysis. In the laboratory portion of the course the students learn to appreciate the spectrum analyzer as a tool for seeing into the frequency domain with real signals. In this paper we explain how the study of radio receiver signal processing can be used to build up a student's understanding of the Fourier transform frequency translation and modulation theorems and superheterodyne receiver design. Mathematical modeling is the foundation of receiver design, but seeing it really work is very satisfying. The experience of seeing real signal spectra at receiver test points on the spectrum analyzer plus hearing the station is invaluable. The student gets to experiment with frequency translation using both high-side and low side tuning. Two methods of assessment were used, one involved a formal written lab report specifically targeted to the radio receiver boards and associated test points. The results were extremely positive. The second method involved a formal lab quiz at the end of the semester. Two questions on the formal lab quiz related to receiver design equations. Again the results were extremely positive.

Lithium-Ion Battery Cell Management: A Model Predictive Control Approach

Marcelo Araujo Xavier

In this work, we investigate the effectiveness of a model predictive control (MPC) strategy for improving cell-level charging control of a lithium-ion battery. The research has implications for the electric vehicle industry. The approach uses a modified form of the MPC algorithm to cater for direct input feed-through which models battery ohmic resistance.

Lithium-ion batteries are the energy storage system of choice in today's electric vehicles due to their high energy density, low self discharge and high cell voltage. However, current battery management systems do not fully utilize the lithium-ion battery's capability. State-of-the-art, real-time model predictive control is a strategy that makes it possible to operate a battery cell much closer to its theoretical limits than is currently done in practice. In this work, MPC is implemented on two different cell models: (1) a single 2nd-order equivalent circuit model, and (2) a reduced order physics based model, both using real cell parameters; the control methodology is used to compute a fast charging profile that respects input, output, and state constraints, i.e. input current, terminal voltage, and state of charge. We examine the effect of the constraints imposed, and also the effect of varying tuning parameters on cell performance. Our results demonstrate that the MPC approach used fits especially well to the battery control problem as it handles explicitly systems constraints.

Mechanical and Aerospace Engineering

Using Biomimicry to Improve Solar Collection Technology

Tom Amundson

This body of work attempts to use biomimicry of microstructures in butterfly wings (specifically *Archeoprepona meander*) to improve performance in concentrated solar collection technology. Increasing energy demands and decreasing fossil fuel reserves require that reliable and innovative technological advancements in renewable energy collection are made. The research objective of this work is to test the hypothesis that the performance of a concentrated solar power receiver is enhanced through the addition of appropriately designed micro and/or nanoscale structures to its surface creating what is known as a directionally selective surface. These structures will be designed in such a way that the surface mimics the almost perfect radiation absorption of butterfly wings.

Comparison of Numerical Methods to Determine the Effects of Non-Equilibrium on Solutions of Hypersonic Flows

Ryan Bosworth

This study compares kinetic and continuum methods to determine the effects of non-equilibrium on the solutions provided for flow regimes ranging from fully laminar to turbulent. The continuum solution method performed by a Navier-Stokes solver in CFD++ allows for small deviations from equilibrium but break down if deviations become larger. The kinetic solution method is performed with the SMILE code which uses the direct simulation Monte Carlo method and is fully capable of modeling non-equilibrium but is computationally intensive, requiring up to 700% of the time for the continuum method in the flows with the highest modeled Reynolds numbers. The flow modeled is that of a free expansion jet through an orifice where the Reynolds number of the flow is defined at the orifice throat.

It is found that the kinetic solver predicts non-equilibrium areas to be 120% larger than those predicted by the continuum solver in the laminar flow regime. As the flow enters the transition regime, the solutions begin to converge as the number of particles within the flow increases. This contributes to diffusing gradients faster and non-equilibrium plays a much smaller role. When the flow enters turbulence, oscillations in the flow cause the solutions to diverge. A turbulent experimental comparison is also made which shows the oscillations predicted are similar in frequency (~20 kHz) to those modeled (20-67 kHz).

Dynamic Observation and Control of Ultrasound Contrast Agent Microbubbles

JT (John) Brlansky

The focus of this project is the control and dynamics of microbubbles for application with ultrasound contrast agents. Ultrasound contrast agents are commonly used to enhance ultrasound imaging by magnifying the reflected sound from the ultrasound transducer and improving contrast. It is hoped that with greater control and knowledge of their dynamics, the use of contrast agents may be extended to medical therapies such as drug delivery or the treatment of atherosclerosis. To study these microbubbles, a suspension chamber is utilized in conjunction with a hydrophone to relate the dynamics of the contrast agents with the scattered sound, which can then be implemented in a feedback control loop to manipulate contrast agents with ultrasound waves.

The Development of a Spectral Lens for Transient Luminous Event Spectroscopy

Joshua Engle

Spectral analysis of Transient Luminous Events give a wealth of physical data that is otherwise unobtainable with any other method available in the lightning research community today. In fact, spectral capture of Blue Jets has yet to be presented to this date. In order to provide accurate spectral data of Blue jets and Red Sprites a customized field friendly spectrometer is required. A transient luminous event or better known as upper atmospheric lightning occurs over fractions of a second requiring the use of a high frame rate Phantom camera. This spectrometer is designed similar to some astronomy telescopes in that it is setup as a linear combination of a slit and optical components. This provides straight through wavelength dispersion which allows for regular camera use when the slit and grism are removed. It also is designed for rugged field use versus the typical bench top applications. Development of this lens is ongoing with a targeted completion of May 2014. The ultimate goal of this research is to successfully capture and analyze a Blue Jet event.

Manifold Design for a High Temperature Heat Exchanger

Roser Ginebra

Beamed energy propulsion systems, studied as an alternative to the current rocket launching systems, place an energy source on the ground in order to transmit the needed energy to the spacecraft. This computational work evaluates different designs of manifolds to be connected to a series of heat exchanger channels, delivering the propellant, for use on a beam propulsion spacecraft.

Optical Lattice Gas Heating Numerical Simulation and Detection

Jacob Graul

Optical lattices, the interference pattern formed from the spatial and temporal superposition of high energy laser pulses, have been investigated as a means of producing high temperature gases. Circumventing the drawbacks and undesired chemical byproducts associated with many gas heating methods used today, this technology could potentially benefit allied fields from material synthesis, and high temperature chemical reaction and gas kinetic studies, to high temperature gas-surface interaction research. Prior research has shown that while optical lattices are a viable mechanism to non-resonantly facilitate energy deposition into a variety of gases, there exists a great divide between the numerical prediction of optical lattice gas heating potential and that which has been accomplished experimentally. This research intends to numerically determine what gas temperatures the heating technique can realistically provide, while providing an experimental methodology through which this heating can be accomplished and quantified.

Bubble Dynamics During Collapse Near a Rigid Boundary

Sean Neu

Bubble cavitation near a rigid boundary can have drastic hydrodynamic and thermodynamic effects. The purpose of this study will be to observe those effects using a computational approach by simulating an air bubble in water under a variable pressure field. The bubble is subjected to an initial pressure drop of 1 MPa in the surrounding liquid causing an isothermal expansion of the bubble to 20 times its original size. The bubble then quickly collapses due to the near vacuum like conditions within, creating extreme pressures and temperatures during this adiabatic process. The rigid boundary causes bubble deformation asymmetrically and a high velocity gas jet toward the boundary. Observing these effects can have implications in numerous fields such as medical applications and sonochemistry.

Computational Modeling of a System of Microbubbles: Application in HIFU Thermal Therapy

Laia Ragues Pujol

Photoacoustic cavitation is a novel technique to improve the speed and efficacy of high intensity focused ultrasound (HIFU) thermal therapy. Currently, HIFU is approved in the US for the treatment of uterine fibroids and is under evaluation for the treatment of a variety of cancers including breast, brain, prostate and liver. The motivation for studying the application of photoacoustic cavitation is the currently excessive treatment time of HIFU, as well as the known benefits that the introduction of nanoparticles has on targeted regions of tissue. Photoacoustic cavitation consists of the creation of microbubbles when the nanoparticles are heated using a pulsed laser source in the presence of an acoustic HIFU field. However, the behavior of bubbles in tissue is highly variable, and the thermal diffusion in the bubble interior is still unpredictable. Thus, this research involves the development of a computational model of a cluster of bubbles based on a modified form of the Rayleigh-Plesset Equation, and explores the effects of the shell properties and the influence of the optical and HIFU fields on the bubble dynamics. It also studies the heat transfer between the oscillating bubbles and the surrounding liquid, in order to accurately predict cavitation and enhance HIFU therapy.

The Design, Fabrication, and Evaluation of Millimeter Wave Lenses for Beamed Energy Applications

Stephen Sloan

Beamed energy methods have the potential to open doors to improved space-based energy transfer systems. The sheer quantity and diversity of both proven and theoretical beamed energy applications create ample reason to research methods by which they can be improved. Sufficient transmission efficiency can lead to the creation of links along which collected or generated energy can be transmitted to benefit the receiving system. While ground-based facilities will likely possess sufficient acreage to create a system using hundreds of parabolic reflectors, satellites do not possess such a luxury. This research seeks to show another way in which the propagation of electromagnetic energy in the millimeter wave range can be improved. Three metal lenses were designed using the optical properties of electromagnetic waves, fabricated with aluminum sheet metal, and tested in an anechoic chamber to quantify their effects upon a propagating beam of energy. Radial data sweeps taken at different distances show a consistent improvement in energy beam propagation in the boresight direction. Up to 70% higher normalized power values were achieved at increasing distances from the source accompanying an expected decrease in beamwidth thereby showing the lenses' successful improvement of electromagnetic energy beam propagation in free space. These results have the potential to aid in the creation of an improved beamed energy system concept, particularly when the transmitting constituent is not ground-based.

Experimental and Computational Determination of the Thermal Properties of a Phase Change Material

Samantha Tow

Globally, the demand for energy is on the rise and more specifically the demand for clean renewable energy is the ultimate goal. To meet this increase, renewable energy sources such as solar power are being researched to fit the demand. One area of interest is the use of phase change materials (PCM) to store solar energy. This research investigates paraffin wax as a phase change material experimentally and uses those experimental results to accurately predict, calculate, and model the behavior computationally. Experiments were performed to determine the ability of paraffin wax to conduct and store thermal energy and the results were analyzed and used to create a computational model. These experimental and computational results are being used to computationally analyze the performance of other phase change materials.

College of Education

Leadership, Research, & Foundations

Scholarship Policies for Latino High School Students with Less Than a 3.0 GPA

Nancy Hernandez

This mixed method study focused on Texas and Colorado Latino students who earned less than a 3.0 GPA in high school and who were in a pilot scholarship program that helped them earn a bachelor's degree. An initial understanding of the students' scholarship retention rates and potential scholarship policies was generated using binary logistic regression and interviews and focus groups. Private scholarship providers cannot always invest in research for their programs and yet findings from such research can be useful in making informed programmatic decisions. Results indicate that the students in the first year of the pilot program were least likely to remain in the scholarship program. College credits earned was the most significant variable in predicting program retention. Students shared ideas for policies that would promote program retention in the future. This information can be instrumental in determining how this and similar scholarship programs can support this student population in the future.

Special Education

Partnering with People with Disabilities to Develop Accessible Technology

Scott Kupferman, Ph.D.

The purpose of this poster presentation is to highlight the work of the National Collaborative for Disability and Technology (NCDT). NCDT partners with a national network of people with disabilities to develop accessible technology. Examples of accessible technology that were developed through this partnership will be demonstrated. This poster presentation will also provide a framework for involving people with disabilities as active partners (versus passive participants) during disability-related research. Main points include (a) the philosophy and ethics of participatory research, (b) the methodologies used in participatory research, and (c) the strategies to build capacity for future research. If accessible technology and other disability-related research is to fully reflect the experiences of people with disabilities, then people with disabilities should be involved from the onset in formulating research questions, developing methodology, interpreting results, and drawing conclusions.

Relational Accessibility: Expanding the Paradigm

Scott Kupferman, Ph.D. & Emily A. Nusbaum, Ph.D.

Accessibility is a function of compliance with regulations that lead to the identification and elimination of barriers within physical spaces (i.e., buildings, roads, transportation, etc.) and virtual spaces (i.e. websites, telecommunication, etc.) for people with disabilities. Accessibility regulations typically establish minimum criteria that are often perceived as or become absolutes. However, these minimum criteria fail to recognize an important facet of access: the relationship between those requesting and those granting access. In this presentation, we propose expanding the accessibility paradigm to consider questions of dependency/interdependency, power, and the nature and context of the communication about access. We will draw on writing from feminist theory and feminist psychology that positions relationships as foundational to the human experience.

College of Letters, Arts, and Sciences

Anthropology

Jean Charlot, Religiosity and the Catholic Southwest

Amanda Pierce and **Glenda Carne, PhD**

The artist Jean Charlot lived and worked in Colorado Springs. He completed several liturgical-themed lithographs, book illustrations, and frescos emphasizing the religiosity of peoples he encountered throughout his lifetime. This project seeks to incorporate interviews of the late artist, to discover the importance of Charlot's religiosity, his interest in the regional religious practices of peoples in the greater Southwest and Mexico, and his motivations for completion of several important works. Charlot's religious works result from his personal and professional experiences as well as his acute skill of observation. Early in his career indigenous images are imprinted in his work. His Southwest inspirations technically and geographically begin in the late 1940s in Southern Colorado and continued into his tenure at the University of Hawaii. Although Charlot's work has been thoroughly investigated, there is a gap in information about his time in the U.S. Southwest and the importance of religious themes in his work. Through access to transcripts of interviews and information from the artist's son, this project seeks to better understand the regional representations Charlot completed during his lifetime. Upon completion, this paper and the manuscript resulting from this research project will be submitted to *The Journal of the Catholic Southwest*. The editor's journal has expressed an interest to publish on this topic. It may be submitted to the Southwest Art History Conference, October 2014, Taos, New Mexico.

Biology

Seasonal Habitat Selection by Non-migratory Female Mule Deer (*Odocoileus hemionus*) in a Semi-arid Environment

Danny Follett, **Jon Pigage** and **Helen Pigage**

Twenty-three non-migratory female mule deer (*Odocoileus hemionus*) at Fort Carson Military Reservation, Colorado were fitted with GPS/VHF collars and tracked for the 2011 winter (January-March) and summer (July-September) seasons. Fixed points were taken every 3 hours and used to make Kernel Density Estimations (KDE). Based on the KDEs, home (95%) range and core (50%) areas were determined and compared on the size of area, vegetation available and vegetation used. Differences in habitat utilization between the seasons were observed. Overall, coniferous areas made up the majority of habitat use on both home and core areas. Winter core areas included a higher percentage of grassland (32.7%) than summer core areas (22.9%). Riparian and shrubland habitats were used more in the summer core area (12.1%, 12.5%) than in the winter core area (8.76%, 7.16%). In summer the deer utilized a higher percentage of grassland in the home range compared to the core area (38.0% versus 22.8%). The treed and riparian areas of the summer core had a higher use (48.16%, 12.12%) than the home range area (41.45%, 6.88%). This information has management implications for habitat conservation in light of expanding military training.

Preliminary Investigation of Evolutionary Genetics of the Tassel-eared Squirrels (Sciurus aberti) Using Restriction-site Associated DNA Sequencing (RAD-Seq)

Jon Pigage, Jeremy Bono, Peter Wettstein (E.C.), Stephanie Herlik (E.C.) and Helen Pigage

Abert's or tassel-eared squirrels (*Sciurus aberti*) are found in montane Ponderosa pine forests in the southwestern United States and northern Mexico. Six subspecies of *S. aberti* are currently recognized by variations in pelage coloration, skeletal features and distribution in ponderosa pine (*Pinus ponderosa*) forests. These observations have led to questions about the status of the species; that is, have sufficient genetic changes occurred to lead to the formation of new species? Lamb et al. (1997) has drawn a geographical East/West split in the phylogeny of these squirrels based on mitochondrial DNA (mtDNA) analysis. We propose to further define the phylogeny of the subspecies as well as examine the possibility of current speciation using Restriction-site Associated DNA (RAD-Seq).

RNA-binding proteins regulate dendrite morphogenesis in C. elegans

Daniel Forand, Kande Jones

Neurons have specialized processes called dendrites, which branch out into complex arbors that cover receptive fields and establish the neural connections that control behavior, learning, and memory. Dendrites also respond to changing environments by maintaining or changing synaptic connections and sensory field coverage. Since defects in dendrite development and/or maintenance are associated with several diseases such as Alzheimer's, autism, Fragile X mental retardation syndrome, and schizophrenia, the molecular mechanisms underlying dendrite morphogenesis and dynamics are important to understand. Ample evidence exists that highly polarized cells, such as neurons, achieve their morphology through asymmetric protein distributions within the cell. Thus, we reasoned that RNA-binding proteins (RBPs) might be important for dendrite arborization by regulating mRNA localization, stability, and translation. Using the highly arborized da neurons from *Drosophila* larvae as a model, we recently showed that 63 RBP-encoding genes are important for dendrite morphogenesis (Olesnicky et al, 2014). To determine if there is an evolutionarily conserved set of RBPs that govern dendrite development in diverse animal species, we identified 54 RBP genes in *C. elegans* that encode homologs of the RBPs implicated in dendrite development in flies. Using a combination of available mutant alleles and RNA interference, we are screening these RBPs in *C. elegans* multi-dendritic PVD neurons for dendrite defects. At least 8 of the candidate genes screened thus far conferred a significant reduction of terminal dendrite branches in PVD neurons. This identifies a conserved role for post-transcriptional gene regulation in dendrite development and implicates several conserved RBPs in this process.

Post-mating reproductive isolation between populations of geographically isolated Drosophila arizonae

Joseph McGirr, Whitney Kelly

New species arise as a result of reproductive isolation between populations. Pre-mating isolation occurs when mechanical, temporal, or behavioral factors limit copulations between individuals from different populations. Post-mating isolation results from incompatibilities that lead to poor fertilization success, or the reduced viability or fertility of hybrid offspring. Our research focuses on these reproductive barriers between geographically isolated populations of the fruit fly, *Drosophila arizonae*. This study model offers us the chance to examine which barriers function in early stages of speciation. Previous work from our lab suggests that pre-mating barriers exist between some populations. We are now testing for evidence of post-mating isolation through selective crossing and observation of F₁ offspring viability.

Chemistry and Biochemistry

Synthesis and testing of triazoles

Erin Barnett, **Wendy Haggren**, **Allen Schoffstall**

The synthesis of a series of novel bis-1,2,3-triazoles containing primary, secondary and tertiary alcohol groups using copper (I) catalyzed cycloaddition, “click chemistry,” is reported. 1,4-Dipolar cycloaddition reactions of 1,2-bis(azidomethyl)benzene and various alkynes in the presence of Ison catalyst afforded bis-1,2,3-triazoles. These reactions do not call for refluxing or a reducing agent. They are performed at ambient temperature and pressure in a solvent free system, making this method practical, economical and eco-friendly. Characterization by GC-MS, ¹³C NMR, and IR confirm the desired products have been successfully synthesized. Additionally, these compounds have been tested for antimicrobial activity against various microbes.

Comparative Study of Chlorogenic Acid Concentrations in Foods: Fresh Fruit, Canned Fruit, Fruit Juices, and Coffee

Santiago Bukovsky-Reyes, Katherine E. Buxton, **Janel E. Owens**

Chlorogenic acid (CGA) is a secondary plant metabolite with purported health benefits. The objective of this study was to compare foods prepared with five extraction protocols prior to instrumental analysis by high performance liquid chromatography with diode array detection. It was determined that microwave-assisted extraction (MAE; 5 min, 80 °C, methanol/water solvent mix at pH 2.5) was optimal for extracting CGA from solid foods (canned fruits, green coffee beans, fresh fruits) while using a dilute and filter approach was useful for beverages (juices, cider, brewed coffee). Concentrations of CGA in beverages ranged from 7.6 µg/mL (peach cider) to 61.8 µg/mL (peach nectar). Solid foods prepared by MAE had CGA concentrations ranging from 6.9 µg/g (fresh peaches) to 34.8 mg/g (green coffee beans). A stability study was completed to demonstrate that CGA was stable in methanol or fruit juice over 11 days. Future work will involve comparing CGA content in various foods and at various stages of produce ripeness.

Controlling Competing Organic Reactions

Chris Butler, **Allen Schoffstall**

The multistep synthesis of 3-(4-methoxyphenyl)-propynoic acid from p-methoxycinnamic acid has proven to be difficult due to the strong activating effect of the p-methoxy substituent. Starting with p-methoxycinnamic acid, bromination of the double bond is intended to give the dibromo derivative. Some literature procedures gave brominated products not only from the double bond, but also on the aromatic ring. Many parameters of the reaction had to be augmented including the nature of the brominating agent, solvent, temperature, and time for the reaction to take place. Once the brominated product was achieved in good yield without interference from ring bromination, the next step involved two E2 elimination reactions to produce the propynoic acid. However, elimination using a strong base could also produce a terminal bromoalkene via bromodecarboxylation. The parameters that had to be modified from literature procedures were temperature of the E2 elimination and the strength of the hydrochloric acid used to precipitate the product. Once the desired product was achieved, it could be used in a regioselective, copper-catalyzed cycloaddition reaction to prepare 1H-1,2,3-triazoles.

Fast Forensic Toxicology: Quantitative Analysis of Fentanyl by DLLME and GC/MS

Michael Gardner, Sheena Sampsel, **Werner W. Jenkins, Janel E. Owens**

Fentanyl is a synthetic narcotic anesthetic that is approximately 200 times more potent than morphine. Owing to the many uses of fentanyl, and the larger potential for abuse, the drug may be included in a forensic toxicology work-up. This creates a need for fast, precise, and accurate measurements of fentanyl in a forensic setting. In the first round of experiments, the stability of fentanyl was assessed when stored at three different temperatures (-20, 4, and 25 °C) in simulated urine. Stability of the drug was demonstrated at those three temperatures over 12 weeks upon analysis by gas chromatography-mass spectrometry (GC/MS) with extraction by three different techniques: liquid-liquid extraction, solid phase extraction, and dispersed liquid-liquid microextraction (DLLME). Given the promising results of DLLME, this extraction method was optimized and validated at two concentrations: 10 ng/mL and 100 ng/mL. The DLLME procedure was then utilized in the analysis of fentanyl in urine samples obtained from autopsy cases at the El Paso County Coroner's Office for which liquid-liquid extraction had been previously utilized and where fentanyl had been a significant toxicological finding. The excellent comparability between DLLME and liquid-liquid extraction in these forensic cases is demonstrated by a Bland-Altman difference plot. The use of this methodology in the analysis of other forensically-relevant analytes is discussed.

Headspace Liquid-Phase Microextraction Analysis of Putative Hydraulic Fracturing Compounds

Eun Kim and **Janel E. Owens**

Hydraulic fracturing or 'fracking' is a method of extracting natural gas from rock by applying pressurized fluid deep within underground formations. Hydraulic fracturing fluids contain chemicals that may have an impact on the environment. The objective of this work was to create an efficient technique utilizing green chemistry principles for the analysis of putative hydraulic fracturing chemicals. Headspace liquid-phase microextraction (HS-LPME) was utilized to extract alkylates (ASTM D5134 Qualitative Reference Standard), naphtha (ASTM D5134 Qualitative Reference Standard) and gasoline in water by using either 1-octanol or benzyl alcohol as a solvent. The experimental conditions were dependent on the concentration of analyte, volume of water used, amount of sodium chloride added to the sample, the temperature of the sample, distance of the solvent from the sample surface, and amount of solvent used. The samples were analyzed by gas chromatography-mass spectrometry (GC/MS) and the data analyzed using AMDIS (Automated Mass Spectral Deconvolution and Identification System).

On the Accuracy of PM7 in Modeling High Resolution Protein Data Bank Structures

Ben Martin, Chris Brandon, James J. Stewart, **Sonja Braun-Sand**

The Protein Data Bank, a central repository for protein structures, has made 3-D structures of biologically significant macromolecules available to experimentalists, theoreticians and the general public. The ability to access these structural models has become increasingly important over the past several years with the advancement of research areas like drug docking, ligand binding, and the development of structure-based drug design methodologies. Prior work has shown that many PDB entries contain several previously undetected geometric anomalies that are themselves chemically unrealistic, and therefore are not representative of the actual structure. Using the software package MOPAC2012 and the semi-empirical PM7 Hamiltonian therein, several types of geometric anomalies were identified in 20 recently deposited structures. Constrained optimizations on the structures were found to correct these local errors. However questions remain as to the accuracy of our method, and of the constraint that was imposed to compensate for the lack of solvation. Results of our attempts to quantify errors attributable to PM7 when used to model macromolecular structures will be presented.

Isolating a cloned Hexokinase I enzyme from Saccharomyces cerevisiae

Emily Munk, Wendy Haggren, Sonja Braun-Sand

Hexokinases are proteins that catalyze the phosphorylation of glucose in cells. Hexokinase I in the yeast *Saccharomyces cerevisiae* is similar to Hexokinase IV in humans, an enzyme implicated in diseases such as cancer and diabetes. Since yeast Hexokinase I is not available commercially, the purpose is to isolate Hexokinase I in yeast by using a plasmid which allows expression of the fusion protein Hexokinase I-GST. The GST tag (~30kDa) allows Hexokinase I (~50 kDa) to be identified among the other proteins in the cell by using SDS-PAGE and Western Blotting, producing a protein band at about 80 kDa. The fusion protein can then be isolated and purified using affinity chromatography.

A Path to Biofuel Production: Engineering Yeast to Digest Starch

Morgan Pinto, Wendy Haggren, Sonja Braun-Sand

Saccharomyces cerevisiae and *Saccharomyces diastaticus* have been used extensively to ferment ethanol from glucose for biofuel production. However, fermentation from glucose is an expensive process and energetically inefficient. These yeasts can be thus be genetically modified to degrade starch, which can be cheaply and efficiently derived from a variety of plant sources, and given directly to the modified yeasts as a feedstock. This project focuses on the modification of *S. cerevisiae* and *S. diastaticus* with the plasmid, pMS12, and derivatives thereof, as well as using novel sources of plant-derived starches for yeast feedstock. The pMS12 plasmid codes for the mouse salivary α -amylase enzyme, which degrades α -1,4 glycosidic bonds in starch. Equipped with this enzymatic machinery, the yeasts have the ability to degrade plant-derived starches. Starch feedstocks are typically derived from corn, but with recent droughts affecting American agriculture, new starch sources should be sought as replacements. The Buffalo Gourd plant has a hardy and starch-laden root that can serve this purpose. *S. cerevisiae* and *S. diastaticus* modified with a derivative of pMS12 have qualitatively been shown to degrade Buffalo Gourd starch.

The Separation and Absorption Spectra Analysis of Single Walled Carbon Nanotube Samples by Chirality

Kathryn Prescott, Kevin Tvrdy

Semiconducting single walled carbon nanotubes (SWNTs) have long been known to exhibit chirality dependent tunable bandgaps with narrow absorption and emission line widths in the infrared region of the spectrum, where the center wavelength of each transition correlates roughly with nanotube diameter due to two-dimensional quantum confinement effects. Recently, the technique of amide gel based adsorption and desorption has afforded the ability to separate preparative quantities of semiconducting SWNT based on their chirality. The ability to dictate the purity of a separation based on this method is of utmost importance in understanding and improving the efficiency and breadth of gel-based SWNT separation. This work focuses on insights gained from fitting single- and few-chirality semi-conducting SWNT absorbance spectra with a series of Lorentzian lineshapes coupled with exponential and Gaussian based backgrounds. Specifically, information regarding the ratio of first to second electronic transition peak intensity is found to be chirality dependent. Further, non-linear and non-exponential background features appear predominantly in the presence of large-diameter chiralities, a phenomenon that potentially correlates with the affinity of each chirality for the hydrogel separation medium.

Antibacterial Effects of Silver Nanoparticles Prepared by Microwave-Assisted Synthesis

Rebecca L. Read, Wendy Haggren, Janel E. Owens

The objective of this study was to assess the antibacterial activity and inhibition of biofilm formation of silver nanoparticles (AgNPs) against *Escherichia coli* (MG1655), *Bacillus subtilis*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Staphylococcus aureus*, and *Janthinobacterium lividum*. The AgNPs utilized in this study were prepared by microwave-assisted syntheses guided by green chemistry using silver ions from silver nitrate and reducing agents dextrose, arabinose, and soluble starch. The successfully synthesized AgNPs were characterized by multiple orthogonal approaches. All AgNPs prepared in this study exhibited antibacterial effects on a variety of organisms (Gram-positive and Gram-negative as determined by a well diffusion assay).

Functionalized Hydrogel Synthesis for Single-Chirality Single-Walled Carbon Nanotube Separation

Jackson Rowland and Kevin Tvrđy

Carbon Nanotubes contribute to a useful class of nanomaterials, the applicability of which is expanded when tubes of a single chirality (diameter) are utilized. Sephacryl S200 functionalized hydrogel is currently the most effective gel medium used to separate carbon nanotubes. Sephacryl S200 contains properties allowing for site selection chromatography of nanotubes, however, because its formulation was not intended for nanotube separation, there is opportunity for the improvement upon the site selection process through custom made functionalized hydrogels. Using Sephacryl S200 as a guide, hydrogels can be synthesized with relative ease, and their specific properties which are responsible for nanotube separation can be identified and enhanced, tending towards a less expensive and more efficient carbon nanotube separation process.

Mutational analysis of yeast hexokinase I

Hannah Ryan, Ralph Galega, Chris Richey, Christy Asay, Wendy Haggren, Sonja Braun-Sand

Hexokinase enzymes are implicated in several disease states including cancer and diabetes. We use the eukaryotic single-celled bread yeast *Saccharomyces cerevisiae* as a model for human cells. In order to correlate structure with function in hexokinase we have engineered a number of site-specific mutations into the DNA of cloned gene for yeast hexokinase I. Computer modeling of hexokinase predicts that our engineered mutations will alter the binding affinities of the enzyme for its common ligands, the hexose sugars glucose, fructose, and mannose. Analysis of hexokinase folding in the presence of such changes will suggest targets in the design of drugs to combat the increase in hexokinase activity in cancers and the decrease in hexokinase activity in diabetes.

Dispersed Liquid-Liquid Microextraction with Matrix Solidification for the Analysis of Tetrabromobisphenol-A (TBBPA)

Shannon Seebeck, David Orban, Christopher Barrett, and **Janel E. Owens**

A rapid, efficient, and environmentally-friendly pre-concentration method was developed for the detection of tetrabromobisphenol-A (TBBPA), a brominated flame retardant, from complex samples including dust. This novel adjustment to the traditional dispersed liquid-liquid microextraction (DLLME) reduces the use of toxic solvents. Traditional DLLME is rapid and cost-effective but the utility of this method for the treatment of complex matrices is limited. In this new method, water samples are sonicated with solvents used for extraction (toluene) and dispersive solvents (acetonitrile and methanol). The solvent phases are separated by centrifugation before freezing the matrix in a CO₂ (s)/ethanol bath and removing the top extraction solvent (toluene). The TBBPA in the toluene is derivatized with acetic anhydride prior to analysis by gas chromatography-mass spectrometry (GC/MS). Current studies are focused on optimizing the method for improved analyte recovery, method validation, and adoption of the method for analysis of TBBPA in dust sampled from an electronics recycling facility.

Synthesis of 2-hydroxy-3-(4-phenyl-1H-1,2,3-triazol-1-yl)propyl benzoate using various methods of copper catalysis

Nathaniel Sundquist

Triazoles have been an area of interest to many chemists for their functionality as potential fungicides or potential antibiotics, the ability to add on functional moieties, as well as their ability to be easily catalyzed by copper (I) click reactions. This project seeks to find which is a more effective means of synthesizing the triazole-2-hydroxy-3-(4-phenyl-1H-1,2,3-triazol-1-yl)propyl benzoate by means of the Ison catalyst or by CuSO₄ xH₂O coupled with microwave synthesis concerning the yields of the products and which produces a purer product. This project also examines the efficacy of this compound serving as an effective fungicide or a possible antibacterial agent.

Analysis of Synthetic Cannabinoids by GC/MS and HPLC

Andrea K. Tully, Simon Johnson, **Janel E. Owens**, **Werner W. Jenkins**

Synthetic cannabinoids are increasing in popularity as drugs of abuse and it is becoming increasingly important to develop methods to identify and quantify these drugs and their metabolites in postmortem specimens. Solid phase extraction (SPE) was employed on two antemortem samples (blood and cerebrospinal fluid) and postmortem samples (brain and bile) from a patient who was a reported user of the synthetic cannabinoids UR-144 and XLR-11. Internal standard (IS) XLR-11-D5 (20 ng/mL) was added to each sample prior to sample clean-up by SPE and subsequent analysis by gas chromatography-mass spectrometry (GC/MS). XLR-11 and IS were detected in the antemortem blood whereas no parent drug was found in the brain or cerebrospinal fluid. Neither the IS nor the parent drugs were detected in bile. A calibration curve was created for these two synthetic cannabinoids for the analysis of blood containing the IS. Using these calibration curves, the concentration of XLR-11 in the patient's blood sample was 8.03 ng/mL by GC/MS. Current work is focused on the use of dispersed liquid-liquid microextraction and high performance liquid chromatography (HPLC) with diode array detection to identify and quantify synthetic cannabinoid metabolites, which have increased water solubility, in various matrices.

English

Missing Mothers

Sarah Barajas

Throughout all of the Disney and Pixar films that have ever been made, there are only two movies that has a mother at some point throughout the movie. In all of the movies that there are the mother figure is missing, from them being killed, from them dying, to them just abandoning their children. I am looking into this to see if this has an impact on today's society and if it does, to see what the impact is that it has on the children that watch these movies, and to see if it potentially harmful to the children that watch them and to what extent.

Mickey Mouse Clubhouse 33

Katie J. Byler

Urban legends have many interesting theories about dear Uncle Walt and the things that go on behind the scenes in the beloved land of Disney. So much magic to be had on the surface, but just underlying the pixie dust are swirling vortexes of black intrigue begging to be exposed. Is Walt's body really frozen, awaiting the day scientists will be able to repair the damage and bring him back to life? What really goes on in Club 33, that mysterious floor riddled with conspiracy? Mickey Mouse Clubhouse 33 is a research poster on the legends, conspiracies and mysteries surrounding the corporate media giant, Disney. Will we ever know the truth and does it matter? Perhaps the fun is in the speculation.

Femininity in Disney

Melin Craze

Does Disney portray women as poor helpless creatures? Many people believe that Disney is corrupting our children, particularly young girls, and are teaching them that they should look and act a certain way. Many of the Disney princesses are portrayed as beautiful, sweet, naive, and dependent young women. It seems that in Disney movies, all the girl has to do to find her prince is to cook, clean and look beautiful. Is Disney implying to young girls that finding your "Happily Ever After" means getting married? For many years, Disney has used stereotypical gender roles in their movies regarding their leading female characters. The Disney princesses are always beautiful and skinny, giving the impression that outer beauty is more important than inner beauty. They have also been portrayed as sex symbols, using their body to get what they want. They are depicted as helpless and in need of a handsome prince to rescue them. They are shown to be living in a submissive, domesticated lifestyle and that their only dream in life should be to find their prince charming and get married. While Disney has made improvements in their portrayal of women over the last few years, many feminists feel that it is still not enough.

Sexism within Disney

Jacqueline Fraser

Disney is a mass media corporation which has a large impact on the American culture as well as the culture of the world as a whole. This poster presentation will be analyzing the presence of sexism and sexist ideals within Disney films and the corporation as a whole. Also, how these sexist ideals impact culture as a whole and specifically young children who idolize Disney.

The Hidden Secrets Of Disney

Nicole Hoffman

Have you ever wondered about the secrets of Disney? If Walt's body is truly hidden in the depths of Disneyland or if all of this is just talk and rumors to attract customers to the "magic" of Disneyland. Walter Elias Disney, also known as Walt Disney started the famous brand every child and parent knows today, Disney. Almost every child knows of Walt's brand but not everyone knows the secrets behind Walt. Walt died on December 15, 1966 caused by lung cancer. The then so called urban legend began, after his death. Many people have reported that Walt's body is cryogenically frozen beneath the Pirates of the Caribbean ride at Disneyland and his body will be unfrozen when technology allows it, so he can write more famous films. While others believe he was cremated. Which side do you believe?

The Horns behind the Mouse Ears

Hadley Hofreiter

Disney has been at the forefront of child and adult entertainment products for decades and has become one of the largest monolithic companies in today's society. With Disney's wide spread group of loyal consumers, Disney is not usually criticized for the content of their film. With looking into films such as Tarzan and the Jungle Book we are able to see the truth of Disney's use of racism that is blatantly being used in its films. From a white man coming into the jungle to save the day to African Americans being depicted as apes Disney has a lot to hide in the true meaning that is being portrayed in their films and the problems that this could be bringing to our society.

Making of the Princesses

Chris Ann Lillie

When you look at the many issues that are brought about with Disney films one of the major ones is the way women, particularly the princesses, are portrayed in the films. This issue is a major one because of the said effects these images have on girls and the way they look at themselves. This paper looks at the thought process and making that goes into the creation of the Disney Princesses. I want to look into why they are created the way they are and how this creation can have an impact on those who view the Disney princesses for their bodies.

Racism in Disney

Jasmine Mathew

For my poster presentation, I will investigate the similarities and differences of animated Cinderella stories compared to the real life (real people) conversions of the stories; all, through the motif of racism. This will be done through evaluating racism in animated Cinderella stories and the appeal to certain stereotypes. Then, it will be evaluated in real life movies to determine if the idea of racism is present or even more apparent in some cases. This will allow the audience to further be informed of the production that young children are watching and the potential negative influence that it can have to forming the child's views in the real world.

Disney: Rewriting History

Will Miller

I will examine how Disney maintains its innocence through using corporate power and favoring popular culture to rewrite history while eliminating its controversial pastimes. Then I will provide examples from Disney classics and address how this becomes very problematic for children in particular, as well as American Society in general.

Disney: The Real Fairy Tales Behind the Magic

Claire Nibbe

Known as a revolutionary in the world of film, Walt Disney is known for capturing fairy tales and creating timeless stories with a magical touch. But is Disney as magical as we all believe? When taking a closer look at Disney, the original fairy tales he interprets are dark and completely different from the version that the animation presents. Looking at fairy tales such as Snow White, it is obvious that Disney is adding his own sparkle to these stories. Because his films are so popular, the story that society knows is the version that we all watched on VHS tapes when we were kids; the one with Disney's magical touch. In this presentation, Walt Disney's timeless fairy tales will be broken down to reveal the originals and will show which one people recognize as the real story.

Disney in Japan, the influence of Disney in collaborations with Japanese companies

Joshua Osborn

This poster will be used to demonstrate Disney's influence as both a company and an ideology in their collaborations with their Japanese partners in square enix and studio ghibli. It will discuss how the ideology and sharing of characters amongst Disney and square are used to create a new hybrid of the two companies in the kingdom hearts franchise. It will also discuss how the translation of original Japanese versions of studio ghibli is influenced by the Disney image in translation into the English language. Along with the influence of the companies combined, it will discuss the influence that the films and video game franchise have on popular culture.

Misleading our "little Princesses"

Kirstin Reynolds

Disney is a giant corporation that is portraying information that is misleading young girls. Within their movies, Disney sneakily shows younger girls what is the correct way to be a young woman in our society. It teaches girls about: relationships, love, morals, and what expectations men have in order to be good. However, all of these topics are presented with an unhealthy outlook on women. Disney has found a way to present these topics in their movies without any negative feedback from our society, and those who do stand against Disney are shunned from society. Culture has become too relaxed about what our young girls watch on television. It is sculpting girl's minds negatively so they are not viewing the truth about life, but instead thinking that life always has a happy ending

Unmasking the Underlying Messages Behind Disney

Bethany Schlachter

Gender discrimination has been a popular theme in the world of Disney from when it began to present day. Starting with the unrealistic bodies placed upon women in Disney films to the constant need of a man to save these women from evils have both played parts in the discrimination against females.

One Disney for All

Danicia Stepisnik-Brown

Walt Disney as a company and an ideology is synonymous with the American culture- it is so ingrained and sacred in our society and is thus constantly perpetuated. Regardless of if you were raised on Disney or not you are aware of it and Disney is a way of not only entertainment, but a way of life. It is a timeless enterprise in the United States, but it also has an international reach. To take Disney from a local level to a global level there must be exploration to find out to what extent and in what way the films are changed, sold, and told in other countries. When there is a Disney film failure in the United States it is easily fixed with mass production of toys etc., but what gives a film success in another country, what “Disneytized” products have failed, and what is done with said failures? There must be an overlap in how the Disney company seeks to avoid and/or evaluate failures in all things Disney that are distributed all around the world.

What Lettuce, Parsley, and Clover Teach Us about Disney’s Tangled

Benjamin Syn

My specific presentation addresses the unique rhetorical choices that Disney made within its fiftieth animated film *Tangled*. After the limited success of *The Princess and the Frog* (which was made at the same time as *Tangled*), Disney retooled the princess film to connect with a wider—and more masculine—audience. First, it did this by rebranding their film “Rapunzel” as the gender-neutral *Tangled*. Second, it then increased the part of Flynn Ryder. Third—and most interesting of all—the film revised the female princess as a hybrid boyish girl. Rapunzel is clearly a girl; however, she has divided interests that transcend gender lines. Also—unlike most of the other Disney Princesses—Rapunzel is an active agent of change within her own life. Laura Mulvey argues that when an audience (both male and female) look up at the screen, we identify with the male lead; however, in *Tangled* when boys and girls look up, they connect with Rapunzel. The best way to explain this phenomenon is by reading Rapunzel through Carol Clover theory of the “Final Girl.” In rhetorical terms, “What Lettuce, Parsley, and Clover Teach Us about Disney’s *Tangled*” will unpack the unique way that Disney creates a pathemata that effectively appeals to members of both sexes, while creating a kairotic moment to reverse (or at least to complicate) criticism of Disney’s recurrent sexism.

Disney Workers

Alicia Waite

Disney has not always had a positive relationship with all of their employees. Many employees during the 40's and 50's were very upset with how their boss, Disney was treating them, and decided to make a change. Their goal was to get credit for the work they had done for the Disney movies. It wasn't fair for Disney to take all the credit when he wasn't the only one who had created the films. When the Disney corporation had first taken off they were very sexist, females were rarely hired. If they were hired they were only allowed to do certain tasks that were considered not important.

Geography and Environmental Studies

Iconography Creating Place in Silverton, CO

Maria Cordova

By touring, interviewing and researching, several specific icons were chosen to determine how residents of Silverton, Colorado interpret their environment. The landscape paintings of Judith Graham depict the surrounding San Juan Mountains while the water colors of Ruth Ann Caitland focus on abandoned or repurposed mining structures. Fritz Klinke, owner of NA Graphics and town historian, offered insight into a photograph he believes best represents Silverton both past and present. A local librarian explains why she and her husband have kept their license plates beginning with the letters "ZE" explaining that they are part of a Colorado code that identified a driver's area of residence. Venture Snowboards, based in Silverton, has placed benches made out of snowboards around the town. Each snowboard is decorated with the Venture Snowboards snowflake logo. Finally Silverton Mountain ski area generates most of the tourist traffic during the winter. Silverton Mountain stickers are found inside and outside of businesses and homes. These icons are memorable and embraced by the residents of Silverton and the tourists who brave driving through Red Mountain Pass to experience the beauty of the place.

Monitoring Post-Fire Surface Treatments in Blodgett Peak Open Space

Chris Myers

The purpose of this project is to monitor recent surface treatments of the area within the Blodgett Peak Open Space following the 2012 Waldo Canyon forest fire. The Rocky Mountain Field Institute completed a series of surface treatments in June of 2013, restoring 13 acres of land by placing log erosion barriers (LEBs), cross vanes in intermittent stream channels and grass seed. This project will be a preliminary assessment of the effectiveness of the treatments and the structures put in place. This project will be completed by measuring vegetation regrowth and sediment discharge along three-to-five transects within four different locations. Location 1 consists of a burned, treated and seeded area. Location 2 consists of a burned and seeded-only area. Location 3 consists of a burned, untreated area. Location 4 consists of an unburned, untreated area and will be considered the control for the experiment. Topics of interest include the success of native vegetation regrowth in the LEB and cross vane areas. This will be assessed using the line-point intercept method as described in the Bureau of Land Management's AIM program manual. Another area of interest is monitoring specific areas of sediment build up or erosion. This will be done using a measuring staff, which will monitor the landscape and indicate areas of sediment accumulation or degradation following rainstorm events. By collecting these data, a preliminary assessment of the effectiveness of the surface treatment of BPOS can be made and applied to future research in the area.

Modeling the Impact of Impervious Surfaces on stream flow in Templeton Gap Wash and prescribing restorative watershed enhancements

Jeremy Tredway

The recent City of Colorado Springs Stormwater Needs Assessment Final Report identified Templeton Gap Floodway infrastructure replacement and levee reconstruction as a high priority for the city (CH2MHILL, 2013). The study, which was completed in October 2013, estimated that the repairs would cost more than \$10 million. This follows a 2009 decision by the Federal Emergency Management Agency to decline accreditation for the Templeton Gap Floodway levee because the city could not prove its capability to handle peak flows from a 100-year storm event (City of Colorado Springs, n.d.). As a result, residents and business owners below the levee could lose coverage under the National Flood Insurance Program potentially costing the community about \$3 million per year in insurance premiums. To date, the city has only considered the same “hard” engineering strategies that have left the stream devoid of ecological, aesthetic and recreational value (Pauley, 2009). These solutions fail to address issues creating stream degradation and are likely to propagate further imbalances downstream. This research project proposes to estimate the amount of total impervious area and effective impervious area in the Templeton Gap Floodway watershed in order to assess the impact of urbanization on stream flows. Building from this information, we will make suggestions for improvements that will simultaneously reduce the amount of effective impervious surface in the watershed and improve ecological functioning in the stream, while lessening the strain on an overtaxed levee and providing a social amenity for adjacent communities. By estimating the amount of total impervious area and effective impervious area in the Templeton Gap Floodway watershed, this study will model the effects of impervious surfaces and assess the impact of urbanization on stream flows. This study will also model the effects of changes to the percent of impervious surface and installation of low impact design features on stream flow. With this data, city planners can take steps to alleviate the effect of storm water runoff into the stream.

Physics

Experimental Investigations of Liposome to Supported Bilayer Binding Events

Andrew Ballast

One of the primary ways in which cells interact with their environments is by release of extracellular vesicles. These cell-derived submicron sized containers are formed either from the cell plasma membrane (microvesicles) or secreted from multivesicular bodies (exosomes). These vesicles contain nucleic acids and proteins that have been suggested to play an important role in intercellular signaling and the process of molecular communication between cells. In microvesicle-mediated intercellular communication, vesicles released by a donor cell must bind to the plasma membrane of a recipient cell in order to deliver their cargo to the target.

Despite the important physiological role of vesicle-plasma membrane fusion and vesicle endocytosis, the details of the physical interactions between microvesicles and the plasma membrane are still poorly understood. To better understand the forces which occur between microvesicles and cells, we experimentally investigate single liposome binding events with a supported lipid bilayer. We employed total internal reflection fluorescence (TIRF) microscopy to observe liposome interactions with a supported lipid bilayer, and compare the experimentally observed bond lifetimes to the theoretical estimates. Our experimental observations indicate that bond lifetimes increase with both increasing liposome size and decreasing temperature.

One Step Microwave Dendrimer Synthesis of Monodisperse Silver Nanoparticles with Narrow Size Distribution

Jewell Anne Lee Hartman, Christopher A. Funari, Justin Case, Kyle Culhane, Bryce Brownfield, **Anatoliy O. Pinchuk**

We present a novel one-step method for the synthesis of silver nanoparticles (AgNPs) with narrow size distribution using a one-step microwave dendrimer assisted technique involving PEI and AgNO₃. The microwave synthesis parameters were optimized in terms of time, temperature, and pressure. The PEI acts as both a reducing agent and a stabilizer for the particles. Various ratios of AgNO₃ to PEI, as well as weight percentages of PEI, were investigated in the experiment. We have determined the relationship that exists between the ratio and the size distribution of the nanoparticles formed in the microwave. Information regarding the size distribution is verified by using the UV-visible spectroscopy. An estimate of the size of the NPs has also been verified by using the dynamic light scattering (DLS). Further possible research involving the microwave dendrimer synthesis and other noble metal nanoparticles will be discussed.

Aqueous nanoparticle colloids and biopolyelectrolytes

Olena Zribi, *Yuriy Garbovskiy*, **Anatoliy Glushchenko**

We present a merger of two research directions: a study of aqueous nanoparticle colloids and biological polyelectrolytes. Majority of biomedical applications of nanoparticles require stable aqueous colloids of nanoparticles as a starting point. A new method of preparation of aqueous solutions of ferroelectric barium titanate nanoparticles was developed and generalized to preparation of stable aqueous colloids of semiconductor nanoparticles. This high energy ball milling technique is low cost, environmentally friendly, and allows for control of nanoparticle size by changing milling time. Aqueous colloids of BaTiO₃ nanoparticles are stable over time, maintain ferroelectricity and can be used as second harmonic generating nanoprobe for biomedical imaging. We use these tunable nanoparticle colloids (coated with variety of easy-to functionalize surfactants) to study novel self-assembled structures in systems comprised of biological polyelectrolytes F-actin and DNA. Said nanoparticles act as simultaneous imaging and aggregation-inducing probes bringing forth exciting potential applications in bioengineering and biomedicine.

Psychology

The Therapeutic Merits of Blogging

Nate Baumann

A collection of current articles on blogging, the psychological benefits of writing, and the merits of internet sociality are examined with relation to depressed individuals. The literature discusses the psychological benefits of writing, such as emotional expression, exploration of the self, and catharsis. The integration of social media may provide support to those who feel isolated due to depression. Writing may be more beneficial when participants write about something meaningful, and people feel less alienated and more supported when they are a part of social internet groups. This combination of findings suggests that writing about meaningful thoughts and experiences in a social environment may provide more psychological benefits than either entity alone. This poster presents a research proposal examining the therapeutic effects of blogging as they pertain to individuals with depressive symptoms when compared to the therapeutic effects of writing alone. We expect that participants that blog as well as participants who use a journal will see a decrease in depressive symptoms, but the blogging group will see more positive effects through the power of social support.

Differential Psychological and Neuropsychological Functioning By Types of Trauma Exposure

Arjun Bhalla, B.A., Scott Hanneman, Nadia Al-Tabaa, B.S., Jordan McDonald, B.A., & Robert Durham, Ph.D.

In the *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; DSM-5; American Psychiatric Association, 2013), new diagnostic criteria for posttraumatic stress disorder (PTSD) have been refined. Criterion A characterizes a qualifying traumatic event or stressor to be either directly experienced (Criterion A1), or witnessed as it is occurring to others (Criterion A2). Criterion A3 includes learning of threatened or actual death of family members or friend being violent or accidental in nature (American Psychiatric Association, 2013). The current study examined group differences in functioning based on type of trauma exposure in childhood. Participants were administered two assessment batteries: the Coolidge Axis II Inventory – Revised (CATI+; Coolidge & Merwin, 1992) and the Childhood Experiences Behavior Questionnaire (CEBQ; Simons et al., 2008). 474 individuals participated in the study. 135 undergraduates (Age Range = 18-57, $M = 22.98$, $SD = 6.85$) could be classified into the three criteria or multiple trauma exposure groups. Results of one-way Analyses of Variance (ANOVAs) revealed no significant differences in current psychological functioning; however, neuropsychological dysfunction scores were significantly different across groups, with the “directly experiencing” group scoring highest on neuropsychological dysfunction, $F(3, 131) = 3.58$, $p = .016$. Specific neuropsychological differences were found in language, $F(3, 131) = 3.42$, working memory language, $F(3, 131) = 4.92$, and neurosomatic symptoms, $F(3, 131) = 3.31$, $p = .022$. Results illustrate type of trauma exposure in childhood may have differential impacts on neuropsychological development and functioning in adulthood.

Social Network Composition in Senior Housing Compared to a Normative Sample

J. Carroll & S. H. Qualls

A move into senior housing can both interrupt social networks and add new opportunities for social contact, yet shifts in the composition of social networks after move-in have not yet been documented in detail. Literature suggests that a move should not impact the closest members of the network, but could benefit the friend and acquaintance membership. In this study, Antonucci’s concentric circle task assessed social network membership in a sample of 49 residents two to three months after moving into an independent living senior residence. Compared to a national sample (Antonucci & Akiyama, 1987), the present analysis found network composition following move-in to be significantly larger in the inner circle ($M = 8.92$ versus 3.5 in national norms) and middle circle ($M = 7.57$ versus 3.2 nationally); whereas the outer circle was similar ($M = 2.71$ versus 2.0 nationally). Larger inner and middle circles in the present sample may indicate heightened family closeness during the transition into senior housing. However, the small size of the outer circle points to the rarity of including other senior housing residents as acquaintances a few months following move-in. A qualitative analysis of the identity of members of the circles points to ambivalence about integrating new acquaintances into the network. Further, more specific analysis quantifying the proportion of fellow senior housing residents compared to total network membership after move-in provides content to support this qualitative observation.

Case study of AbleLink HealthCare Manager Use with Home Health Clients

J. D. Gentry, M. A. Doffing, **S. H. Qualls**, D. K. Davies (E.C.), & S. Stock (E.C.)

The rate of demand for professional health care and direct-care workers is expected to dramatically outpace supply over the next decade as the baby boomer generation surges toward retirement. How will this generation of 78 million seniors be able to remain as independent as possible while increasingly burdened by the onset of multiple, chronic, medical conditions and a decline in cognitive abilities when the demand for home health services is larger than the supply available? One approach to assist aging in place is to use new technologies to help improve self-directed personal health care compliance along with remote health monitoring tools for professional caregivers while maximizing quality of care for seniors with disabilities. The current project is a case study of the implementation of the AbleLink HealthCare Manager (HCM), a personal healthcare support system that aims to make it easier for seniors to perform personal health care activities and to track health care actions that have been completed. The case study approach used an A B A B design with one week at each phase. The A phase utilized paper tracking forms and the B phase utilized the HCM to collect data. Participants reported that the HCM was easy to use although they needed a little help feeling confident with using the device at the beginning of the study. Over time, participants became more familiar with and more comfortable doing the health tasks, felt more confident that they could manage their own health and believed that doing the health tasks will reduce how much their health issues affect their everyday life. In a final endorsement of the HCM, most participants reported that they would like to continue using the device after the end of the study.

Picture Content Affects Older Adults' Speech Fluency

Lori James, Chelsea Placzek, & Brittany Chambers

In the present study, we examined the effect of picture content on speech disfluencies by analyzing the picture descriptions provided by participants in James and Kooy (2011). Young and older participants saw and described six pictures, three containing visual errors or anomalies and three containing no errors. We expected that the presence of errors in the to-be-described pictures would require participants to form novel representations both visually and verbally. It was hypothesized that the presence of errors would disrupt speech, resulting in more speech disfluencies for pictures containing visual errors than for those without errors. It was also hypothesized that older adults would have more speech disfluencies than young adults overall, and that older adults' speech would be particularly compromised for pictures containing visual errors. A 2 x 2 ANOVA on percentage of words that were speech fillers (e.g., "um," "ah") showed an interaction between error presence and age, because older adults produced more fillers than young adults when describing pictures containing errors, but there was no age difference when describing pictures without errors. A separate 2 x 2 ANOVA on percentage of words containing all other speech disfluency types revealed a main effect of age group, but no main effect of error presence, nor interaction. We suggest that older adults' speech was differentially disrupted by the need to form novel representations of the errors, leading to the increased production of filler terms.

The Relationship between Healthy Diet Adherence and Mental Well-Being in a Population of Low Income, Ethnically Diverse Patients with Pre and Type-2 Diabetes

Anna Lalik

In the U.S. roughly 8.3% of total population is affected by some form of diabetes mellitus (CDC, 2011). Of those with diabetes, 90-95% have type 2 diabetes mellitus (T2DM; CDC, 2011). Insufficient diabetes self-management increases rates of disability, health costs and mortality (Nam et al, 2011). Depression and T2DM are often comorbid and depression has a negative impact on diabetes management (Tovar et al, 2013). Research suggests that over 60% of diabetic, low-income patients might exhibit clinical levels of depressive symptoms (Renn, Steers, Jay & Feliciano, 2013). Therefore, understanding factors contributing to depression in this population is crucial. This study examines the relationship between self-reported adherence to a healthful eating plan as assessed by the general diet subscale of The Diabetes Self-Care Activities measure (SDSCA – GD) and emotional well-being as measured by the WHO-5 scale in a population of pre diabetic and type 2 diabetic, low-income, ethnically diverse primary care patients. Calculations identified a positive and statistically significant correlation between WHO-5 and SDSCA–GD scores, $\tau = 0.22$, $z = 3.40$, $p < .001$ such that higher scores (indicative of less depressive symptoms) are associated with more days of following a healthful eating plan/diet. These results point to the importance of investigating dietary patterns in low income, ethnically diverse, diabetic populations in depression and diabetes treatment research. The application of these findings could improve diabetes treatment and management aid through affording health care providers the ability to better understand how changes in following a healthy diet might result in changes in wellbeing and vice versa. Low scores in one area could draw provider attention to the other area and thus result in more effective care.

Reinstated Fear Increases Over Time

Nicole Streeb

A common treatment for individuals with phobic anxiety disorders is exposure to the feared stimulus until fear is reduced, a process called extinction. Although fear may be extinguished, it is also possible for a subsequent conditioning experience to produce a recovery of fear after extinction, a phenomenon known as reinstatement. The present study observed fear in rats by measuring “freezing,” defined as the absence of all movement except breathing. The purpose of the present study was to use the freezing response to investigate whether an increase in reinstated fear to a discrete conditioned stimulus would occur with a delay between reinstatement and testing, and whether any delay effect would generalize to a different stimulus. After extinction of fear to a tone, rats were given reinstatement with either the same or different stimulus and then reinstated fear was tested after either a short or long interval. An increase in reinstated fear over time was observed but did not generalize to a different stimulus.

School of Public Affairs

Hate Crimes Committed by Whites against African Americans

Omar Algarni

This paper examines the significance of hate crimes in the United States as well as statistics offered by the Federal Bureau of Investigation's Uniform Crime Reports (UCR) Department in the year 2012. The paper explores the legislation that anchors the reporting and collation of hate crimes in the U.S. namely, the 2009 Matthew Shepard and James Byrd, Jr. Hate Crimes Prevention Act (HCPA) so as to provide further understanding about hate crimes and annual reports. I argue that the importance of hate crimes and statistics as compiled by the UCR is meant to address the issue of criminal activities that are motivated by bias or hate. A hate crime refers to any crime that is motivated by bias that may be on the basis of religion, race, ethnicity, gender, sexual orientation or disability. Discussion will center around the notion that hate crime statistics in the US as availed by the FBI play an important role in highlighting the state of affairs in regard to hate crimes and enables the relevant agencies to take appropriate measures. However, it need be noted that the same could have been as a result of underreporting of such hate related crimes to the law enforcement agency. In conclusion, the paper makes the case that there is a need for additional measures to be put in place to encourage the reporting of hate crimes and address instances of perpetration of such crimes.

Campus SaVE Act: Mandatory Violence Prevention Education for Students and Employees

Carrie Baatz, BA; Catherine Kaukinen, PhD

The 2013 reauthorization of the Violence Against Women Act included new legislation called the Campus SaVE Act that mandates violence prevention education for all incoming students, staff, faculty and administrators in higher education institutions. As a part of their ongoing efforts to prevent dating violence, domestic violence, stalking and sexual assault at UCCS through the Respect on Campus program, Dr. Kaukinen and Carrie Baatz are collaborating with other offices on campus to ensure that UCCS becomes compliant with this new law.

Biases in the Criminal Justice System against the Mentally Ill Living in High Poverty Areas

Amy Bunn

The Bureau of Justice Statistics (2006) found that about 40 percent of jail inmates and 30 percent of state and federal inmates had suffered from a mental disorder without any history of mental illness symptoms. These rates of mental illness are significantly increasing in minority populations; specifically in high poverty areas. In this paper, I assess the prevalence of mental illness among high poverty areas and the likelihood of these individuals to end up in the criminal justice system. Special attention is paid to biases in the criminal justice system against those in poverty suffering from mental illness. While many cases of poverty can be attributed to an individual's social and environmental history, I focus on previous familial and social relationships among the mentally ill found within the criminal justice system. I discuss the role of media on the construction of mental illness and its relation to criminal behavior. I assess the importance of training and knowledge about mental illness within the criminal justice system as well as the need for specialized structures for the mentally ill who do find themselves involved in criminal behavior.

Can we put the 'Just' in System Justification? Perceptions of Fairness in Legality by Social Class

Lauren Duke

System Justification theory states that people are motivated to defend and legitimize social systems that affect them (Jost & van der Toorn, 2012). This serves the palliative function of lowering negative affect partnered with injustice that is perceived from the system; meanwhile, system justification also increases positive affect in order to gain satisfaction with the "status quo". Studies have shown that once someone has a need to justify the system, they will produce ideologies, even at their own expense. Women will agree with stereotypes associated with their gender, disadvantaged groups will favor advantaged groups of which they do not belong, and low-income groups will not support policies like economic distribution, even though they would presumably benefit the most from it. This overview of system justification is explored as it applies to social class, particularly lower income and disadvantaged groups. Research previously conducted will provide basic assumptions and in depth theories as to why those who benefit least from the systems they are apart of are more willing than others to justify and defend those systems.

A Theoretical Examination of Involvement in Street Gangs

Timothy Fahy

Street gangs can be seen as a major issue within inner city areas drawing a lot of specialized attention from the police of said cities, due to the violence and illicit activities that they draw. Examining the reasoning behind involvement in street gangs can be critical in creating effective policy with intent to interrupt the operation and activities of violent street gangs. In this paper I examine existing literature on street gang membership and applying theoretical framework to explain reasons why an individual would stay involved with a street gang despite the danger they face based off of their membership. This look at street gang membership will call into question the effectiveness of current policing strategies, and will offer up potential new ideas of how to properly approach the problems associated with street gangs.

Chinese criminal groups and transnational crimes: How they affect U.S. national security

Kornrattha Henry

A wide variety of Chinese criminal groups are active in the United States. Some are based exclusively in the United States, while others have links to triad groups in Hong Kong and Taiwan, and some to Chinese communities in other countries. Chinese criminal groups conduct transnational crimes including smuggling narcotics, people and arms. They also involve in illegal prostitution, violation of intellectual property rights and gambling. This study examines the Chinese criminal groups that have conducted transnational crimes and impact U.S. national security interests. . The study will focus on the groups, activities, nature of each crime and how the groups relate to each other. More focus will be placed on the impact such crime organizations have on U.S. national security.

Dating Violence among College Students: The risk and protective factors

Catherine Kaukinen, PhD

The research review synthesizes the knowledge base on risk and protective factors for dating violence while highlighting its relevance to violence against college women. In particular the review highlights the personal, family, relationship, and behavioral factors that heighten the risk for dating violence victimization and perpetration, while also noting the methodological limitations of the current body of empirical research and identifying directions for future academic work. Researchers have identified the correlation between risky health and behavioral factors and dating violence, most often modeling these as part of the etiology of dating violence among college students. Less often have scholars explored these as co-occurring risk factors. This approach to dating violence may be used to develop meaningful and impactful interventions to reduce the incidence and prevalence of college dating violence while also addressing the other health risk behaviors that impact academic success and place students' well-being at risk.

The impact of Cheyenne Mountain Reentry Center (CMRC) on offender recidivism

Catherine Kaukinen, PhD; Ráchael Powers, PhD (E.C.)

Using secondary / administrative data from the Colorado Department of Corrections we examine the effectiveness of the Cheyenne Mountain Reentry Center (CMRC) in preparing offenders for return to the community (all of whom are Colorado Department of Corrections inmates). We used "return to prison" as the measure of recidivism for the project. This study used a quasi-experimental design (propensity score matching) and survival analyses to evaluate the effects of participation in CMRC programming on the subsequent recidivism of program participants relative to an equivalent control group (identified from the Colorado Department of Corrections data). Given that an extensive criminal history can impact the probability of recidivism through collateral consequences, analysis is further restricted to individuals whose current offense was their only offense. These inmates should be the most receptive to correctional programming. In our analyses we find that the CMRC inmates recidivate slightly less than matched controls, however, the difference is not statistically significant.

Camouflage is the New Black: Women Veterans in the Criminal Justice System

Heather Kling

According to the US Department of Justice (2004), approximately 10% of those serving time in state and federal prisons are veterans. Of those veterans, approximately 1% are women veterans, around 1,400. Although it is difficult to obtain exact numbers, due to the drawdown or ceasing of military operations in recent years, the number of women veterans and those incarcerated has increased. As with their male counterparts these veterans are dealing with trauma, homelessness, mental health disorders and physical disorders. This study examines the path of how these female veterans went from service to incarceration. Particular focus will be on the experiences of female vs. male veterans and how certain disorders or life experiences may have contributed to the female veteran ending up in prison.

Juvenile Labeling in the Criminal Justice System and The Effects

Herlinda Krystofiak

This paper explains why parents, family and society shouldn't label children or adolescents. Particular focus will be placed on why negative labels have an adverse outcome on the child or juvenile. Emphasis of the negative label includes stigma and internalization which can lead to a negative self-image. Youth who are labeled as "criminals" or "delinquents" may hold these as self-fulfilling prophecies believing the labels that others assign to them thus acting upon the negative labels. Youth who are labeled and troubled become distanced from society and find themselves in deviant lifestyles. Implications will be discussed for how the criminal justice system negatively labels juveniles and how that relates to their overall delinquent status.

Race, Crime, Profiling, and Stereotyping: NY's Stop and Frisk Law and Arizona's Senate Bill 1070

Sunday Omikorede

A 2005 Executive Order exercised by Arizona Attorney General Janet Napolitano stated that Arizona Police cannot use race, skin color, or ethnicity to pull someone over under new racial profiling guidelines. On another account, a 2013 report from the Office of the Attorney General (OAG) noted that in New York, 150,000 arrests resulted from the more than 2.4 million stops conducted between 2009 and 2012 under the Stop and Frisk law. This research paper will seek to address changes to policies, attitudes, and perceptions in respect to evolution among the different races in regards to race, crime, profiling, and stereotyping. A focus will be put on policies such as the New York State's: Stop and Frisk", and Arizona's Senate Bill 1070 and their impact on the people (especially minorities) within their respective states and the interest of other states in adapting such measures in curbing crimes and illegal immigration.

"Get tough" Juvenile Sentencing as an Adult

Duangkamol Pongsiri

Juvenile violence began increasing in the 1990's. Since then, nearly every state passed legislative enactments to toughen the trial and sentencing of juveniles through the adult criminal court. Juvenile sentencing as an adult represents efforts to deter juvenile offenders to commit serious crime and reduce recidivism. This paper focuses on juvenile sentencing guidelines and the discrepancy of adolescent youths tried as an adult offenders. The outcomes of punishments with the age ranges and offenses of the juvenile offenders will be presented. Policy implications will be discussed in which the consequences of juvenile justice reform are necessary to be reasonable. Punishments should be in consideration of juvenile justice and emphasized on the rehabilitation and treatments.

Decriminalization of Drug Use in the United States

Tiffany Steckler

The Bureau of Justice Statistics (2013) found that in 2012 there were around 323,000 offenders incarcerated for drug offenses in both state and federal facilities. This statistic includes possession and other types of drug offenses. This study discusses the decriminalization of personal drug use and possession. This study also evaluates the cost of treatment and rehabilitation versus incarceration. Furthermore, this work discusses what implications decriminalization of drug use would have on corrections in the United States. Decriminalization of personal drug use has already been instituted in other countries and some of their results and success rates will also be used to advocate for decriminalization of personal drug use and possession in the United States.

Drug Wars: The Effect on Mexico's Criminal Justice System

Adrian Vasquez

In 2011, 19 out of 50 most violent cities in the world were in Mexico. According to a Harvard University study (2012) this was due to the President Felipe Calderon's stance against the drug cartels and their response to the disruption of their illicit trade. The drug wars in Mexico have had a profound effect on the government's ability to control violence in the country. The drug wars have also had a tremendous effect on the quality of life for the citizens of Mexico. This study examines the effects the drug wars have on the criminal justice system in Mexico and specifically examines the violence surrounding the illicit drug market. Implications of this research will focus on law enforcement response to the illicit drug trade.

The role of genetic factors in substance abuse and in development of delinquency

Henriikka Weir

While medical research generally views substance abuse as a disorder owing to a combination of both biological and environmental risk factors, criminological research classifies it as antisocial behavior and seeks for predisposing factors in social/environmental influences. Building on this backdrop, the present study examined the relative contribution of genetic and environmental factors in substance abuse and delinquency among substance abusers. Using the twin sample from the National Longitudinal Study of Adolescent Health, the current study uncovered two prominent findings. First, 33 percent of the variance in substance abuse was attributable to genetic factors with the remaining variance being explained by nonshared environmental factors. Second, utilizing group-based trajectory modeling techniques, heterogeneity in the development of delinquency among substance abusers was explored and the findings suggested genetic factors play a role in the development of different offending patterns.

Undergraduate Research Academy

Biology

Genetic basis of adaptation in *Drosophila mettleri*

Kim Hoang

Adaptation is the force that creates the incredible range of diversity found on earth: organisms adapt to their unique environment and become unique themselves. While the concept of adaptation has been understood for some time, the molecular basis that underlies adaptive traits is still poorly understood. Here we investigate the molecular mechanisms involved in host-plant adaptation in *Drosophila mettleri*, a fruit fly that utilizes soil soaked in rotting cactus as its feeding and breeding substrate. Specifically, we compared the gene expression of two populations of *D. mettleri* reared on different cactus hosts, each of which has a distinct chemical composition. We detected overrepresentation of classes of genes that were differentially expressed between cactus treatments, including those involved in metabolic, protease, and mitochondrial activities. We also found certain detoxification genes differentially regulated between larvae reared on their natural host and an alternative host, suggesting these are likely candidates in helping *D. mettleri* adapt to its host cacti.

The RNA binding protein Cg11505 functions in multiple cell types during *Drosophila* neurogenesis

Mary Morton and Hannah Steinert

Neurons often exhibit highly complex cellular morphologies that are necessary for proper cellular function and for establishing appropriate neural connections. Post-translational gene regulation has recently been implicated in dendrite morphogenesis and the plasticity of neurite morphology during learning. RNA binding proteins (RBPs) play an integral role in directing mechanisms of post-transcriptional regulation of gene expression including translation, splicing and mRNA localization. To determine the extent to which post-translational gene regulation mediates neurite morphogenesis, we previously conducted an RNA interference (RNAi) screen in *Drosophila melanogaster* to identify RBP encoding genes involved in the elaboration of the highly complex dendritic trees of Class IV dendritic arborization (da) neurons. The screen identified Cg11505, a well conserved but previously uncharacterized RBP, as an important player in dendrite elaboration in da neurons. Objective: We performed a detailed molecular genetic analysis of cg11505 throughout *Drosophila* embryonic and larval development to determine the requirement of cg11505 in multiple cell types during morphogenesis. Methods: We used in situ hybridization, immunofluorescence and RT-PCR to investigate the spatial and temporal expression pattern of cg11505 throughout development. In order to investigate the requirement of cg11505 function in various cell types, we generated a cg11505 deletion allele using P element mediated excision. We also utilized the Gal4/UAS system to activate cg11505 RNAi in a cell type specific manner. Results: Our expression analyses reveal that cg11505 mRNA and protein is present in the central nervous system, peripheral nervous system, tracheal system and germ-line stem cells (GSCs) during embryonic development. Interestingly, we find that cg11505 mRNA is localized during oogenesis and early embryogenesis. Moreover, our results indicate that Cg11505 functions in the morphogenesis of the neuromuscular junction. Conclusions: Taken together, our analyses indicate a role for cg11505 in the development of multiple cell types during *Drosophila* development and suggest that cg11505 is itself regulated at the post-transcriptional level.

History

How to Process an Archival Collection

Tawnie Mizer

The collection and storage of information is critical to understanding the past and determining the future. According to William Pollard "Information is a source of learning. But unless it is organized, processed and available to the right people in a format for decision making, it is a burden, not a benefit." Organizing and processing this information is the principle job of the archivist. In the summer and fall of 2013 I interned with Mrs. Mary Rupp UCCS Archives Librarian to learn the archival procedures of processing an unprocessed archival collection in the UCCS archives. This exhibition focuses on the process of organizing, arranging, processing and creating the finding aid for UCCS's archival collection of the Carmen Abeyta Papers. Examples from my experience will serve to illustrate the different steps of the process while my notes showcase the finding aid.

Carmen Abeyta attended UCCS as a student from 1976-1980. During this time she began working on campus until her position was eliminated in 1981. She returned to work on the campus in 1986 and worked in various capacities in the student services area until her retirement in 2010. Many of her positions included student event programming where her strong interest in diversity and multicultural events were engaged. The materials in her collection help to document the evolution of diversity activities at UCCS from the 1970's to 2012. The collection also helps ensure that UCCS's history, of activities, social traditions and administrative functions are preserved for future generations of students and researchers.

Mechanical and Aerospace Engineering

Numerical Analysis of Argon within a Single Minichannel High-temperature Heat Exchanger for Beamed Energy Propulsion Applications

Mario Arias

The requirement that the propellants used in launch vehicle systems must also provide the thermal energy to be converted to kinetic energy in the rocket nozzle has limited rocket designers. Beamed propulsion systems, however, avoid this constraint by placing the energy source on the ground and transmitting the energy to the spacecraft via microwaves. This computational work evaluates the transfer of energy from the mm-wave to the fuel, Argon in this case, through the heat exchanger, and the feasibility of providing propulsion for the spacecraft. The input energy was 1.3 kW and was applied both as an evenly distributed flux as well as a Gaussian distribution, the latter of which more accurately represents the energy distribution of the mm-wave. The increase in axial temperature along the 0.1 m long channel was as high as 2500 K. In addition, it was found that despite the very small diameter of the minichannels, 1 mm, each design produced extreme temperature gradients across the channel cross section which in turn affected the velocity profile.

Computational Modeling of Intracranial Aneurysms

Colin Curtis

The purpose of this research is to develop models of intracranial aneurysms that elucidate the process that leads to their rupture, which can cause severe brain damage or even death. Four axisymmetric models of intracranial saccular aneurysms, based on patient data, are presented and analyzed. The diameters of each model are 4 mm, 6 mm, 8 mm, and 10 mm. Each model assumes a simplified spherical geometry for the aneurysm in order to develop insight into the mechanisms that effect wall shear stress and deformation of the membrane. Analytical models are first developed based on Stokes equations for viscous flow in order to derive a stream function that describes the vortical flow inside a sphere representative of flow inside a real aneurysm. The resulting flow patterns are then implemented into finite element models of a spherical aneurysm that account for the deformation and stress of the membrane. Each model is subjected to clinical blood flow velocities that range from 0.3601 m/s to 0.3653 m/s. As the aneurysm diameter increases, the internal stress experienced by the aneurysm membrane also increases, with the maximum stress being located near the fundus of the aneurysm. The maximum wall shear stress caused by the fluid, however, decreases with aneurysm diameter. The wall shear stress and internal membrane stress computed in this study compare favorably with previous studies of intracranial aneurysms that have similar geometric and fluid properties.

Feasibility Study of a Terrestrial High Energy Advanced Thermal Storage System

Faraz Saleem

With advancements in technology and the associated increased energy demands, alternative energy research is needed. The sun provides more than enough energy to meet all of Earth's energy demands as well as being a clean renewable energy source. Solar energy's main flaw is that it typically requires direct sunlight which is not possible during the evening hours. This research investigates using a High Energy Advanced Thermal Storage (HEATS) system in order to circumvent this issue by storing energy in a phase change material (PCM) during the day for use at night. The PCM for this project was silicon due to its ability to store a high amount of thermal energy per unit of mass. Using silicon as a way to store solar energy should ultimately reduce the amount of land used in Concentrating Solar Plants (CSP) due to its high energy density. The research goal of this study was to size a phase change material (PCM) to provide the same energy input as a boiler in a Rankine Cycle and predict thermal performance of the system. In addition, the amount of solar concentration needed to completely melt this quantity of PCM was also examined.

Development of Stereoscopic Non-intrusive Active Positioning System (Snaps) for Biomimicry

Corbin Spells

The increasing demand for autonomous robotic swarms stems from the large allocation of operating costs in the budget for current systems. Modern systems require high levels of human intervention to provide high survivability rates. For instance, satellite constellations have continuous guidance from ground controllers, which costs up to 85 percent of most space missions. An intelligent system with the ability to assess situations and react freely addresses these problems. Autonomous robotic swarms are already a reality but do not incorporate decision making ability. A system modeled after animal behavior provides a solution due to the fact that animal herds and flocks possess the necessary survival instincts that have allowed them to adapt to changing circumstances. The desire to mimic biological behavior to develop a control algorithm requires a high level of fidelity, which has been overlooked in other biomimetic control algorithms. A stereoscopic camera system has been developed to determine possible spacing and interactive behavior of herds and flocks. This data will aid in the development of a control algorithm to reduce the human element in the control loop.

Psychology

Comparing Computerized Performance Validity Tests Under Two Social Manipulations

Jason Adams

The Test of Memory Malingering (TOMM) and Green's Word Memory Test (WMT) are common tests used to discriminate between valid neuropsychological impairment and test scores that may be invalid (e.g., due to malingering, poor effort, a lack of motivation, etc.). Elucidating environmental factors that contribute to variance in test performance is essential to enhance test validity. The TOMM and WMT may be administered with the examiner present or absent during the testing; however, any effect of the presence versus absence of the examiner is yet unknown. Past research has suggested that test scores may differ depending on whether or not the examinee is being observed. The goal of the current study was to determine whether subjects perform better on the TOMM and WMT with the examiner present rather than absent. We administered the TOMM and WMT to a total of 99 undergraduate psychology students ($M = 22.9$ years, $SD = 6.3$ years) using a mixed design with the examiner either present or absent during test administration; test order and examiner present/absent were counterbalanced. Statistical analysis did not demonstrate significant differences in performance between subjects for whom the examiner was present versus absent, although the results for the TOMM and WMT indicate the presence of ceiling effects. The results of the current study suggest an individual's performance on the TOMM and WMT are independent of the presence of the examiner.

Promoting Activity Engagement in Older Adults with and without Dementia

Sandra Garcia

Activity engagement improves quality of life and reduces the risk of developing dementia among community dwelling older adults. Since activity engagement is beneficial in later life, it becomes important to promote activity engagement in older adults with dementia, as they tend to often disengage as their dementia progresses. This decline in engagement may occur due to difficulties initiating leisure activities independently, communicating needs, and caregivers may not be accurate in predicting activity preferences. Preference assessments (PA; structured choice making opportunities) can be effectively used to determine likes and dislikes among individuals with dementia. The present study will examine the utility of PA and the stability of preferences (i.e., one and six months after the initial assessment) in 40 (34 females, 6 males) community dwelling older adults, with a mean age of 75.13 years ($SD = 7.71$), and in two females with dementia, with a mean age of 92 years ($SD = 7.07$). Thus far, 80% of community dwelling older adults met the criteria of $r=0.5$ when comparing initial preferences to one-month preferences, and 84% of community dwelling older adults met the correlational cut off of $r=0.5$ when comparing initial preferences to six-month preferences and one-month to six-month preferences. Fifty percent of the individuals with dementia demonstrated stability between the initial and one-month assessment points. Results from the present study will improve knowledge as to the types of activities that seniors enjoy, better understand what activities need to be programmed to promote activity engagement, and will increase the quality of life of older adults with dementia.

Centers

Biofrontiers

Utility of nanoparticles for drug application

Simon Marinelli

Application of Barium hexaferrite nanoparticles aid in administering the drug, Dextromethorphan (DXM), to patients with excessive buildup and thickening of mucosal fluid; magnetic properties of Barium hexaferrite allows for versatile movement through the mucus via rotation of the particles with a magnetic field. Utility of the particles will allow drug application that previously could not permeate the fluid, rendering them ineffective in suppressing the buildup.

Center for Science, Technology, Engineering and Math Education

Predictors of Pikes Peak Math Teachers' Circle Effectiveness

Paige A. Nelson, Isabel A. Davis, **Dionisia R. de la Cerda** and **Dave H. Khaliqi**

Math Teachers' Circles have been shown to be effective in increasing inquiry-based practices in the classroom and self-efficacy in math instruction. UCCS Center for Science, Technology, Engineering and Math (STEM) Education created the Pikes Peak Math Teachers' Circle (PPMTC) to aide in these efforts for teachers in the surrounding area. Per state standards, less rigorous course work in mathematics is expected of students in lower grade levels than in upper grade levels. Therefore, it was predicted teachers working with lower grade levels would be able to focus more on their teaching methodology, thus showing improved reformed teaching practices and developing greater levels of self-efficacy as opposed to those teaching higher levels of math. School type (public versus other) was also predicted to affect teacher self-efficacy and changes in inquiry-based practices since they have different resources available. Twenty-four teachers completed the Reformed Teaching Observation Protocol, Local Systemic Change through Teacher Enhancement, and Science Teaching Efficacy Belief Instrument pre and post surveys. While PPMTC was effective in increasing self-efficacy and inquiry-based practices overall, the best predictors of whether or not PPMTC would be effective were grade level and type of school.

Trauma, Health and Hazards

Veteran Treatment Courts: The Course of Recovery

Raine Lamb, Justin Miller, *Michelle Slattery, Mallory Dugger, Justin Ahl*

After five years of diligent work by the court team, the evaluation team, and the peer mentors, this Veteran Trauma Court has allowed veterans to regain a healthy lifestyle. This poster explores the long process to recovery for returning soldiers who have participated in this treatment court over the years. This Veteran Court is located in Colorado Springs, Colorado, home to five military bases. Many of these veterans have suffered from a condition called Post Traumatic Stress Disorder, or PTSD. This health issue is often diagnosed after veterans find themselves caught within the justice system, needing treatment, but facing incarceration. With the help of the Veteran Trauma Court, these veterans can face their illness without discrimination. This poster provides a visual representation of the collective work done by not only the court, but also the veterans.

Why did the driver cross the flooded road? Texas motorists describe why, how and if they get to the other side

Cedar League

In the U.S., an average of 92 people die from floods annually, and 63% of flood deaths are vehicle-related. Texas is known as “Flash Flood Alley” and in 2007, flash floods were responsible for at least 42 deaths, of which, 76% were vehicle-related. Despite the progress made in technological innovation, flood mitigation, and warning communication, flood fatalities remain high due to inadequate human behavior. This study addresses the driving behavior of motorists in the Dallas-Fort Worth Metroplex. Two focus groups were conducted with 18 residents of Fort Worth to identify the physical, technological, spatial, temporal and social circumstances that influence driving decisions during flash flood conditions. Participants indicated flash flooding is a very localized issue. Reasons that DFW motorists will drive through a low-water crossing include: the car in front made it; longer alternate routes; previous experience; vehicle type; and having a low risk perception. Participants indicated they do not by-pass barricades or emergency vehicles, but they will disregard flashing lights instructing them to turn around if they judge the water levels to be low enough to cross or if it has been raining only for a short time. Participants suggested installing rulers at each crossing to aid in decision-making, along with barricades when roads are impassable. PSAs were recommended for public education. This study informs the installation of a new radar network in the Metroplex called CASA, and how CASA’s integrated flood warning system may help to improve public response to flash flooding.

Abstract Index by Author

(Alphabetized by first author if there is more than one)

Name(s)	Title	Page #
Adams, Jason	Comparing Computerized Performance Validity Tests Under Two Social Manipulations	43
Aldrich, Lukas	Reduced Order Modeling Lithium Ion Cell Degredation	10
Algarni, Omar	Hate Crimes Committed by Whites against African Americans	35
Amundson, Tom	Using Biomimicry to Improve Solar Collection Technology	13
Arias, Mario	Numerical Analysis of Argon within a Single Minichannel High-temperature Heat Exchanger for Beamed Energy Propulsion Applications	41
Baatz, Carrie Kaukinen, Catherine	Campus SaVE Act: Mandatory Violence Prevention Education for Students and Employees	35
Ballast, Andrew	Experimental Investigations of Liposome to Supported Bilayer Binding Events	30
Barajas, Sarah	Missing Mothers	25
Barnett, Erin Haggren, Wendy Schoffstall, Allen	Synthesis and testing of triazoles	20
Baumann, Nate	The Therapeutic Merits of Blogging	31
Bhalla, Arjun Hanneman, Scott Al-Tabaa, Nadia McDonald, Jordan Durham, Robert	Differential Psychological and Neuropsychological Functioning By Types of Trauma Exposure	32
Bosworth, Ryan	Comparison of Numerical Methods to Determine the Effects of Non-Equilibrium on Solutions of Hypersonic Flows	14
Bowers, Spenser	Content Analysis of Eating Disorder Policies and Procedures of Collegiate Institutions	5
Brandau, Katrina	Cell Voltage Monitoring with MATLAB	10
Brlansky, JT (John)	Dynamic Observation and Control of Ultrasound Contrast Agent Microbubbles	14
Bukovsky-Reyes, Santiago Buxton, Katherine E. Owens, Janel E.	Comparative Study of Chlorogenic Acid Concentrations in Foods: Fresh Fruit, Canned Fruit, Fruit Juices, and Coffee	20
Bunn, Amy	Biases in the Criminal Justice System against the Mentally Ill Living in High Poverty Areas	35
Butler, Chris Allen Schoffstall	Controlling Competing Organic Reactions	20
Byler, Katie J.	Mickey Mouse Clubhouse 33	25
Carroll, J Qualls, S.H.	Social Network Composition in Senior Housing Compared to a Normative Sample	32
Cordova, Maria	Iconography Creating Place in Silverton, CO	29
Craze, Melin	Femininity in Disney	25
Curtis, Colin	Computational Modeling of Intracranial Aneurysms	42
Duke, Lauren	Can we put the "Just" in System Justification? Perceptions of Fairness in Legality by Social Class	36
Engle, Joshua	The Development of a Spectral Lens for Transient Luminous Event Spectroscopy	14

Fahy, Timothy	A Theoretical Examination of Involvement in Street Gangs	36
Ferguson, Kelli	Does Handedness Predict Side of Groin Strain Injury in Rough Stock Riders?	6
Fitzpatrick, William Wickert, Mark Semwal, Sudhanshu	3D Sound Imaging with Head Tracking	11
Follett, Danny Pigage, Jon Pigage, Helen	Seasonal Habitat Selection by Non-migratory Female Mule Deer (<i>Odocoileus hemionus</i>) in a Semi-arid Environment	18
Forand, Daniel Jones, Kande	RNA-binding proteins regulate dendrite morphogenesis in <i>C. elegans</i>	19
Fraser, Jacqueline	Sexism Within Disney	25
Garcia, Sandra	Promoting Activity Engagement in Older Adults with and without Dementia	43
Gardner, Michael Sampsel, Sheena Jenkins, Werner W. Owens, Janel E.	Fast Forensic Toxicology: Quantitative Analysis of Fentanyl by DLLME and GC/MS	21
Gentry, J.D. Doffing, S.H. Davies, D.K. Stock, S.	Case study of AbleLink HealthCare Manager Use with Home Health Clients	33
Ginebra, Roser	Manifold Design for a High Temperature Heat Exchanger	15
Graul, Jacob	Optical Lattice Gas Heating Numerical Simulation and Detection	15
Guido, Jeffrey Thomas	An Approach to the Active Defense of Wireless Radio Networks	11
Hartman, Jewell Anne Lee Funari, Christopher A. Case, Justin Culhane, Kyle Brownfield, Bryce Pinchuk, Anatoliy	One Step Microwave Dendrimer Synthesis of Monodisperse Silver Nanoparticles with Narrow Size Distribution	31
Henry, Kornrattha	Chinese criminal groups and transnational crimes: How they affect U.S. national security	36
Hernandez, Nancy	Scholarship Policies for Latino High School Students With Less Than a 3.0 GPA	17
Hickerson, Katlin	Challenges Female Athletic Trainers Face As Parents	6
Hoang, Kim	Genetic Basis of Adaptation in <i>Drosophila mettleri</i>	40
Hoffman, Nicole	The Hidden Secrets Of Disney	26
Hofreiter, Hadley	The Horns behind the Mouse Ears	26
Hunnicut, Jennifer	The Effects of a Plyometric Training Program on On-Ice Jump Performance in Collegiate Figure Skaters	6
James, Lori Placzek, Chelsea Chambers, Brittany	Picture Content Affects Older Adults' Speech Fluency	33
Kaukinen, Catherine	Dating Violence among College Students: The Risk and Protective Factors	37
Kaukinen, Catherine Powers, Ráchael	The impact of Cheyenne Mountain Reentry Center (CMRC) on offender recidivism	37
Kim, Eun Owens, Janel E.	Headspace Liquid-Phase Microextraction Analysis of Putative Hydraulic Fracturing Compounds	21
Kirihennedige, Nuwanee J.	The Flying Carrot, Food Literacy Educational Model	7

Kling, Heather	Camouflage is the New Black: Women Veterans in the Criminal Justice System	37
Krystofiak, Herlinda	Juvenile Labeling in the Criminal Justice System and The Effects	38
Kupferman, Scott	Partnering with People with Disabilities to Develop Accessible Technology	17
Kupferman, Scott Nusbaum, Emily A.	Relational Accessibility: Expanding the Paradigm	17
Lalik, Anna	The Relationship between Healthy Diet and Mental Well-Being in a Population with Type-2 Diabetes	34
Lamb, Raine Miller, Justin Slattery, Michelle Dugger, Mallory Ahl, Justin	Veteran Treatment Courts: The Course of Recovery	44
League, Cedar	Why Did the Driver Cross the Flooded Road? Texas Motorists Describe Why, How and If They Get to the Other Side	45
Lillie, Chris Ann	Making of the Princesses	26
Marinelli, Simon	Utility of Nanoparticles for Drug Application	44
Martin, Ben Brandon, Chris Stewart, James J. Braun-Sand, Sonja	On the Accuracy of PM7 in Modeling High Resolution Protein Data Bank Structures	21
Mathew, Jasmine	Racism in Disney	26
McGirr, Joseph Kelly, Whitney	Post-mating reproductive isolation between populations of geographically isolated <i>Drosophila arizonae</i>	19
Miller, Will	Disney: Rewriting History	27
Mizer, Tawnie	How to Process an Archival Collection	41
Morton, Mary Steinert, Hannah	The RNA binding protein Cg11505 functions in multiple cell types during <i>Drosophila</i> neurogenesis	40
Munk, Emily Haggren, Wendy Braun-Sand, Sonja	Isolating a cloned Hexokinase I enzyme from <i>Saccharomyces cerevisiae</i>	22
Myers, Chris	Monitoring Post-Fire Surface Treatments in Blodgett Peak Open Space	29
Nelson, Paige A. Davis, Isabel A. de la Cerda, Dionisia R.	Predictors of Pikes Peak Math Teachers' Circle Effectiveness	44
Neu, Sean	Bubble Dynamics During Collapse Near a Rigid Boundary	15
Nibbe, Claire	Disney: The Real Fairy Tales Behind the Magic	27
Omikorede, Sunday	Race, Crime, Profiling, and Stereotyping: NY's Stop and Frisk Law and Arizona's Senate Bill 1070	38
Ortiz, Robert O., Jr.	Effectiveness of Active Recovery Interventions on the Athletic Performance of Professional, Collegiate, and Competitive Level Adult Athletes: A Systematic Review	7
Ortiz, Tony	Frequency, Key and Mode Detection in Music	11
Osborn, Joshua	Disney in Japan, the influence of Disney in collaborations with Japanese companies	27
Peterson, Kerry A. Garrett, Susan L. Benton, Melissa J.	Academic Self-Efficacy and Psychological Distress in Undergraduate Nursing Students	4

Peterson, Kerry Kaukinen, Catherine Powers, Ráchael Baatz, Carrie	Evaluation of Two Dating Violence Prevention Programs on a College Campus	4
Pierce, Amanda Carne, Glenda	Jean Charlot, Religiosity and the Catholic Southwest	18
Pigage, Jon Bono, Jeremy Wettstein, Peter Herlik, Stephanie Pigage, Helen	Preliminary Investigation of Evolutionary Genetics of the Tassel-eared Squirrels (<i>Sciurus aberti</i>) Using Restriction-site Associated DNA Sequencing (RAD-Seq)	19
Pina-Thomas, Deborah Peterson, Kerry A. Garrett, Susan L. Benton, Melissa J. Schlairet, Maura C. James, Kynthia L. Carter, Laura E.	Differences in Academic Self-Efficacy and Self-Esteem in Beginning and Experienced Baccalaureate Nursing Students	9
Pinto, Morgan Haggren, Wendy Braun-Sand, Sonja	A Path to Biofuel Production: Engineering Yeast to Digest Starch	22
Plett, Gregory Trimboli, M. Scott	Research in Battery Management and Control	12
Pongsiri, Duangkamol	"Get tough" Juvenile Sentencing as an Adult	38
Prescott, Kathryn Tvrdy, Kevin	The Separation and Absorption Spectra Analysis of Single Walled Carbon Nanotube Samples by Chirality	22
Pujol, Laia Ragues	Computational modeling of a system of microbubbles: Application in HIFU thermal therapy	15
Read, Rebecca L. Haggren, Wendy Owens, Janel E.	Antibacterial Effects of Silver Nanoparticles Prepared by Microwave-Assisted Synthesis	23
Reynolds, Kirstin	Misleading our "little Princesses"	27
Roller, Robert C.	Automatic Dependent Surveillance-Broadcast: A Low-Cost Prototype Receiver	12
Rowland, Jackson Tvrdy, Kevin	Functionalized Hydrogel Synthesis for Single-Chirality Single-Walled Carbon Nanotube Separation	23
Ryan, Hannah Galega, Ralph Richey, Chris Asay, Christy Haggren, Wendy Braun-Sand, Sonja	Mutational analysis of yeast hexokinase I	23
Saleem, Faraz	Feasibility Study of a Terrestrial High Energy Advanced Thermal Storage System	42
Schlachter, Bethany	Unmasking the Underlying Messages Behind Disney	28
Seebeck, Shannon Orban, David Barrett, Christopher Owens, Janel E.	Dispersed Liquid-Liquid Microextraction with Matrix Solidification for the Analysis of Tetrabromobisphenol-A (TBBPA)	24
Sloan, Stephen	The Design, Fabrication, and Evaluation of Millimeter Wave Lenses for Beamed Energy Applications	16

Spells, Corbin	Development of Stereoscopic Non-intrusive Active Positioning System (Snaps) for Biomimicry	42
Steckler, Tiffany	Decriminalization of Drug Use in the United States	38
Stepisnik-Brown, Danicia	One Disney for All	28
Stetzel, Kirk	Model-based Estimation of Lithium-Ion Cell Internal Physical State	12
Streeb, Nicole	Reinstated Fear Increases Over Time	34
Sundquist, Nathaniel	Synthesis of 2-hydroxy-3-(4-phenyl-1H-1,2,3-triazol-1-yl)propyl benzoate using various methods of copper catalysis	24
Svette, Sean	Motivations for Participation in Community Gardens	8
Syn, Benjamin	What Lettuce, Parsley, and Clover Teach Us about Disney's Tangled	28
Tekamp, Les Wickert, Mark	Radio Receiver Signal Processing using Hands On Hardware Experiments	13
Tow, Samantha	Experimental and Computational Determination of the Thermal Properties of a Phase Change Material	16
Tredway, Jeremy	Modeling the Impact of Impervious Surfaces on Stream Flow in Templeton Gap Wash and Prescribing Restorative Watershed Enhancements	30
Tucker, Elizabeth	The Impact of Recess Before Lunch on Student Plate Waste, Academic Performance, and Discipline Rates	8
Tully, Andrea K. Johnson, Simon Owens, Janel E. Jenkins, Werner W.	Analysis of Synthetic Cannabinoids by GC/MS and HPLC	24
Vasquez, Adrian	Drug Wars: The Effect on Mexico's Criminal Justice System	39
Waite, Alicia	Disney Workers	28
Weir, Henriikka	The role of genetic factors in substance abuse and in development of delinquency	39
Xavier, Marcelo Araujo	Lithium-Ion Battery Cell Management: A Model Predictive Control Approach	13
Zhao, Rui Yue, Chuan	Vulnerability and Risk Analysis of Two Commercial Browser and Cloud Based Password Managers	10
Zribi, Olena Garbovskiy, Yuriy Glushchenko, Anatoliy	Aqueous nanoparticle colloids and biopolyelectrolytes	31

Featured Speakers



Cheryl Kelly Buening

Cheryl Kelly is an Assistant Professor in the Department of Health Sciences, Beth-el College of Nursing & Health Sciences. Over the last 10 years, she has worked to identify barriers to physical activity and healthy eating and strategies to reduce obesity and diabetes. Her research focuses on the relationship of the built environment and related policies with healthy behaviors, including access to grocery stores, sidewalks, parks and safe neighborhoods. As a health education specialist, Dr. Kelly helps communities identify ways to improve the built environment in support of healthy choices and evaluate whether these changes have been successful. She currently teaches Research Methods, Health Promotion Program Planning and Evaluation and Physical Activity and Health at the undergraduate and graduate levels.



Lisa M. Hines

I received interdisciplinary training in the areas of epidemiology, genetics and proteomics. My research goals are to apply this knowledge to improve public health, and more recently, to enhance biology education. Within the area of public health, my efforts have primarily focused on studying breast cancer. Specifically, I am trying to elucidate why Hispanic women have lower rates of breast cancer compared to non-Hispanic White women yet worse prognosis. Health disparities research has helped to provide a new perspective on the complex molecular mechanisms of breast cancer etiology, which could ultimately contribute to improved preventive measures and treatment strategies. A few years ago, my research took on a new direction as a result of the 2009 Vision and Change Report. As echoed by Bruce Alberts in his Grand Challenge to Science Educators (April 2013), educators must “incorporate active science inquiry into all introductory college science classes”. However, data supporting this recommendation are limited to selective undergraduate settings, and the benefits are ill-defined due to methodological limitations of prior published studies. In collaboration with a few UCCS colleagues, we set out to rigorously test if this approach is truly feasible and beneficial in different educational settings in order to advance efforts toward biology curricular reform. With support from the National Science Foundation, we developed and evaluated an eight-week research experience entitled “Soakin Up the Rays with *Schizosaccaromyces pombe*” (SUR). During 2011-13, we implemented and evaluated this research experience in the equivalent introductory-level general biology course at UCCS and Pikes Peak Community College, as well as in the research methods course of UCCSTeach program. Our assessment results revealed both anticipated and unanticipated findings, which I will reveal during my presentation.

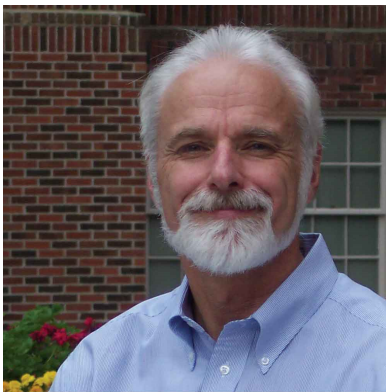
Jugal Kalita



Jugal Kalita has taught in the Department of Computer Science at UCCS for the past 24 years. He received his Ph.D. from University of Pennsylvania. He has a Masters degree from University of Saskatchewan (Canada) and a Bachelors degree from Indian Institute of Technology (Kharagpur, India). Professor Kalita's areas of expertise are Artificial Intelligence, Human Language Processing, Machine Learning and Bioinformatics. He has published over 130 refereed papers in journals and conferences and has written two books. Professor Kalita has supervised 50 undergraduates in research, and has published more than dozen papers with undergraduate authors. Professor Kalita has received grants worth over 2.5 million dollars during his years at UCCS. Seven of these are major grants are from the National Science Foundation.

Keynote Speaker

Chris Jenkins



The primary purpose of Bio-Inspired Engineering (BiE) is to expand the design space of possible solutions to technical problems. Human technologists have always taken cues from nature but in the last few decades there has been renewed interest in the topic. Nature has had eons to develop solutions to a host of specific problems, many of which are similar to problems with which we grapple. For the engineer, the ability to access the “catalog of nature solutions” expands the space of possibilities and hence has the potential to revolutionize technology. Even though the domain of biology is vast and new discoveries occur daily, much is known about biological solutions. Turning this knowledge into technical solutions is a challenge we face.

Among others, this presentation will discuss:

- An introduction to Bio-Inspired Engineering, what it is and what it isn't
- Biology vs engineering
- Evolution and optimality
- Structures and materials in nature
- Biological “smartness”
- The Bio-Inspired Engineering process

Chris Jenkins is a Professor and Head of Mechanical & Industrial Engineering at Montana State University. He is a registered professional engineer and an Associate Fellow of AIAA. Dr. Jenkins has authored or co-authored 12 book chapters, over 190 peer-reviewed journal and conference papers, and 2 textbooks, *Mechanics of Materials: A Modern Integration of Mechanics and Materials in Structural Design* (Elsevier, 2005) and *Bio-Inspired Engineering* (Momentum Press, 2012).