

MOUNTAIN LION RESEARCH DAY

Abstract Book



Gallogly Events Center
Friday, April 8



University of Colorado
Colorado Springs

Mountain Lion Research Day Schedule.....	2
Schedule of Student Talks	3
Welcome to the 2016 UCCS Mountain Lion Research Day.....	4
Abstracts	5
Student Speakers	5
Biology	5
Communication	5
Electrical and Computer Engineering.....	6
Health Sciences	7
Physics	7
Psychology.....	7
College of Business.....	8
Southern Colorado Economic Forum	8
College of Education	8
Curriculum and Instruction	8
College of Engineering and Applied Sciences	8
Electrical and Computer Engineering.....	8
Mechanical and Aerospace Engineering	11
College of Letters, Arts, and Sciences	13
Biology	13
Chemistry and Biochemistry	17
English	19
Geography and Environmental Studies.....	27
Physics	28
Psychology.....	29
Helen and Arthur E. Johnson Beth-El College of Nursing & Health Sciences.....	30
Health Sciences	30
Nursing	35
School of Public Affairs	36
Undergraduate Research Academy	37
Biology	37
Chancellor’s Leadership Class	37
Chemistry and Biochemistry	38
English	38
Geography and Environmental Studies.....	38
Mechanical and Aerospace Engineering	39
Physics	39
Psychology.....	39
Centers.....	40
Biofrontiers.....	40
Index.....	41
Notes.....	47
Featured Speakers	49
Keynote Speaker	50

Mountain Lion Research Day Schedule

Presenter Registration <i>Gallogly</i>	7:30-8:30 a.m.	
Poster Presentations <i>Gallogly</i>	8:30-11:00 a.m.	Posters are available for viewing all morning
Student Talks University Center, 116 A & B		Student speakers will give talks throughout the morning. See next page for details.
Welcome & Featured Speaker <i>Gallogly</i>	8:55 – 9:15 a.m.	Stephanie Bontrager Ryon <i>Relationships and Research</i>
Featured Speaker <i>Gallogly</i>	11:15-11:30 a.m.	Willie Harrison <i>Physical-Layer Security and Coimbra, Portugal</i>
Luncheon Welcome <i>Berger Hall</i>	11:45 a.m. – 12:00 p.m.	Kelli Klebe
Keynote Speaker <i>Berger Hall</i>	12:00 – 1:00 p.m.	Anne Libby <i>Research Mentoring as Practice for Lifelong Success</i>

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

Schedule of Student Talks

Time	University Center, room 116A	University Center, room 116B
9:20 - 9:35 a.m.	<p>Tom Ebersole</p> <p><i>Training for Success: Veterans Transition and Communication</i></p>	<p>Erin Jordan</p> <p><i>Functional Assays of Post Mating-Prezygotic Isolating Candidate Genes in Drosophila arizonae and D. mojavensis</i></p>
9:40 - 9:55 a.m.	<p>Paige Whitney</p> <p><i>Presenteeism and Physical Activity</i></p>	
10:00 - 10:15 a.m.	<p>Jennifer Roberts</p> <p><i>The Impact of Alzheimer's Disease Risk Reduction Education on Dementia Worry</i></p>	<p>Jackie Cromer</p> <p><i>Physics-based models of commercial lithium-ion cells</i></p>
10:20 - 10:35 a.m.	<p>Christopher R. Butler</p> <p><i>Experimental and calculated studies on the regioselective reduction of 1H-1,2,3-triazole esters</i></p>	<p>McKenna Lovejoy</p> <p><i>Non-Uniformity Correction using Non-Linear Characteristic Performance Curves for Calibration</i></p>
10:40 - 10:55 a.m.	<p>Jewell Anne Lee Hartman</p> <p><i>Novel Molecular Metamaterial: Refractive Index Measurements of Extended Metal Atom Chains</i></p>	<p>Adam Smiley</p> <p><i>Estimating Battery Age Using an Interacting Multiple Model Kalman Filter</i></p>

Welcome to the 2016 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)

Terry Boulton
Chair of Innovation
and Security



Tom Duening
Chair of Business and
Entrepreneurship



Michael Larson
Chair of Engineering and
Innovation



Abstracts

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

Student Speakers

Biology

Experimental and calculated studies on the regioselective reduction of 1H-1,2,3-triazole esters

Christopher R. Butler, **Allen Schoffstall**

Recently it was discovered that ester substituents at the 1- and 5-positions of 1H-1,2,3-triazoles can be regioselectively reduced whereas esters at the 4-position remain intact when treated with sodium borohydride in methanol solution at room temperature. It has also been observed that the rates of these reductions is greatly influenced by the presence of substituents at the 1-position of the triazole ring as well as the presence or lack of an ester substituent at the 4-position of the ring. The Spartan molecular modeling program has been utilized to explain not only the reduction, but also the rate at which the reductions occur. A correlation exists between the low electron density at the C-5 ring carbon adjacent to the ester and the reduction rate of the ester. The relative electron density at C-5 plays a major role in the ability of the ester to be reduced and the rate at which the reduction occurs.

Functional Assays of Post Mating-Prezygotic Isolating Candidate Genes in *Drosophila arizonae* and *D. mojavensis*

Erin Jordan, **Jeremy Bono**

Biological speciation is the result of taxa acquiring traits that reproductively isolate or limit gene flow between populations. Many traits have been identified that restrict copulation (prezygotic isolation), and traits that make hybrid offspring less fit are clearly recognized (postzygotic isolation), however traits that play a role post-mating, pre-zygotic isolation (PMPZ) are poorly understood. The rapid evolution of reproductive proteins has been an epic discovery in the field of evolutionary biology in recent decades. Upon copulation, successful molecular coordination between sperm and ovum includes bypassing the female immune system, orienting sperm to egg by chemotaxis, successful sperm storage and release, and bidding sperm to egg. Failure to coordinate at any aforementioned step, resulting in reproductive isolation, encompasses PMPZ isolation. Given the recent divergence of *D. mojavensis* to *D. arizonae*, the identification of PMPZ barriers between these species could yield insight into the question of how genetic isolating traits accumulate. Interestingly, recent evidence has suggested the male transfer transcripts to the female. One such transcripts, named *GI20218*, is a *D. mojavensis*/*D. arizonae* male reproductive gene that has known orthologue in *D. melanogaster*. Using a molecular genetic technique called CRISPR-Cas9, we generated a *GI20219* knockout in *D. arizonae*. *We have identified that females mated to GI20219 KO's lay fewer eggs than females mated to wildtype males.* We have also used CRISPR-Cas9 system to generate 3x flag-tagged *GI20219* protein, which we hope to co-immunoprecipitate from the female reproductive tract and identify interacting protein partners for his genes.

Communication

Training for Success: Veterans Transition and Communication

Tom Ebersole

Training our veterans how to communicate once they have departed the military is an important issue. The military experiences many different transitions during their military careers, but nothing like transitioning from the military to civilian life. The objective and purpose of this training is to obtain a better communicative understanding of the issues that our military have encountered while transitioning from the military to life in the civilian world. This proposal will show that training our military when it comes to transitioning will play an important role in enabling them to transition using the knowledge, motivation and skills that Brian Spitzberg and other academic scholars have researched. Writing resumes, learning job interview techniques will be two classes during this seminar. Awareness of the education opportunities will benefit both the veterans, local colleges and the community. It will also show how the communication competencies are used during this training, as well. Surveys and other academic resources will be used to determine how the military is preparing our soldiers for this transition.

Electrical and Computer Engineering

Physics-based models of commercial lithium-ion cells

Jackie Cromer, Ryan Jobman

Due to their computational simplicity and robustness, equivalent-circuit-type cell models are widely used as the basis for control algorithms in battery-management systems. These models execute quickly and have relatively few parameter values to optimize to make the model calculations fit laboratory test data. However, equivalent-circuit models lack the predictive capability of physics-based cell models. For example, while equivalent-circuit models can predict a cell's current–voltage behaviors well, they cannot predict internal cell electrochemical variables such as lithium concentration or electric potential at different spatial locations internal to the cell. Knowledge of these internal variables is critical to being able to predict and control the instigators of premature aging or unsafe operating conditions. While physics-based models have much greater predictive capabilities, they also have more parameter values that must be measured or inferred to make the model match the behaviors of a real cell. We propose a methodology that minimizes the need for laborious cell tear-down and electrochemical experimentation during the system identification process. The model equations are reformulated, and specific cell level laboratory tests are crafted such that the current–voltage response isolates certain sets of model parameter values. A simple and fast optimization procedure computes the physics-based model parameter values directly from specialized lab-test data. We present results based on a virtual (simulated) cell, where “truth” values for the electrochemical parameters are known for comparison purposes. In most cases, the identified parameters have error less than 1% when compared to the truth values.

Non-Uniformity Correction using Non-Linear Characteristic Performance Curves for Calibration

McKenna Lovejoy, **Mark Wickert**, David Gardner (E.C.)

A known problem with infrared imaging is its non-uniformity. This non-uniformity stems from the fact that each pixel has its own offset and gain response. Factors such as exposure time and amplifier choice will affect the gain and offset. Calibration techniques are used to correct the non-uniformity and improve performance. However, standard calibration techniques commonly use a piecewise linear model to approximate the non-linear response. This often leaves unacceptable levels of residual non-uniformity. Calibration techniques often have to be repeated during use to continually correct the image.

The goal of this study is to determine and compare alternative non-uniformity correction (NUC) algorithms. Ideally the results will provide better NUC performance resulting in less residual non-uniformity as well as reduce the need for recalibration. This study will consider non-linear NUC curves such as higher order polynomials and exponentials. These alternative techniques will be compared with the common, piecewise linear approach. Performance will be compared based on RMS errors, error envelopes, peak errors, residual non-uniformity and the impact quantization has on correction.

Estimating Battery Age Using an Interacting Multiple Model Kalman Filter

Adam Smiley, **Gregory Plett**, **M. Scott Trimboli**, **Willie Harrison**

As aging processes in a lithium-ion cell progress, they affect the operational boundaries the battery management system uses to ensure that the health of the cell is preserved while still meeting the demands of the system it is connected to. While there are existing methods for identifying how aging processes have affected the health of a cell, there is no method for non-destructively identifying to what extent different aging processes contributed.

This research presents a method to estimate the state-of-health of a lithium-ion cell, as well as estimate the chemical mechanisms that contributed to cell aging. First, a method to estimate changes to critical cell parameters due to significant cell aging processes is established. The aged cell parameters are then used to produce reduced-order physics-based models in state-space form. A selection of possible aging configurations are modeled, representing the state-of-health of a cell from its beginning-of-life parameters to a defined end-of-life condition. These are used as the system model within a set of nonlinear Kalman filters to produce an estimate of cell voltage and state-of-charge.

The interacting multiple model Kalman filter method is utilized to blend the results of each model, and to produce a probability mass function that identifies the aging model that best fits the system measurements. The ability of the interacting multiple model Kalman filter to estimate aging and aging mechanisms is shown for a variety of possible configurations.

Health Sciences

Presenteeism and Physical Activity

Paige Whitney; **Mary Ann Kluge, PhD; Margaret Harris, PhD; Michele Okun, PhD**

The phenomenon of presenteeism is defined as a decrease in on-the-job performance and productivity due to the presence of physical and/or psychosocial symptoms or conditions. Research indicates a powerful intersect between employee health and productivity. The phenomenon of presenteeism has grown in awareness and necessitates additional research. In addition, physical activity is recognized as a key component to both mental and physical health; however, little research has examined the impact physical activity has on presenteeism. Therefore, the purpose of this study is to explore the relationship between physical activity and presenteeism through extracting evidence from both qualitative and quantitative methodologies. A purposive sample of University of Colorado Colorado Springs faculty and staff (n=33) participated in a one hour focus group followed by the completion of validated questionnaires highlighting the following areas: general health, physical activity, perceived stress, and presenteeism. Initial findings suggest a negative association between physical activity and levels of presenteeism. Findings from this study will add dimension to the topic of presenteeism while also demonstrating the potential positive impact of physical activity interventions in the workplace.

Physics

Novel Molecular Metamaterial: Refractive Index Measurements of Extended Metal Atom Chains

Jewell Anne Lee Hartman, Simon Alexander Marinelli, Devan Sebastian Cruz, Justin G.B. Case, Kyle Culhane, **Anatoliy O. Pinchuk**

Materials whose electric and/or magnetic properties are artificially dictated rather than intrinsic are known as metamaterials. Since Victor Veselago's theoretical prediction of metamaterials in 1967, modern optics has focused on developing microscopic and nanomaterials with pre-engineered properties not normally found in nature. Theoretical work by Shen in 2014 predicted that the heterocyclic annulenes in extended metal atom chains may function as molecular split ring resonators that respond in the optical frequency region. Synthesis and purification of nickel-based extended metal atom chains with 2,2'-dipyridylamine bridging ligands have been successfully performed. Thin films of the synthetic material were then developed on glass via thermal evaporation. Refraction of light through the film and glass was experimentally measured through determining the shift of intensity as a function detector position at various angles of incidence. Optical measurements were taken over a broad range of the visible spectrum. The experimentally determined refraction was then compared to Snell's law in order to obtain the refractive index of the synthesized EMAC.

Psychology

The Impact of Alzheimer's Disease Risk Reduction Education on Dementia Worry

Jennifer Roberts, **Molly Maxfield**

As dementia rates increase, older adults may be more prone to worry about developing dementia. It may be that poor understanding of dementia and its causes contribute to worry. In an experiment, we examined whether health and risk reduction education would reduce dementia worry. We hypothesized that participants exposed to basic information about Alzheimer's risk reduction would report lower levels of dementia worry compared to participants who read about a control topic.

Sixty-four adult participants (aged 60 - 84 years, $M_{age} = 70.55$, $SD_{age} = 5.61$) completed self-report surveys assessing neuroticism, general health worry, affect, social desirability, dementia worry, and intention to engage in healthy behaviors. Participants were randomly assigned to either the experimental group (Alzheimer's disease risk reduction education) or the control group (falls and fractures risk reduction education).

Correlations and a one-way ANOVA were computed to assess the relationships between variables. Dementia worry was positively correlated with neuroticism and health worry and negatively correlated with physical activity, suggesting that dementia worry is associated with negative indicators of psychological and physical health. There was not a significant effect of education on dementia worry, $F(1, 62) = 1.86$, $p = .18$.

Based on the results of this study, it appears that rudimentary education about risk reduction is not enough to reduce dementia worry. It may be that individuals with high levels of dementia worry require more than basic information to alleviate that concern. Future research will examine what amount of information would be effective.

College of Business

Southern Colorado Economic Forum

Southern Colorado Economic Forum Updates

Tatiana Bailey and *Rebecca Wilder*

The Southern Colorado Economic Forum (SCEF), a research arm of the UCCS College of Business, brings together state and local experts from the public, private and academic sectors to provide an annual report on the health of the regional economy. The annual Forum offers the community a snapshot of local economic activity and provides forecasts to help businesses plan for the coming year. SCEF also produces a quarterly update of a few key indicators, and in recent months, SCEF has produced a dashboard of metrics sent to sponsors on a monthly basis. This valuable research about where our community has been and where we are headed is made possible through a partnership between the UCCS College of Business and many business sponsors. This long-standing partnership between the academic and business communities has produced timely, accurate and objective information to guide local business for almost twenty years.

For past publications, visit our website: www.SouthernColoradoEconomicForum.com.

College of Education

Curriculum and Instruction

Collaborative Teaching to Promote Inclusion: Faculty and Student Perspectives

Scott Kupferman, Wilson Buswell (E.C.)

The presenters have co-taught a special education course at UCCS over the past two years. Their collaborative teaching approach has helped UCCS students understand and advocate for the inclusion of people with disabilities in our society. This presentation will explore both faculty and student perspectives related to collaborative teaching.

College of Engineering and Applied Sciences

Electrical and Computer Engineering

Comparison of synthetic methods for copper(I)-catalyzed fluorinated triazoles

Laura George, Breanna Tracey, Allison Duensing, **Allen Schoffstall**

Several variations of Cu(I) catalysts have been reported for use in the preparation of 1,4-disubstituted 1H-1,2,3-triazoles. Some of these have been adopted in our lab to prepare triazoles containing fluorinated groups at the 1 and 4 positions. The method reported most often used sodium ascorbate and copper (II) sulfate to generate the copper(I) catalyst along with heating of the reaction mixture. Conventional heating and microwave heating methods were used. Another catalytic method used 1,3-bis(2,4,6-trimethylphenyl)-imidazolium copper(I) chloride as the catalyst, used no reaction solvent and required no heating. These methods will be compared by product yields and product purity of various fluorinated triazoles synthesized

Design and Stimulation of a Brainwave Controlled Neuroprosthesis

Alfredo Guillem, **Carlos A. Paz de Araujo**

Every day, an important amount of people have their bodily function diminished. Spinal cord, nerves, muscles, or any of the five senses function improperly or stop working due to accidents, diseases, or injuries. This is a desperate situation for a patient. He wants to get a sip of his but he cannot; human research exists for this, to try to give a solution to problems.

To restore the lost function of injured patients and give them a better life when life is already difficult, that is the objective of neural prostheses, such as a robotic arm. Building a neural prosthesis needs progress on several disciplines like neuroscience, medicine, engineering, biology, and anatomy. Despite being a challenge, this thesis reviews what is behind the development and simulation of brain controlled prosthetic arm, and then presents a design solution.

We start with survey of neuromorphic and neural models, and a study of the state the art in the field of neuroprosthetics. Then, we explain the muscle movement by describing the connection from the brain to the nervous system, and to the muscle. At the muscle we described this process through electromyography. After that, we translate it to a practical example of a basic design of an arm prosthesis and an EMG simulator, and emphasize on the consideration to be taken into account in a real case scenario. Finally, we show an example of how a robotic arm could be controlled with brainwaves, and talk about the future of brain-controlled prostheses.

Developing a Test Fixture for Lithium-Ion Battery Control Research

Wesley Hileman

Lithium-ion batteries (LIBs) are commonly used to power electric vehicles due to their high energy density and power-delivery capability. Unfortunately, the full energy capacity of LIBs is not realized in many applications due to incorrect operating constraints derived from low fidelity cell models. Currently, UCCS's electrical engineering department is developing improved models of lithium-ion electrochemistry. These models have the potential of greatly increasing the utility of current LIBs.

This project's objective is the creation of a test fixture for stimulating, enforcing controls on, and monitoring LIBs to facilitate model refinement. Once complete, the fixture will be capable of charging LIBs and emulating the operation of electric vehicles for research purposes.

The test fixture in development consists of five top level elements: (1) a LIB suitable to power a small electric vehicle, (2) a stack of Linear Technology LTC6803 and LTC6804 chips used to monitor and discharge the battery's cells, (3) a remotely-adjustable bidirectional power source capable of emulating an electric motor (AeroVironment MT-30 and ABC-170), (4) a switch module designed to safely connect the battery to the bidirectional power source, and (5) a PC-based unifying command and data-handling tasks implemented in MATLAB. Presently, software drivers for the individual elements have been created and integrated into basic charge and vehicle-emulation programs. Future development will likely encompass repair of sensors in the switch module, creation of modular control algorithms for the emulation program, and internet-based test scheduling.

Characterization of the Photovoltaic Silicon Solar Cell Hot Spot Reliability Problem in Partially Shaded Solar Modules

Paul Lundquist

The performance of a photovoltaic solar cell can be degraded by the heat generated in it when a reverse bias voltage is produced across it in a partially shaded solar module (panel). The heat generated produces a hot spot. The operation of single crystal silicon and multicrystalline silicon solar cells was characterized by several tests: current vs. voltage (I vs. V) power curve, forward bias voltage dark current graph, and reverse bias voltage leakage current measurements. A solar simulator built using DC powered LED lamps and halogen lamps illuminated each solar cell being tested. Hot spots were produced in a shaded solar cell which had a reverse bias voltage applied to it. A FLIR infrared (IR) camera captured the hot spot thermal image, while thermocouples also recorded temperatures. The shadow was profiled to measure the amount of shading on the solar cell. The measured hot spots and their temperature was studied as a function of shading.

Real-World Physical-Layer Security Coding: Software Radio Proof of Concept

Jordi Nonell, **Willie Harrison**

Physical-layer security is derived from the fact that there exist physical locations from which an eavesdropper can only observe degraded communications. Coding and/or signaling techniques can then be implemented to exploit this degradation to bring about security, preventing eavesdroppers from being able to deduce the transmitted message. In this work, a real transmission system has been established as a testbed to allow the classification of a physical space into two differentiated zones, the first where the eavesdropper is able to retrieve the plain-text message, and the second where the eavesdropper cannot retrieve the message. This information has then been correlated to a group of physical parameters that describe the communications channel quality, such as SNR, to identify hard dependencies throughout the two zones. Furthermore, this work shows how the physical location of the eavesdropper and the correlations to channel quality are affected when modifying some basic transmission parameters in a digital communications system, e.g., the modulation scheme or the codes deployed.

Rate-Adaptable Convolutional Codes for Maximum Throughput

Sam Schmidt, **Willie Harrison**

In this work, an adaptive convolutional coding system for arbitrarily changing binary symmetric channels (BSC) is presented. The channel to be considered is the hard-decision fading channel with Gaussian noise, which can be accurately modeled as an arbitrarily changing BSC, where bits are flipped with a certain probability as a function of the fading coefficient plus Gaussian noise. The system uses two convolutional encoders with rates $\frac{1}{4}$ and $\frac{3}{4}$, and dynamically switches between them as the severity of the fading in the channel makes either one more desirable than the other. Knowledge of the channel is obtained at the transmitter through a feedback training message sent from the receiver. At the receiver, an innovative decoding method based on the well-known Viterbi algorithm is used. The decoding method does not require the receiver to have any knowledge of the channel or code transitions, as it will adaptively choose the correct decoder based on the best-path principle in an expanded Viterbi trellis, but does place limitations on the convolutional codes that can be used. The codes must have the same number of output bit streams and the same free distance, however, the constraint lengths and rates of the codes are not constrained by the decoder. This system supplies the end user with a hassle-free solution to maximizing throughput in a practical setup without reducing the reliability of the point-to-point communications.

Using the ARM Cortex-M4 and the CMSIS-DSP Library for Teaching Real-Time DSP

Mark Wickert

In this paper we describe experiences working with the Cortex-M4 microcontroller in a graduate/senior elective real-time DSP course. Previously the same course used dedicated DSP processors, but the invitation from the ARM University Program to try out a new Lab-in-a-box (LiB) kit for teaching real-time DSP was intriguing. The hardware is inexpensive, costing only \$50, thus allowing students to buy their own boards. The LiB comes with teaching materials, but beyond the use of the audio codec software library, essentially all of this new course was developed by rewriting teaching materials from a previous course, and making extensive changes to adapt to the new software and hardware. Of particular interest is CMSIS-DSP, the Cortex-M Software Interface Standard (CMSIS) DSP library, which contains over 60 DSP algorithms in both fixed-point and floating-point. By using this library students become familiar with the Misra C coding standard, and software re-use. Developing algorithms in C from scratch is still needed and encouraged. When writing a custom filter algorithm for example, the students can benchmark against one or more CMSIS-DSP library algorithms. The Digilent Analog™ Discovery PC-based instrumentation and the use of Jupyter/IPython notebook were also added into the new course.

Mechanical and Aerospace Engineering

Development of a Solar Concentrator Test Platform

Jonathan Cheek, James Stevens

This research project developed an apparatus for testing the effects of a solar concentrators, made from a single sheet of material, on the efficiency of photovoltaic cells or modules. The test platform developed was a solar tracker; which is a device that solar cells or modules are placed on to keep them positioned in a direction normal to the sun in order for the photovoltaic cells to receive the maximum amount of sunlight. An Arduino was utilized to capture data from the photovoltaic cells and for keeping the cells normal to the sun. The design criteria for the test apparatus was: the solar tracker had to be able to track the sun through a minimum of 120° of motion, capture data throughout the day on the output of both concentrated and non-concentrated cells, and have an azimuthal angle that can be manipulated to account for the change in the axial tilt of the spin axis of the earth throughout the year. All design criteria were met in the building of the test apparatus.

Combustion of Endothermic Fuels

Colin Curtis, Daniel Gowing, Bret Windom, Janel Owens, Louis Lowe, Thomas Bruno (E.C.)

Liquid propelled propulsion systems, which range from rocket systems to hypersonic scramjet and ramjet engines, require active cooling in order to prevent additional payload requirements. In these systems, the liquid fuel is used as a coolant and is delivered through micro-channels that surround the combustion chambers, nozzles, as well as the exterior surfaces in order to extract heat from these affected areas. During this process, heat exchange occurs through phase change, sensible heat extraction, and endothermic reactions experienced by the liquid fuel. Previous research has demonstrated the significant modifications in fuel composition and changes to the fuel's physical properties that can result from these endothermic reactions. As a next step, we are experimentally investigating the effect that endothermic reactions have on fundamental flame behavior for real hydrocarbon fuels that are used as rocket and jet propellants. To achieve this goal, we have developed a counterflow flame burner to measure extinction limits, i.e. extinction strain rates. The counterflow flame system is to be coupled with a high pressure reactor, capable of subjecting the fuel to 2500 psi and 650 K, effectively simulating the extreme environment that cause the liquid fuel to experience endothermic reactions. The fundamental flame properties of the reacted fuels will be compared to those of unreacted fuels, allowing us to determine the role of endothermic reactions on the combustion behavior of current hydrocarbon jet and rocket propellants. To quantify the change in transport properties and chemical kinetics of the reacting mixture, simultaneous numerical simulations of the reactor portion of the experiment coupled with a counter-flow flame simulation are being performed using simple compound surrogates, such as n-heptane.

Modelling and Cooperative Control of Autonomous Agents

Alex Riley, Scott Harder

The purpose of this work is to demonstrate a stable, non-linear controller that drives a group of autonomous vehicles with any initial state to follow a moving target while maintaining a given formation shape. This study shows how artificial potential field functions can be used to generate cooperative behavior between autonomous systems with a common goal. This is achieved by creating a MATLAB script modeling the interactions between autonomous agents in three dimensional space under the guidance of a distributed artificial potential field controller. Because the artificial potential field functions are non-linear, the system coefficient matrices are functions of the agents' state. Therefore the eigenvalues of the system vary in time as the relative positions and velocities of agents change. System stability implies that the system eigenvalues must eventually converge to points in the left half of the complex plane. Additionally, this study shows that the locations of the eigenvalues in the complex plane are bounded by the structure of the system's graph as demonstrated by plots of the eigenvalues against time. The simulation results demonstrate the effectiveness of artificial potential field functions in generating cooperation among independent autonomous dynamic systems. Incorporating this distributed control method into real systems such as rovers and drones, leads to the development of cooperative robotic systems that can perform complex tasks in hostile or remote locations with minimal human intervention.

New Application Horizons in Disease Diagnosis with Magnetic Resonance Elastography

Kevin Smiley, **Zbigniew Celinski** and **Janusz H. Hankiewicz**, Karl Stupic (E.C.)

Recent developments in Magnetic Resonance Elastography (MRE) provide new applications of the technique in the detection of early changes in the mechanical properties of tissues affected by certain diseases. Currently, the technique is used routinely to diagnose liver cirrhosis. The technique possesses the unique ability to map the shear modulus of the liver, both non-invasively and in-vivo. The shear modulus is a metric used to quantify the stiffness of materials and is an excellent indicator of organ health. It is hypothesized that variations in tissue elasticity will aid the diagnosis of traumatic brain injury and kidney nephrosis, which are difficult to diagnose non-invasively and quantitatively. In this project, we designed multiple piezo-based transducers to introduce shear waves into tissue-mimicking phantoms. A phantom in a cylindrical cell was designed to show the technique with simple geometry. To see the effects of varying tissue density on shear wave propagation, a transducer with a two-component phantom in a rectangular cell was designed. A transducer with the same rectangular phantom geometry was equipped with temperature control in the range of 5 °C to 45 °C. Finally, a transducer with a phantom in a spherical cell was made to mimic the geometry of the human skull. All transducer set-ups were designed to be fully compatible with a 30 cm, 1.5 T, pre-clinical MRI scanner. We present the technical details of the aforementioned transducers. Various results of shear waveforms propagating through modified agar gel phantoms are shown at different shear wave frequencies, gel densities, and temperatures.

Magnetic Resonance Elastography: A Detailed Diagnosis of Traumatic Brain Injury

Meghan Smith, Alexander Riley, Kevin Smiley, Jared Strutton, **Zbigniew Celinski**, and **Janusz H. Hankiewicz**

Traumatic Brain Injury (TBI) affects over one million Americans in sports, car accidents, and military operations each year and is notoriously challenging to promptly diagnose. Conventional Magnetic Resonance Imaging (MRI) produces very detailed morphological images of tissues based on local concentrations of water but it cannot visually distinguish differences between normal and TBI affected tissues. Magnetic Resonance Elastography (MRE) utilizes pulsed magnetic gradients synchronized with shear waves for phase contrast MR imaging to detect tissue response due to shear wave propagation. Mechanical properties of tissues are frequently changed due to tissue damage such as bruises caused by TBI and can be detected by MRE. The purpose of this project is to design and build an MRI compatible device for non-invasive studies of shear wave propagation in the human brain. We present a working pneumatic device prototype consisting of a subwoofer driver, flexible waveguide, and wave transducer. This assembly transmits pressure waves from the subwoofer to a drum transducer and phantom. Shear waves propagating through the phantom are imaged and analyzed for changes in wavelength indicating changes in mechanical stiffness. Also presented is a simplified skull model (3D print) and gelatin brain mimic with a slightly stiffer inclusion used to assess transducer efficiency and measurement precision. Additionally, preliminary MRE results of phantoms with different gelatin concentrations are shown. This prototype will be tested using a pre-clinical MRI scanner at the National Institute of Standards and Technology in Boulder, CO before being tested in a full body clinical 3 T scanner.

Broadening Frequency Range of RF Devices Using a Frequency Mixer. Pulsed NMR Application

Jared Strutton, **Zbigniew Celinski**, and **Janusz H. Hankiewicz**

Radio frequency (RF) is used to transmit and receive signals within a specific frequency range determined by instrumentation bandwidth. This limited range restricts what signals can be transmitted and received. A frequency mixer can be used to expand the desired frequency range by applying an additional signal. A double balanced mixer (DBM) combines the RF signal with the secondary signal, known as local oscillator (LO), to make an intermediate frequency (IF) signal, which is the sum or difference of RF and LO frequencies. The goal of this project is to change the operational frequency of a pulsed Nuclear Magnetic Resonance (NMR) spectrometer, currently functioning at 15.5 MHz, to 45 MHz. The existing set up is designed for ^1H NMR at 15.5 MHz in an external magnetic field of 360 mT. The frequency range expansion will allow NMR research on ^{57}Fe nuclei in the internal, hyperfine field of magnetically ordered materials. This method will be employed in BioFrontiers to the study of carbonyl iron used in pharmacology as a dietary supplement for iron deficiency treatment. The mixer can further expand the frequency of the spectrometer up to 100 MHz by changing the local oscillator frequency and reconfiguring bandwidth limiting filters. In the poster, we present the complete mixer design for transmitting and receiving channels of the pulse NMR spectrometer with bench tests.

College of Letters, Arts, and Sciences

Biology

The Genetic Basis of Reproductive Tract Incompatibilities between *Drosophila mojavensis* and *D. arizonae*.

Holly Anderson, Jeremy Bono

Speciation is a phenomenon that occurs when two populations can no longer interbreed as a result of the accumulation of reproductive isolating barriers. The molecular basis behind post-mating prezygotic (PMPZ) reproductive isolating barriers is not well known but appears to be a major contributing factor in the divergence process. My project focuses on two species of recently diverged fruit flies, *Drosophila mojavensis* and *D. arizonae*, which exhibit strong PMPZ isolation. Previous research has identified four male genes that are strong candidates for involvement in PMPZ reproductive incompatibilities, including the gene *GI11629*. The primary goal of my experiment is to test the functional role of *GI11629* in fertility and incompatibilities between species using the CRISPR/Cas9 genome editing system to create knockout lines and transgenic flies.

Exploring the Relationship Between Body Mass Index and Breast Cancer Susceptibility in Hispanic and Non-Hispanic White Populations

Lacey Hanner Bankston, Lisa Hines, Laura Fejerman (E.C.), Donglei Hu (E.C.)

Previous studies of the relationship between body mass index (BMI) and breast cancer (BC) incidence have shown disparities between Hispanic populations and Non-Hispanic White (NHW) populations. Though Hispanic women have been shown to have increased BMI, they have decreased rates of BC when compared to NHW women. This paradoxical relationship highlights a fundamental lack of understanding with respect to the etiology of this complex disease process across racial/ethnic populations. This research seeks to improve understanding of the genetic relationship between BMI and BC using single nucleotide polymorphism (SNP) data from 7,974 Hispanic and NHW women. Cross-validated logistic regression analysis of SNP (population-based, single-base DNA sequence variations) data are used to mathematically derive separate Hispanic and NHW genetic risk models unique to BC and BMI phenotypes. Phenotype models are then statistically evaluated within racial populations for population-based correlations with both BC risk and BMI. Then, models are compared across ethnic populations looking for commonalities and disparities in locations correlated with phenotypes. Finally, we hope to produce a robust classification of genetic risk loci across both phenotypes that illuminate this complex relationship in Hispanic and NHW populations. Ultimately, this research will expand understanding of the etiology of BC and contribute the limited literature on BC among Hispanic women.

Influence of pulse wave reflection upon cerebral pulsatility during acute sympathetic activation: preliminary findings

Anastasia Borner, James Pearson

Aortic pulse wave reflection indicates left ventricular afterload, predicts cardiovascular events and increases with activation of the sympathetic nervous system. In contrast to this deleterious impact upon the heart, aortic pulse wave reflection has also been hypothesized to dampen pulsatile force transmitted into the end organ. The aim of this study is to simultaneously examine cerebral pulsatility and aortic pulse wave reflection during sympathetic activation and test the hypothesis that increased aortic pulse wave reflection is accompanied by reduced end organ pulsatility. Nine participants (32±12yrs; 174±10cm; 78±15kg) completed a cold pressor test (CPT) wherein the left hand was immersed in 2-4°C water for 3 minutes. Blood pressure (mean arterial pressure; MAP) and pulse wave reflection (radial tonometry) were measured throughout. Pulse wave reflection was referenced to a heart rate of 75 bpm (augmentation index; Alx75). Middle cerebral artery blood velocity (MCAv) was measured using transcranial Doppler and pulsatility index (MCAPI) calculated using Goslings pulsatility index (systolic MCAv – Diastolic MCAv/ mean MCAv). Prior to CPT the baseline MAP (87±11mmHg), Alx75 (-3±19%) and MCAPI (0.76±0.09) were measured. At the end of the CPT both MAP (103±7mmHg) and Alx75 (15±14%) increased while MCAPI was reduced (0.63±0.05) relative to baseline (all P < 0.01). Elevations in sympathetic activation caused acute increases in blood pressure and aortic pulse wave reflection which were associated with decreased cerebral pulsatility. These preliminary data suggest that an increased reflection of the aortic pressure wave may dampen excessive pulsatile force being transmitted into the end organ.

Development and Validation of a Silver Nanoparticle (SNaP) Antioxidant Assay for the Determination of Total Antioxidant Capacity in Whiskeys

William M. Brandon, Santiago Bukovsky-Reyes (E.C.), Karen G. Dixon, Samantha Coyne, Luis E. Lowe (E.C.), **Janel E. Owens**

Previous studies have demonstrated the use of gold nanoparticles to determine total antioxidant capacity in fruit extracts whereas the use of silver nanoparticles in an antioxidant capacity assay has not been well explored. Here, we demonstrate the development and validation of a silver nanoparticle (SNaP) antioxidant assay using microwave-assisted synthesis for the determination of antioxidant measurements in whiskeys. Silver nanoparticles were prepared using 1% starch and ultrapure silver nitrate with measurement of surface plasmon resonance at 420 nm. In this new assay, prepared silver nanoparticles (500 μ L) were treated with antioxidants potentially found in whiskey (vanillin, vanillic acid, syringic acid, syringaldehyde, among others) to determine antioxidant capacity of individual antioxidants versus gallic acid equivalents. Then, antioxidant status of individual whiskey samples was demonstrated with the same assay. The method will be validated by quantitatively determining the levels of antioxidants by liquid chromatography tandem mass spectrometry. This work has the potential for serving as a rapid, sustainable method for determining total antioxidant capacity in beverages and foods.

Effects of Beetroot Juice on Cerebral Blood Flow

Andrea Davaro, David Le, Zachary Garrett, **Andrew Subudhi**

It is well noted that stroke is amongst the leading causes of death in the United States and its relation with cerebrovascular disease risk cannot be overstated. Previous research has shown the potential benefits beetroot juice (BRJ) may have on blood flow and arterial blood pressure (ABP), however, little is known about its effect on cerebral hemodynamics. It is hypothesized that BRJ supplementation can elicit similar effects on cerebrovascular blood flow (CBF) and autoregulatory function in humans. To test this hypothesis, we collected CBF and ABP values of 11 healthy, non-medicated subjects at rest and during thigh cuff testing periods (mean age, height, and weight of 27yrs, 171cm, 67.6kg, respectively). Subjects randomly consumed 2 70 mL bottles of either BRJ or the placebo 2.5hrs prior to a 5-minute resting data collection period. Autoregulatory capacity was then evaluated using a bilateral thigh cuff test; inflation to 30mmHg above the subjects' systolic BP was held for 3 minutes; thereafter, thigh cuffs were immediately deflated and analysis continued for an additional 2 minutes. This procedure was repeated for a second set of measurements. Significant increases in mean-, systolic-, and diastolic middle cerebral artery velocity (MCAv) values were observed during the BRJ intervention ($P<0.05$). Drops in normalized ABP post-thigh cuff deflation were also less ($P<0.05$) after BRJ supplementation. No significant differences in BP, rate of regulation, autoregulation index and heart rate were observed. We conclude that dietary nitrate treatment with BRJ can elicit improvements in cerebral hemodynamics and may therefore offer a viable and economical dietary strategy to reduce risk of stroke.

Antisense-RNA and Gene Regulation in E. coli

Casey Dolen, **Meghan Lybecker**

Double-stranded RNA (dsRNA) is formed when both strands of DNA are transcribed and the resulting RNAs base-pair. Sense RNA is the transcript coding for the protein and antisense-RNA (asRNA) is the RNA transcribed opposite to the sense RNA. as-RNA gene regulation mechanisms include transcription interference, inhibition of translation and mRNA stabilization and degradation via ribonucleases. Recently we identified over 300 asRNAs found in dsRNA duplexes in *E. coli*. We hypothesize asRNA gene regulation via a dsRNA intermediate is an important global mechanism of gene regulation. In this study we are elucidating the mechanism of gene regulation of an antisense RNA encoded opposite to the *dps* gene. The promoter of the asRNA was identified and characterized and we generated an asRNA depleted strain of *E. coli* by inducing a silent mutation in the promoter region of the asRNA. Mutations in this area prevent RNA polymerase from binding, transcription initiation is inhibited and the asRNA is not produced. Northern blot analyses are being conducted on the asRNA depleted strain to determine its role in *dps* gene regulation.

Delineation of a Rad26ATRIP motif that directs localization to microtubule organizing structures

R. Doss, D. Klimczak, A. Morgan, G. Williamson and **T. Wolkow**

Human ATRIP is an essential regulatory subunit of the ATR kinase that occupies central positions within DNA damage response (DDR) pathways. Interestingly, ATRIP also localizes to centrosomes, although why remains a mystery. It is also not understood why patients with nonlethal mutations in ATRIP or ATR present with microcephalic primordial dwarfism. Loss of the DDR function does not appear to influence this condition, since CenpJ mutations that disrupt centriole biogenesis in mice phenocopy Seckel Syndrome without compromising ATR-dependent DDR signaling. Here, we report that Rad26^{ATRIP} in fission yeast localizes to spindle pole bodies (SPB) by a mechanism that depends on interaction(s) within the 146 residue N-terminal region. Experiments to further delineate the necessary sequence required for localization of Rad26^{ATRIP} to the SPB are underway. The purpose that Rad26^{ATRIP} serves at the SPB may inform on the mechanism by which ATRIP and ATR mutations cause microcephalic primordial dwarfism.

Analysis of the Brominated Flame Retardant Tetrabromobisphenol-A in Dust from Consumer Electronics by LC/MS/MS

Eric Gaulke, Zachary A. Pitcher, Luis E. Lowe (E.C.), **Janel E. Owens**

Tetrabromobisphenol-A (TBBPA) is the most widely used brominated flame retardant worldwide. Despite its widespread use, especially in consumer electronics, there are very few studies reporting concentrations of this compound in the United States. Given that dust is an excellent sink for semi-volatile compounds, including TBBPA, our goal was to analyze dust collected from a local electronics recycling for levels of TBBPA. Dust samples were prepared for liquid chromatography tandem mass spectrometric (LC/MS/MS) analyses by a low density solvent-dispersive liquid-liquid microextraction method, LDS-DLLME, which we recently developed and validated. TBBPA was detected in all electronic dust samples collected from the facility, which included TVs, computer monitors, and printed circuit boards. This study is important for demonstrating: 1) applicability of the LDS-DLLME method for samples analyzed by LC/MS/MS and 2) reporting levels of TBBPA in electronics at a U.S.-based electronics recycling facility.

Transcriptional Gene Regulatory roles of the Pervasive Transcripts as-OmpX, as-RpsT, and intra-YgcB

Paul Hong, **Meghan Lybecker**

Recent advanced high-throughput sequencing has uncovered a new type of RNA, pervasive transcripts, which could play important roles in transcriptional and posttranscriptional gene regulation. Pervasive transcripts are transcripts that do not adhere to annotated gene borders or code for proteins, which were thought to be transcriptional noise. We identified two different subsets of pervasive transcripts based on the functional properties of binding to the RNA chaperone Hfq (intragenic) or binding to their sense counterpart in a double-stranded RNA (antisense) that could potentially be functional. Here, we present innovative methodologies to construct deletions of pervasive transcripts, antisense *ompX*, antisense *rpsT*, and intragenic *ygcb*, investigating the role of pervasive RNAs in gene regulation.

Is One CURE Enough: Extended Analysis of a Course Based Undergraduate Research Experience (CURE)

Alyssa Mallette, Jill Jenkins, **Thomas Wolkow, Lisa Hines**

The Programme for International Student Assessment (PISA) comparison found that American secondary students ranked 26th in math and 21st in science among the 34 developed countries reflecting the need to reform STEM education in this country. One of the most widely cited recommendations for reform efforts is the transformation from lecture-based to inquiry- and research-based curricula. Indeed, course-based research experiences challenge students to think critically and motivate them to consider careers in science. However, there are relatively few examples of CUREs in undergraduate education due to a variety of implementation barriers. With funding from the National Science Foundation, we implemented a CURE into the curriculum of an introductory biology laboratory course at UCCS, which serves approximately 250 students per year. Through this process, several barriers of implementation were identified and addressed. These data were recently published. We are now conducting follow-up on these students to determine the long-term impact of this curricular reform. Since 2011, we have followed and assessed these students as they progress through their biology education. Here, we show the progression of CURE and traditional lab participants over time in order to determine whether participating in a single CURE is enough to produce a long-term impact on student outcomes related to learning, perceptions, and motivation to pursue careers involving scientific research.

A Mission of Transition from Military Service to STEM Professional

Kimberly Mastropietro, Lisa Hines, Jugal Kalita, Pat McGuire, Phillip Morris

It is well-accepted that the United States economy is lacking skilled professionals who are knowledgeable in science, technology, engineering and mathematics (STEM). The availability of the Post 9/11 GI Bill for service members has increased the number of veteran enrollment in post-secondary institutions who are well-suited for STEM degree programs and can potentially help to fill this need for STEM professionals. However, the transition of veterans from the military environment to an academic setting poses many barriers that ultimately lead to the unsuccessful completion of an undergraduate degree and subsequent progression into the STEM workforce. With the support from the National Science Foundation, we have developed and implemented the Military STEM Scholarship Program at the University of Colorado Colorado Springs. The goal of this distinct program is to provide the necessary support for the unique needs of this underserved population to ensure that they graduate and successfully transition into professional civilian jobs within the science, hi-tech and engineering industries, or into graduate level programs. Through this program, we are also conducting research to identify the major barriers and how to overcome these barriers so that military STEM student can be successful. We will discuss our preliminary results in this poster presentation. Ultimately, the findings from this project will be informative for addressing a national issue and can serve as a model for other institutions to follow.

Elucidating the Function of the intragenic *raiA* RNA

Kim Morris, Meghan Lybecker

Recently a new class of transcripts was identified that originate from inside known genes; these intragenic RNAs function remain unknown. In this project we are characterizing the intragenic RNA that originates within the *raiA* gene in *Escherichia coli*. The *raiA* gene encodes a Ribosome- Associated Inhibitor A protein that is responsible for regulating ribosome activity during stationary phase. We hypothesize that the intra-*raiA* RNA is either a regulatory non-coding RNA or an alternate mRNA encoding a novel protein. The present study is aimed at determining the function of the intra-*raiA* RNA.

Determination of Opiates in Whole Blood by LC/MS/MS

Lorne D. Muir II, Andrea Tully, Werner W. Jenkins (E.C.), Luis E. Lowe (E.C.), and Janel E. Owens

The El Paso County Coroner's Office (EPCOO) Toxicology Laboratory has a need for determining concentration of opiates (morphine, hydromorphone, oxymorphone, codeine, hydrocodone, and oxycodone) in post-mortem blood at trace levels (< 1 ppm). In this collaborative study, we have developed a rapid analytical method for the determination of opiates in whole blood using a liquid-liquid extraction protocol with liquid chromatography tandem mass spectrometry (LC/MS/MS) analyses with chromatographic run times under 7 min. The method was developed and validated using synthetic blood where a two-step extraction with acetonitrile (pH adjusted with ammonium hydroxide) had an absolute recovery ranging from $94.9 \pm 10.2\%$ (mean \pm standard deviation) for codeine to $138.9 \pm 5.4\%$ for oxymorphone. This method is now being applied to whole blood samples at the EPCOO Toxicology Laboratory. Thus far, absolute recovery of opiate standards was approximately $31.7 \pm 2.5\%$ (oxymorphone) to $55.3 \pm 3.4\%$ (codeine) from whole blood with relative recovery (versus deuterated internal standards) ranging $111.0 \pm 4.1\%$ (oxycodone) to $117.9 \pm 9.0\%$ (oxymorphone). Future goals include determining ways to limit matrix effects and to determine absolute recovery for part-per-billion concentrations.

Characterization of non-coding RNAs in *Escherichia coli*

Taylor Van Gundy

Pervasive transcription is the genome-wide synthesis of RNA and has been reported in all domains of life. In our lab, we study pervasive transcription in the model organism *Escherichia coli*. Pervasive transcription in bacteria often yields antisense-RNAs (asRNA), which are encoded on the DNA strand opposite an annotated gene. Therefore, asRNAs are completely complementary to their sense mRNA counterpart. We identified two asRNAs encoded opposite to the type II toxin-antitoxin system genes *MazE* and *MazF*. *MazE* is the antitoxin and *MazF* is the toxin, which under normal growth conditions are in a dimer and inactive. Under stressful conditions, such as heat or antibiotic presence, *MazE* is degraded and *MazF* is activated in the absence of *MazE*. *MazF* is an endoribonuclease that degrades mRNA into small fragments ultimately leading to cell death. We are currently characterizing the role of the novel asRNAs in the regulation of *MazEF* expression.

Intragenic-narK RNA in E. coli produces a small protein of unknown function

Luke White, Meghan Lybecker

Gene expression through transcription is a process highly regulated to ensure only the necessary genes are expressed at any given time. A new class of transcripts, termed intragenic RNAs, was recently identified that originate from within known genes. The purpose of this work was to determine the function of an intraRNA originating from within the *narK* gene. *NarK* is a gene that encodes a transmembrane nitrate transporter in *Escherichia coli*. Through the use of epitope tagging, preliminary data suggest that intra-*narK* does indeed produce a small 2.5 kDa polypeptide, which is the first of its kind. The function of this protein is not yet known. In addition to evaluating the function of this small protein, future research will involve determining regulation of the intraRNA.

Chemistry and Biochemistry

Investigation of near IR heptamethine cyanine dyes in cancer therapy

Zach Bricker

Near Infrared heptamethine cyanine dyes or NIR dyes have been shown to accumulate in the mitochondria of cancer cells, but not in non-cancerous cells. These dyes can be used for cancer imaging via non-invasive fluorescence in the infrared range. Several forms of these dyes including: IR-808, and MHI-148 have also demonstrated anticancer properties to be used in cancer therapy. After NIR radiation these dyes generate heat (photothermal therapy) and reactive oxygen species (photodynamic therapy) that can kill cancer cells. For our research we will be collaborating with a local Colorado Springs company, Chromatic Technologies Inc. (CTI), to test first if we can demonstrate NIR dye accumulation in cancer cells. Then we will test novel dyes developed by CTI for their accumulation specificity in cancer cells. Finally we will determine if NIR dyes do indeed have inherent cancer killing properties. If these cancer accumulation and anticancer properties are confirmed, the use of NIR dyes make for a very promising form of cancer therapy.

Cellulose degradation by Saccharomyces cerevisiae for the production of biofuels from diverse feedstocks

Bryce Brownfield, Wendy Haggren

Abstract Cellulosic ethanol is a promising biofuel to displace dependence on fossil fuels. Cellulosic biomass constitutes a large fraction of agricultural waste, and is currently an uneconomic feedstock for fermentation due to its recalcitrance as a substrate. Chemical pretreatment methods are a costly necessity for current fermentation methods, and while costs are being reduced, the availability and viability of cellulosic fermentation of pretreated biomass at a commercial scale requires further investment and research. Enzymatic cellulose degradation *in situ* would minimize the economic and environmental cost, as preparation of feedstock materials and its waste is minimized. In the most efficient cellulose degrading organisms, a complex array of cellulase enzymes are organized into a large complex known as a cellulosome. Utilizing the cellulosomal CipC operon of *Clostridia cellulolyticum* and β -glucosidase B (β glB) EC 3.2.1.21 from the bacterium *Paenibacillus polymyxa* a method is proposed to construct the most complex recombinant cellulosome to date. The enzyme β -glucosidase B (β glB) EC 3.2.1.21 from the bacterium *Paenibacillus polymyxa* was cloned into two yeast expression vectors, p416GPD and p426GPD, and progress reported in isolating the CipC operon from *C. cellulolyticum*.

Antigen Loading Exosomes for Therapeutic Purposes

Maria Font, Jarred Bultema

Exosomes are small, heterogeneous 30-100 nm extracellular vesicles that play prominent roles in intercellular regulation and communication. Studies suggest that exosomes provide promising advances for immunotherapy treatment of cancers and neurodegenerative diseases. The goal of this project is to design and produce exosomes that stimulate specific immune responses for use in cancer immunotherapy. This will be accomplished using a SpyTag/SpyCatcher linker system to covalently attach proteins of interest onto the surface of exosomes. Exosomes from mature dendritic cells contain peptide-loaded MHC class-I and -II molecules for T-cell stimulation, as well as proteins CD63, CD81 and CD9. Incorporation of Spy Tag into these proteins may allow an antigen to be covalently attached to exosomes through the SpyTag-Spy Catcher isopeptide bond. Spy Tag constructs will be expressed in HELA and HEK cells while Spy Catcher will be produced from bacteria and purified *in vitro*. These will then be tested *in vitro* to ascertain the effectiveness of binding and loading into exosomes and later, *in vivo* in mice to judge effectiveness as an immunotherapy.

Synthesis and electrochemical, photophysical and NMR characterization of Osmium(II) complexes with high nitrogen content ligands

Ratna Malkan and **Ronald Ruminski**

Two novel complexes with formula $[\text{Os}(\text{bpy})_2(\text{bt})]$, and $[\text{Os}(\text{bpy})_2(\text{bta})]$ where bpy = 2,2'-bipyridine and bt = 5,5'-bi-tetrazolate⁻² and bta = 5,5'-bi-tetrazolate amine⁻² were synthesized and studied. Structures were verified by ¹H and ¹³C NMR spectroscopy. Absorption spectra show intense Os(II) → bpy metal to ligand charge transfer transitions at lower energy than expected, suggesting bt and bta ligands serve as π -donors toward Os(II). The transition shifts to higher energy as a function of pH, consistent with protonation of non-bonded nitrogen atoms. Reversible oxidative waves for Os(II)/Os(III) couples are observed for both complexes, while an irreversible amine oxidation is observed at more positive potential for the bta complex. Reductive waves are assigned to bpy reductions.

Purity Enchantment of Single-Walled Carbon Nanotube Solutions using Iterative Gel-Based Interactions

Caleb Rolsma and **Kevin Tvrdy**

Single-walled carbon nanotubes (SWNT) are a class of nanomaterial comprised solely of earth-abundant carbon that, depending on their structure, can exhibit either metallic or semiconducting electronic properties. Further, the tube-specific chiral wrapping vector of semiconducting SWNT dictates the effective bandgap of the material. In an effort to obtain preparative scale amounts of chirally pure SWNT, recent developments have focused on the use of sequential gel-based separation techniques. While such techniques are capable of producing a handful of single-chirality materials, most of the known SWNT-chiralities remain unavailable in pure form. In this work, the use of iterative (secondary, tertiary, etc.) runs through gel-separation media is explored, and the effects on sample purity quantified. This analysis will help in the construction of a model that fully depicts the the limits of gel-based SWNT separation using surfactant concentration steps.

Green metal binding for a brighter future

Anna Russell, Chris Butler, **Allen M. Schoffstall, Renee M. Henry**

Due to the strain of supply and demand in the modern world, we are experiencing a shortage of metals. As years pass, mining metals is becoming more and more difficult. Heavy metal waste is caustic and toxic to both the environment and the communities situated around landfills and waste processing plants. More efficient and environmentally friendly methods of recycling metals are needed to alleviate these issues. The goal of this project is to, in the spirit of green chemistry, use ligands to bind metals in a series of complexes and then to unbind them and recycle both the metals and the ligands. First, a three-step synthesis was performed to form dimethyl 2-[1-(2-oxo-2-phenylethyl)-1H-[1,2,3] triazol-4-ylmethyl]-malonic acid (TyMMa). Using tert-Butyl alcohol and water solvents, sodium azide was reacted with 2-bromoacetophenone to form 2-azidoacetophenone. This was reacted with methyl propargyl malonate, sodium ascorbate, and copper sulfate pentahydrate to synthesize 2-[1-(2-oxo-2-phenylethyl)-1H-[1,2,3] triazol-4-ylmethyl]-malonic ester (TyMMa Ester). This compound was hydrolyzed to form TyMMa. This ligand was then reacted with various transition metal ions in an attempt to form and characterize metal complexes.

The relationship between dendritic cell maturation conditions and exosome content and function

Danielle Saunders, **Jarred Bultema**, Olivia Hatton (E.C.)

In the mammalian immune system, different cell types are activated and differentiated through complex interactions that serve a distinct function. Dendritic cells are the most potent antigen presenting cells that link the innate and adaptive immune system. Dendritic cells exist in an immature state, and once activated, mature into various sub-classes of cells with immunosuppressive or immunostimulatory roles. Exosomes are 30-100 nm diameter microvesicles produced by most cells that serve critical roles in cell-cell signaling. Dendritic cell-derived exosomes initiate the same type of immune response as the sub-class of dendritic cells themselves. Distinct signals induce the activation and maturation of dendritic cells into sub-classes, but the relationship between dendritic cell maturation and exosome content and function remains unknown. Exosomes have enormous therapeutic potential including cancer therapy, the treatment of allergy and autoimmune disorders, or neurological disorders due to their size, stability, and signaling capability. The function of exosomes is determined by their content and that is determined from the cell in which they were produced. This project aims to determine the relationship between dendritic cell maturation conditions and exosome content and function in order to advance the use of exosomes as an immunotherapy.

Synthesis and Characterization of Novel Hydrogel Beads for Selective Interactions with Carbonaceous Nanomaterials

Nathaniel Sundquist, Jackson Rowland, and **Kevin Tvrdy**

Recent innovations in the purification of single-walled carbon nanotubes (SWNTs) using commercially available hydrogel beads (Sephacryl S200) intended for size-selective protein purification has spurred interest in the quantitative description and optimization of this process. Areas of focus have primarily been on the nature of SWNT separation surfactant, system pH, and system temperature. Interestingly, an alternative route to process optimization lies in studying the nature of the separation medium (hydrogel bead) itself. This project aims to synthesize high-quality separation media tailored specifically for the isolation of preparative scale single-chirality aliquots of SWNT. Potential applications for achievement of this goal lie in the areas of nanoscale electronics, biological imaging schemes, and near-infrared active photovoltaics.

English

Technology and its Effect on the Human Brain

Holly Brasfield

In this day and age, technology is booming. It is used all throughout our daily lives and people have grown to depend on it. Although, many people are unaware of all the effects it has on their brains. Between the usage of technology on a developing brain, the popularity of social media, and all the different kinds of mobile devices commonly being used, technology is effecting brains every day. Looking at different aspects of the brain, technology can affect the brain both physically and psychologically. I'm hoping to be able to present information on this topic for the many effects technology has on the human brain both now and in the future.

Race and Religion in Disney's Princess and the Frog

Danielle Britt and Malia Jackson

This presentation will explore religious and racial motifs and how they are portrayed in Walt Disney's adaptation of *The Princess and The Frog*. In 2009, Disney released their first African-American princess, highlighting the cultural influences circulating New Orleans in the midst of the 1920s, during the first World War. Being one of the world's most accredited and beloved corporations, people of all ages, genders, and ethnicities admire The Walt Disney Company for accepting and embracing all racial backgrounds and spiritual significances. This poster will analyze various sources including Richard Breaux, Annalee Ward, and other scholarly critics to help illustrate exactly how effective and valid Disney truly is when regarding racial and religious adaptation. To support this research, this work will offer an in depth view of the film's most controversial scenes, as well as its overall messages, to conclude if Disney incorporated the common racial stereotypes that were perpetuated throughout the country during the 1920s into this film. Ethnic appropriation and religious apprehension work hand-in-hand to guide the film's representation of African Americans, and how this reflects Disney's—and thus perhaps society's—perspective on the Other.

The Works of Tim Burton within Disney Productions

Jerree Cleavenger and Tatumn McCart

Tim Burton, a famous writer and producer, is known for his mysteriously dark productions. He has made many films both with and without Disney, and many of his Disney films are meant for children. This work will negotiate Burton and Disney's collaboration and how these films affect their intended audiences. To explore these movies this presentation will use insights from Yvonne Tasker, Helena BassilMorozow, Jeffery Weinstock, and others. This work finds that most of his films are not in fact child appropriate but are still considered children's movies. Ultimately, it concludes that future research is needed to investigate the potentially adverse effect that Burton's Disney films have had on their audiences.

Societal Views of Humor in Relation to Gender

Emma Coonan

The problem I am set out to solve is of societal concern. Why is it that men and women are viewed differently when it comes to humor? My rationale for pursuing this question starts with the fact that I once dreamed of being a female comedian. But most of the people I looked up to were male comedians. I thought to myself, why are there not a lot of female comedians? The number has continued to rise for successful female comedians, but society still seems to view men as funnier. I wanted to solve the issue by finding evidence through studies and psychology to support the reasoning as to why this is. Women are believed to be too delicate for certain types of humor that men find entertaining. The popularity of vulgar humor has risen, and this is not a form of humor that is universally appreciated by females. Men and women have different stand points on what is funny. If I can show people the differences psychologically, then there will be a better global viewpoint on the answer for why men are viewed as more humorous.

The Lion King's Sexuality and Philosophies Unveiled

Marah Guzman and Willie Moore

The purpose of this poster is to explore the use of sexuality in the Disney film, *The Lion King*, and how it is torn between the two philosophies "Remember who you are" and "*Hakuna Matata*." The two philosophies contrast each other on which route Simba should follow and by proxy what philosophy its audience should embrace. "Remember who you are" is characterized by Mufasa, Simba's father, and Nala, Simba's romantic partner, both of whom compel Simba to return to his masculine heteronormative responsibilities, while "*Hakuna Matata*" (meaning no worries) is introduced to Simba at a young age by Timon and Pumba—the first openly homosexual protagonist in a Disney movie. Using insights from Laura Mulvey, Gale Sweeney, and more, this work will expose the hidden truth behind the seemingly innocent image Disney portrays in *The Lion King*, especially in regards to gender norms and sexual orientation.

Animals, Joy, and Healing: Considering Therapy Animals in Hospital Settings

Graham Hicok

This paper looks at how joy can make the lives of ill patients better. When medical professionals set up scenarios that spark joy, these situations have the potential to not only boost morale, but also improve physical health as well. Based on research of current studies and observations at Memorial hospital's therapy wing, this paper concerns itself with patients' reactions to therapy dogs in particular and how they encourage positive emotional reactions. Furthermore, this paper explores the possibilities for expanding upon such observations to consider potential courses of action in reflection of such outcomes despite conventional protests to animals' involvement in sterile environments. How to do this while still respecting allergies and other sensitivities is an important stakeholder component as well.

Daily Life of College Student Athletes

Nicole Hoffman and Makenna Smith

We are studying how student athletes juggle the amount of schoolwork and class time combined the hours they put into their particular sport. In addition, we are looking at coaches' perspective about their student-athletes' workloads. Specifically, we are interested in the athletes' perceptions of their free time, homework time, and school time (class). Furthermore, we will look at the differences that the athletes experience from in season and out of season. Lastly, we see how the head coaches decisions for practice, study hall, and etc. is effected by the athletes' schedule.

Gendered Humor

Sophia Holm

Sexist humor is commonly used throughout the world as a source of laughter from an audience. However, sexist humor is not simply a form of harmless amusement. It can affect people's perceptions of their environments and allow them to feel comfortable with behavioral expressions of sexism without the fear of disapproval from others. Many studies have illustrated a direct correlation between sexist humor and aggression towards women and rape proclivity. In this paper I research the cause and effect patterns of sexist humor and assaultive behavior in environments where such humor is accepted and in environments where it is not. I also investigate the connection between the perception of sexist jokes and how young men appeal to the humor verses how young women appeal to the humor.

Humor in Pediatric Care

Kyle Huddle

One of the most frequently asked questions by researcher's and doctors on children's health and intelligence development is what can make kids healthy and develop their intelligence as they grow up? Many researchers and doctors have always said that comedy has a factor in the development of children's intelligence and health. I set out to research and see if comedy makes children more intelligent and if they are healthier. In the health aspect, humor has been used to make kids healthy for centuries. Humor relieves stress, pain, and conflict. For children, growing up can be tough times, but in order to stay healthy kids need comedy in their lives. Laughter is a natural reaction that all humans have when they find something funny. There is never humor that makes you laugh that brings you down. Laughter is to bring joy to someone's day. Children need humor in order to live a healthy life style. Happiness is a key factor to a healthy kid. Intelligent development is an important factor in our society to better our world and the technology. It all starts with making kids more intelligent. Humor has also been known to help with intelligence development. Intelligence development is used with comedy, some studies have been done showing kids have learned faster and better using comedic relief. This humor processing is called a social cognitive-affective human function. Building intelligence in the youth will help our society grow tremendously. A factor to this intelligence is humor. Humor helps kids develop into healthy kids as well as it makes them smarter. That is the topic I have chosen to write about. My motivation to research this is because I firmly believe that our youth is our future on this planet. Without a healthy and intelligent youth I believe we won't be able to grow as a society.

Are Demigods Superheroes?

Aurore Klassen

Almost anybody could be a superhero because the definition is open to interpretation. Percy Jackson series is formed of graphic novels, which are very closely related to comic books. For example, Percy Jackson and Annabeth Chase from the *Percy Jackson & the Olympians* series, as well as other demigods could in fact be considered superheroes because they have superheric genes. Thor, son of Odin, is considered a superhero, and both Thor and demigods inherited their powers from at least one parent. Another superhero with hereditary superpowers is Franklin Richards, the son of Mr. Fantastic and the Invisible Woman. Franklin, Thor, Percy, and Annabeth all have some form of genetic superhuman ability. Similarly, a mutant is defined as someone who is mostly human but possesses a genetic trait called an X-gene that allows the mutant to demonstrate superhuman abilities. Other examples of mutant superheroes are Scarlet Witch, Deadpool, Wolverine, and other *X-Men* characters. Although many superheroes obtain their powers from accidents, there are several different forms of superheroes, many of which inherit genetic abilities that make them superhuman, like demigods. Therefore, characters like Percy Jackson deserve the recognition and respect that our beloved superheroes have.

Running With Superheroes

Shelley Lautenbach

Running with Superheroes will involve research about what mental health benefits and drawbacks running can cause. I have a strong passion for running and feel as if this research will benefit not only myself, but others passionate about this sport and mental health. It can be beneficial by informing readers to be healthy and stay active and also to find their own superhero. Superheroes can be found anywhere and I found mine through the sport I truly love. Joan Benoit, the first female Olympic marathon gold medalist, and Paula Radcliffe, the female marathon record holder, are two inspiring ladies I call my heroes. Through my research I will find what advantages and disadvantages these two ladies and other runners have found through running and relate it to being a superhero.

Fans' Experience of Pro Wrestling Storylines

Nick Leonard

My project, "Fans' Experience of Professional Wrestling Storylines", aims to discover what lies in the constantly expanding gap that exists between pro wrestling powerhouse World Wrestling Entertainment (WWE) and a large portion of WWE fans. WWE, obviously a scripted product, has longtime been presenting its storylines to its fans. However, as the "information era" has risen, more and more fans are not buying into the WWE's storylines. In short, fans are not rooting for the right people. The WWE formula, that has hand-picked certain marketable superstars and booked them to succeed for so long, is no longer working. Fans are making the picks themselves. My project aims to dig deeper into this rebellion, discovering why fans are behaving the way they are.

Disney vs. Popular Fantasy Literature: A Look at the Men

Sarah Logue

Disney presents the men in their stories in a plethora of ways, some being bookworms while others are dashing princes, although how Disney's men in fantasy compare to the men in other modern fantasy literature is a topic not often discussed. Looking at how Disney's men in fantasy compare to the men in other literature will use sources to form a conversation from Amy Davis, Laura Mulvey, Philip Zimbardo and others. The results of this research support Disney's fantasy men to be quite different from the men in other modern popular fantasy literature. Further research should study the effects of Disney on boys and the effects of men in other modern popular fantasy literature.

Effects of Humor on Cancer Patients

Michaela Masopust

This research focuses on the effects of humor on the overall wellness of cancer patients. Many believe that humor has positive effects on the wellness of cancer patients. However, there are many opposing views on whether this is true or not. My goal for this research paper is to examine all sides to this claim. Most articles found under the topics of "humor" and "cancer" are from medical journals authored by nurses; this helps to keep the subject matter smaller, but can be problematic, because I am trying to find the effects on overall wellness. Thus, I will also look at perspectives from other stakeholders.

Disney: The Corruption of Innocence

Emily Montoya

The purpose of this research is to demonstrate how Disney, one of the top media conglomerates in the world, has been adversely affecting the growth of children's minds, such as the skewing of gender roles and the diminishing of children's creativity. Sources such as Henry Giroux and Grace Pallock, Shirley Steinberg, and others provide the foundation to unpack whether Disney films are actually suitable for young children, or if its hidden messages corrupt them for the rest of their lives. Research will demonstrate that Disney's idealistic portrayals of their characters and storylines will create a universal imagine of what is expected of future generations in society. Left unchecked, research suggests that Disney's influence will result in a world with less tolerance and creativity.

Society's Impact on Disney Princesses

Amanda Morris

This presentation will analyze the impact of changes in society on Disney princesses. From the 1930s to 2009, Disney's princesses have gone from passive, gentle, housecleaning women to active, independent, and strong women. Disney does a great job of reenacting changes in society through *Snow White and The Seven Dwarfs* (1937), *Cinderella* (1950), *Sleeping Beauty* (1959), *Mulan* (1998), and *The Princess and The Frog* (2009). Snow White, Cinderella, and Aurora all are very passive, pale characters that continue to assist others enacting the stereotypical female gender role. On the other hand, Mulan and Tiana are very active characters that are very independent and want nothing but to better themselves. This reflects each time period in which these films were created (such as Snow White and The Seven Dwarfs being created during the Great Depression era; resulting in the submissive, passive princess). Using analyses from books such as *Diversity in Disney Films*, *Mouse to Mermaid*, and *Good Girls and Wicked Witches*, this presentation will overlook the tension between Disney and society regarding stereotypical female gender roles.

Evolution of Gender in Disney Films

Ann Odom and Amber Lamdin

This presentation will explore the evolution of gender roles in Disney films. Generally, female protagonists in Disney movies are highly sexualized, weak, and dependent on their male counterpart. Through their strong stature, heterosexual tendencies, and charming qualities, males are also stereotypically represented in Disney films. Over time, as societal norms have progressed regarding gender roles, Disney's depiction of male and female characters has superficially advanced, but ultimately stayed the same. The information used in this presentation will explore these stereotypes in Disney films from *Snow White and The Seven Dwarfs* (1937) to *The Princess and The Frog* (2009), with insights from scholars like Elizabeth Bell, Amanda Putnam, and others. This presentation concludes that Disney continuously attempts to accurately represent society's current gender roles but continues to depict these characters in a way that misleads its young audience.

The Vagina Crutch: An Evaluation on the Use of Rape Humor in America

Kimberly Ozaki

One in 6 women will be raped within their lifetime. Although rape is a heinous crime, humor related to rape can heavily influence rape culture positively and negatively. Through extensive research from highly accredited feminists including Dr. Regina Barreca, Jessica Valenti, Laura Cox, and Megan Strain, this evaluation scrutinizes the value of rape humor and how it impacts rape culture. With examples from Dane Cook, Wanda Skyes, Sarah Silverman, Daniel Tosh, George Carlin, Bloomingdale's, and Bud Light, it is shown that subversive humor is a beneficial type of rape humor allowing victim's to cope with pain, giving victim's a voice, and exposing social wrongs. In juxtaposition, reinforcing humor demoralizes rape victims, undermines rape culture, and bolsters damaging stereotypes associated with rape. While many people, both men and women, unfortunately become victims of rape, this evaluation will focus specially on instances in which women have been attacked by a male perpetrator and the humor surrounding those instances.

Offensive Humour In Relation to Minority Groups

Shannan Parris

Humour is something in which we as a society interact with each day. The things we laugh at influence how we look at the world around us, and affect our everyday actions. Humour as a medium of entertainment is a form of insult, because at its base, all humour is pain. The types of humour that we interact with is dependent upon what the speaker or writer of said humour is talking about. However, although we as a culture can agree that many forms of humour no matter the medium make us laugh, when certain ethnic or cultural lines are crossed, the humour no longer is considered funny; it then becomes offensive humour. People that hear and laugh at offensive humour at the expense of minority groups can have their perceptions change, and therefore negatively impact the lives of the groups of which they continue to laugh at. By looking at the different ways humour affects the minority groups of the world, a way to stop this kind of humour can begin to be found.

Humor in Therapeutic Treatment

Isabella Perdichizzi

People have often questioned the value of humor, and if it really has an impact on today's society. I have taken on the task of researching the effects of humor in therapy. This paper considers both the negative effects and the positive effects of using humor in a therapeutic setting. It looks both at how this type of therapy has an impact on the patient and also on the doctor practicing this form of therapy. It also examines the lasting benefit on the patient. Humor is mainly known as being used as a sense of comedy and laughter, but I set out to see if it can be used in a more practical sense.

Humor, Religion and "Feel Good Chemicals"

Joanna Piatek

We have heard that laughter is a form a medicine, that it releases special chemicals and makes us feel good. But just how powerful are these feel good chemicals, and can laughter be influential enough to persuade one's wellbeing. As seen in *Funny by Catherine Cucinella*, there are many different types of comedy. A genetic study from the University of Western Ontario, Canada analyzes these different types of humor and connects them to aspects of mental toughness. For example, the most significant correlation is seen between self-enhancing humor and Emotional Control. Thus a negative connection is made between those who lack mental toughness and their susceptibility to self-defeating humor through which negative health outcomes are achieved. Throughout this study, we will also explore humor in religion, specifically Christianity. The Bible proclaims that joy is a gift from God, and with its apparent effects, we can successfully make the general assumption that those of faith have an increase in wellbeing. Through this study we will further explore the "feel good chemicals", their overwhelming effects on our health and wellbeing and the marriage of these two effects within religion.

Magneto, Comics, and the Responsibility of Social Commentary

Jessica Puzick

This presentation will take an in-depth look at the original characters from Marvel Comic's X-Men, Magneto in particular, and their pivotal role as social commentaries about racism. Though X-Men was not originally created to be a metaphor for issues of race, it soon adopted a narrative with deeper meanings. Research will be conducted from not only the creators of the comics, such as Stan Lee, Jack Kirby, and Chris Claremont, but also include insights from scholars such as Frank Verano and Stanford Carpenter. This presentation will highlight the time before the addition of three-dimensional characters, the transition of key writers and their respective backgrounds, and the business effects because of these new characters. Some aspects of the culture and their characters will be referenced throughout with regard to the overall effect they have on business and an inclusive edge Marvel has. These resources not only give evidence to how the social climate affected the creation of these characters, but also the opposite: How these characters affected society's perception of other cultures. These realizations also problematize the loss of socially conscious comics like the X-Men of the '60s, '70s, and '80s in favor of contemporary monetary concerns.

Animals' Use of Humor

Kyle Rudy

Animals seem to start having more characteristic that humans have as well. These characteristics used to be unique to humans and humans only. But as time goes on, more information has come out showing that animals might not be as different from humans than what was said. Animals have all five of the same senses humans do but as knowledge on animals expand can they really have the same brain emotions humans have? Information coming out have shown that animals can have a sense of humor and can laugh just as humans can. Animals use humor the same way humans do. They use it to communicate and relieve stress. Many people are still skeptical about these findings and still do not believe that animals can have a sense of humor and claim it as different types of emotions like pain for rats for example. As we continue to gain information we start to see that animals do have more than just a sense of humor and other emotions. Animals are closer to humans than we think they are.

Alice in Wonderland Reflecting '50s and '60s Culture

Anna Schwecke

The purpose of this research is to explore the connections that the Disney film *Alice in Wonderland* (1951) has with the preceding decades concerning the American culture of the 1950s and '60s. Breaking the typical Disney movie mold, the film creates a distinct identity when compared to almost every other Disney film. The 1951 production practically foreshadows the next two decades through drug culture and counterculture, as well as music and art styles. Referring to authors such as R. J. Miller, Johnson Cheu, and many other critical references, this research will analyze the direct relationships that Disney's *Alice in Wonderland* has with the culture of the decades that followed it. Unearthing the parallels between these two will create a compelling connection between children's movies and the popular culture at the time of the film that had a lasting impact.

Perception on who is the Hero and Villain in Stories

Katherine Sheafe

Most stories present superheroes as good, crime fighters that are always there to save the damsel and city in distress, while the supervillain is seen as evil, the cause of all the disaster that takes place. It is rare to see them switch roles where the superhero is evil and the supervillain is actually the hero or protagonist of the story, but it is becoming more common. Why does this role change occur and does it happen in real life? The reason why this occurs is based on how people perceive each other. Perception plays a key role in determining who is victorious in situations against others and who the enemy really is. It also plays a key part in wars like World War I and events that involve many different parties into the situation to react. With using research done on superheroes and supervillains, the line between who really is a villain and a hero in certain situations will become clearer and defined.

Absence of Mothers in Disney Animated Films

Jacob Simon

This presentation will explore the frequent absence of mothers in Disney animated films. Since the start, the people at Disney have incorporated a missing mother as a constant theme within their productions. To understand why mothers are absent so often, this presentation will explore many of the popular motherless films such as *Cinderella* (1951) who is raised by her evil stepmother, *The Little Mermaid* (1989) who never has a mother at all, as well as Anna and Elsa from *Frozen* (2013) whose parents die early in the film. To understand these absent parents, this work will utilize insights from Ann Hall and Mardia Bishop, Paul Loukides and Linda Fuller, and others. By analyzing the literature, it is revealed that in these motherless films, the main characters are free to go on their own journeys, depending more on characters they meet as opposed to their parents. Ultimately, this presentation will reveal the true reasoning behind why mothers are omitted from so many Disney films and what this means for Disney's impressionable audience.

Gallows Humor: A Savior of Morality

Alexis Spadi

Gallows humor is often thought to be morbid and immoral. In reality, gallows humor is necessary in various criminal justice fields in order to retain sanity. I am researching how police officers, detectives, and crime scene investigators alike all face graphic scenarios that display the worst humanity has to offer and how they effectively cope with what they have seen. I set out to prove why gallows humor is a necessary evil in the criminal justice discipline and should be encouraged throughout the CJ community. I set out to explore this topic because I have watched many people in my life die and have developed a darker sense of humor because of it. Going into the criminal justice and forensics field I have already seen and heard some of the grimmest cases. Even with my shallow background in the field, I still rely on gallows humor to make light of dark situations. I want to witness the effect this humor has on veterans of the field. I expect to see results along the lines of improved thoughts and well-being due to the coping skill of humor.

Humor's Role in Nurse-Patient Relationships

Kyli Spalding

This paper focuses on humor's role in the relationships of nurses and patients within hospital settings while the patient is receiving nurse care. The goal is to find out how humor helps patients deal with their experiences being hospitalized as well as help nurses cope with being involved in traumatic situations. Analyzing various stakeholders' accounts further reveals commonalities as well as differences in regard to what defines humor, its effects, if they are positive or not, and how nurses might proceed with this information to best serve patients. In considering such important questions, nurses and patients alike might benefit from the findings.

Gender and "Sense of Humor"

Kelsey Stretcher

Author Leon Rapport explains finding that women "dislike slapstick humor and practical jokes where individuals are injured or victimized" (Rapport 184). In other words, it is found that women likely have a different sense of humor than men, and men find harsh practical jokes and tricks to be funnier than their female counterparts. In order to test the theory that women and men have different senses of humor, many experiments of how humor affects individuals based on his or her gender were examined. It was expected that women were more likely than men to find harsh humor with another individual or group as the victim to be much less funny than men perceived it to be. After looking at many of articles, it was found that in many situations, men and women do in fact have different senses of humor. Men find more harsh and victimizing humor to be funnier than women do. Also, the reason behind what is funny could be different depending on culture and upbringing.

Thankee-Sai: A Literature Review of The Gunslinger Born, its Predecessors, and Decedents

Benjamin Syn

This work surveys and summarizes the literature around Marvel's *Dark Tower: The Gunslinger Born*, the graphic-novel adaptation of Roland Deschain's backstory in Stephen King's *Wizards and Glass*. It explores both the research on King's magnum opus and the academic conversation on this and other graphic novel adaptations of print works. In addition to the primary texts of Marvel and King, this work will offer insights from author Bev Vincent, scholar Patrick McAleer, and writer Robin Furth (who uniquely coexists as King's former research assistant, an author of the reference source *The Complete Concordance*, and plotter/consultant on all of Marvel's *Dark Tower* graphic novels to date). While much of the literature on *The Gunslinger Born* has been very critical of this adaptation, Marvel's *Dark Tower* series succeeds in terms of its continuing popularity as well as its ability to bring new readership to both Marvel and to King. This work concludes by calling for future research into what new opportunities exist as the printed page is transformed into a visual medium (such as the addition of Peter David's multidimensional narrator in this adaptation as well as the expression of internal states in King's writing through external representation in Jae Lee's artwork), all of which is particularly kairotic as King's *Dark Tower* is currently being adapted into film for a 2017 release.

The Dream Not Worth Living

Katie Vaillancourt and Nikki Wentworth

This presentation is a comparison of works detailing the lives of Disney child actors and original research on how people react to these actors now that they have grown up and are no longer on Disney Channel. This work will focus specifically on Selena Gomez and Miley Cyrus, how these two actors started on two Disney Channel original series, and how they have earned controversial reputations through their recent works. After examining Gomez's and Cyrus's reputation post-Disney, it will be determined if their life at Disney influenced them to make these controversial choices. Having established a correlation between these two on both their earlier works with Disney and recent provocative works, this presentation will call for more research on this Disney effect on celebrity.

Deconstructing Alice in Wonderland

Paige Von Bank

The purpose of this poster is to explore Disney's *Alice in Wonderland* (1951) and the truth behind the company's intentions for the film as well as the film's effect on popular culture. Using insights from William Verrone and Douglas Brode, this work will explore the limits of this avant-garde film as well as deconstructs the properties of the film itself. This work finds that *Alice in Wonderland* was indeed received by the counterculture in the 1960s and 70s, helping it to establish its avant-garde reputation. However, it should not be considered an avant-garde film because of the very fact that Disney did things to prevent its questionable themes, and can be concluded that Disney's *Alice in Wonderland* is surrealistic at best.

Humor Therapy in Cancer Patients

Elissa Watson

Many doctors and nurses are always trying to find new ways to help cancer patients cope with treatment and stress that comes along with the disease. In my studies, I researched the different benefits that humor therapy can have on cancer patients and their nurses, to propose a hypothesis about whether humor therapy should or should not be used in the medical setting. To conduct this research I used databases, more specifically Academic Search Premier, to find academic journals. Using the keywords humor and cancer I found articles that combined the two. By looking at the physiological and psychological benefits of humor therapy on the patient I found more avenues to research about the nurse-patient relationship instead of just the patient. I then investigated how nurses can be most effective in using humor therapy to maximize their patient's benefits. I researched when would be the most appropriate times for nurses to use humor as therapy. This also led me to investigate how the use of humor, needs to change with each audience because humor is subjective, as stated in one article. I analyzed these components, for they will help me in constructing my hypothesis because the different ways to use humor actually have to be plausible in order for it to be used.

Disney and the Brothers Grimm Fairytales

Hayley Wilson

This presentation will explore the changes Disney made from the original fairytales to appeal to their audiences. This work will specifically focus on Cinderella and Snow White within the Brothers Grimm fairytales, the Disney's features, as well as within the *Once Upon a Time* television series to highlight the changes Disney makes to suit different audiences. The findings suggest Disney altered these fairytales to appease to children by turning both Cinderella and Snow white into iconic Disney princesses, whereas in *Once Upon a Time*, these fairytales were focused on adults by keeping aspects of Grimms' original tales. Disney conforms to the norms of society to keep the company profitable by appealing to the masses. Ultimately, Disney changes the original tales to keep from appearing deviant in the view of society and avoid alienating their various audiences.

Geography and Environmental Studies

Geography Education in Colorado

Joshua Camacho

This research project uses GIS tools to understand geographic patterns in relation to geography education in Colorado school districts. In an era where major population shifts and globalization trends affect many aspects of life, the study of geography is an important aspect of student's educational development. Multiple maps will be created using data available from the Colorado Department of Education (CDE), Colorado Measures of Academic Success assessments (CMAS), Advanced Placement Geography tests (APGeo), and other statewide indicators that project student's geographic knowledge. This data is compared to publicly available demographic and fiscal data for visual analysis to identify any overlap. If overlap between data is visually apparent, further investigation will be necessary. This study will develop analytic models and visualizations to reveal areas of strengths and weakness across Colorado School Districts.

How Do Urban Policies Shape the Landscape?

Angela Martell, Cerian Gibbes

Within an urban environment, the relationship between physical and biophysical patterns may be influenced by the policies that guide urban development. Balance between urban development and biological systems promotes both human well-being, as well as environmental stability. This study considers the impacts of urbanization policies on land use patterns, as these patterns relate to various factors of the natural environment. A comparative study of Colorado Springs, CO. and Boulder, CO. provides an evident contrast of the relationship between urban policies and land use patterns. Image analysis of remotely sensed data are evaluated for their land use patterns over time, and also with consideration to the policies guiding urban land use. The image analysis will provide a view of the changes in physical parameters such as impervious surfaces, and biophysical parameters such as greenness, as related to the implementation of urban land use policies. This research is relevant to land use managers, policy makers, and citizens who recognize the importance of incorporating biological systems within urban landscapes.

Fire Occurrence and Impact on Land Use within El Salvador's Jiquilisco Region

Malcolm Nichols, Kayla Inks, Cerian Gibbes

The identification of land cover classes and subsequent use of that land remains to be a dynamic process due to fire phenomenon. Whether fires occur by lightning-ground strikes or deliberately set in order to support agricultural production, fire has a huge impact on land. Because land cover changes can negatively impact the environment and in some cases are driven by fire activity, protection measures must be implemented to manage land cover change. Such is the case in this research study site of the Jiquilisco region, El Salvador. The region consists primarily of sugar cane and mixed cropping agricultural practices which rely on the intentional setting of fires. This research employs Landsat satellite imagery (2003-2013) and digital image analysis techniques to measure change in the earth's surface as they relate to fire. This analysis of spatial patterns in land cover change contributes to the detection of fires that may be detrimental to different neighboring land covers and/or protected areas such as the Cañon La Lagartera Mangrove forest.

The Green Side of Globalization in El Salvador (Bahia Jiquilisco)

Erylin Serra-Ward

In this study I intend to demonstrate the green side of globalization in El Salvador. This refers to the socioeconomic impacts that migration and remittances have on El Salvador forest's coverage. Our understanding of globalization largely emphasizes economic measures of development. However, globalization also impacts land-use and social interactions are taken into consideration. Using imagery data, peer review work and statistical reports will enable visualization of these relationships. This report will provide information that could facilitate a look in to the basic interactions between household and land-use. One source of data is imagery of remote sensed data. The imagery will show land cover change from 2000-2013, the locations to which migration is most common, location to which the remittances are being received and effects of environmental policies. The compilation of various data sources regarding land-use and migration to explore the dynamics of household and forest cover.

Physics

Magnetic 3-d metal alloy structures for Magnetic Resonance Imaging temperature contrast

Noweir Alghamdi, Jason Nobles, Nate Sorensen, **Zbigniew Celinski**, and **Janusz Hankiewicz**

We investigate biocompatible magnetic structures that can be employed for noninvasive measurements of temperature using magnetic resonance imaging (MRI) in a range of human body temperature 310 K (37 °C). Permalloy (Py), which is an alloy of iron and nickel ($\text{Fe}_{0.20}\text{Ni}_{0.80}$), is a very promising material with the Curie temperature (T_c) around 872 K, relative high magnetic moment and good biocompatibility. It is known that the addition of non-magnetic metals to Py can lower the Curie temperature. In this project we explore the possibility of using Permalloy doped with different amounts of copper. We present experimental results from $\text{Py}_x\text{Cu}_{1-x}$ thin films, ($0.45 < x < 0.70$). Our films of about 0.6-1.0 μm thickness were deposited on silicon wafers and capped with chromium using a magnetron sputtering system. Films were tested using a superconducting quantum interference device (SQUID) at a low magnetic field of 2 mT for T_c temperature determination, and at 1.5 T and 3.0 T for temperature dependence of magnetization. The actual composition of different films was studied using energy-dispersive X-ray spectroscopy (EDX). We were able to significantly lower T_c by adding Copper to Permalloy. For example, for $\text{Py}_{0.45}\text{Cu}_{0.55}$ the T_c was 105 K, which makes this material a promising candidate for our MRI project. We plan to study micron size particles manufactured by standard photolithography and magnetron sputtering.

Using Magnetic Nanoparticles in a Static and Dynamic Magnetic Field to Penetrate Model Mucus

Austin Routt, Meghan Smith, Evangelos Economou, **Kathrin Spendier PhD**, **Zbigniew Celinski PhD**

Asthma affects millions of individuals worldwide and current treatment options are often hindered due to inefficient drug delivery methods. An asthmatic respiratory tract is usually covered in a layer of mucus which essentially stops inhaled medication from reaching the underlying inflamed tissue. This project tested magnetically guided iron oxide, Fe_3O_4 , nanoparticles (FeNPs) and barium hexaferrite, $\text{BaFe}_{12}\text{O}_{19}$, nanoparticles (BaNPs) as a drug delivery system through model mucus. To do this, a high magnetic field gradient was generated using a permanent neodymium magnet with an iron core pole piece to pull the magnetic NPs through a 1 cm thick layer of hydroxyethyl cellulose (HEC) gel. In addition, two Helmholtz coils were used to produce an oscillating magnetic field to physically rotate the magnetic NPs. The penetration time of FeNPs and BaNPs through HEC gel was measured as a function of oscillation frequency. For a frequency range of 0 to 1900 Hz, the data illustrated that HEC gel penetration time of BaNPs is functionally dependent on oscillation frequency whereas penetration time of FeNPs showed no apparent correlation. This observation is consistent with theoretical predictions. Specifically, barium hexagonal ferrites have large magnetic anisotropy fields which allow them to physically rotate and potentially open holes through the HEC gel. In contrast, this is more difficult when using FeNPs because their low magnetic anisotropy allows the magnetization to rotate without the particle physically moving or rotating.

Heating Tissue by Radio-Frequency for Hyperthermia Therapy

John Stroud, Jason Nobles, Mary Claire Rizzardi, **Zbigniew Celinski**, and **Janusz Hankiewicz**

Hyperthermia therapy is a medical procedure performed by slightly warming tumor-affected tissue to 40 - 43 OC. Hyperthermia is usually followed with a complementary treatment such as radiotherapy and/or chemotherapy (multimodal oncological strategy). This current hyperthermia procedure is based on the initiation of the process of tumor cells “programmed death” called apoptosis that are exposed to thermal stress at temperatures above 41 oC. Tumor tissue with more compact blood vessel systems have more difficulty dissipating heat than normal tissue, and tumor tissue cells are prone to apoptosis in response to prolonged (about one hour) heat. Even if tumor cells are not dying immediately because of the heat, they are becoming more susceptible to radio- and chemo-therapy that follow hyperthermia. In this project, we study the efficiency of warming aqueous solutions and gels that are isotonic relative to fluids and tissue in humans using Radio Frequency (RF) pulses in 15 MHz range. We present results from exposing samples made of deionized water, Ringer’s solution and agar gel to 50 ms, 44 Watt peak RF pulses with 250 ms repetition (17% duty cycle). For heating, we utilize the resonant circuit of a pulsed nuclear magnetic resonance spectrometer. We use the miniature, thermally sensitive optical birefringent element to monitor temperature. To increase the heat locally, different metallic materials were added to solutions and gels for generating additional heating by inducing eddy currents in metals. We observe a heating increase of approximately 10% when metals are present.

Psychology

Development and Dissolution of Memory Systems across the Lifespan

Vanessa Obetz, **Damon Tomlin, Ph.D.**, **Hasker Davis, Ph.D.**

During the last century cognitive psychologists have shown that memory is not a single cognitive entity, but instead is a highly complex set of theoretical structures with varying operating principles. We have examined how age, type of stimulus, and sex affect declarative, nondeclarative, working, and short-term memory in participants ranging in age from 5 to 89 years.

Differences in performance across ages on verbal and visuospatial tests of each type of memory and for the sexes were examined using a series of factorial, repeated measures, and split plot ANOVAs with z-scores from the various tests as the dependent measures. Virtually all forms of memory regardless of stimulus type and sex demonstrated a quadratic function with a rapid development through the teenage years, peak performance in the 20s and 30s, and a gradual decline starting in the 40s or 50s.

Many studies have investigated different aspects of memory from childhood to adulthood and from young adulthood to old age, but no study that we are aware of has compared the development, peak, and decline of four different memory types, two subtypes (verbal and visuospatial), sex differences, and age effects across the lifespan. Thus, this project provides a unique lifespan prospective on the development and dissolution of different forms of memory.

Helen and Arthur E. Johnson Beth-El College of Nursing & Health Sciences

Health Sciences

Body Composition Assessment of 10th Group Special Forces Soldiers

John Boesch, Margaret Harris

The Tactical Human Optimization and Rapid Rehabilitation and Reconditioning (THOR³) program is a human performance staff tasked with the duty of physically preparing Special Forces Soldiers for the demands of their occupation. The purpose of this study was to identify the effectiveness of the Officer Training Course (OTC) at Fort Carson (Colorado Springs, CO). Twenty-six male soldiers were tested (age 28±3 y, BMI 26±2 kg/m²). Body composition and physical performance measures (power, agility and cardiovascular) were obtained at baseline and at 6 weeks after training. Body composition was measured using the International Society for the Advancement of Kinanthropometry (ISAK) standards using Harpenden and Slim Guide skinfold calipers. A Lufkin tape measure was used for girth measurements (to the nearest 1/10 cm) and a balance beam scale for weight. Body fat percent was calculated from skinfolds using the Yuhasz formula. Descriptive statistics, paired sample t-tests, and independent sample t-tests were calculated to detect differences between measures and over time (SPSS v.23). Results showed that body composition did not change over the 6 week training program except for an increased waist circumference (all power, agility and cardiovascular measures significantly improved at the p<0.05 level. There were no differences in any of these measures when comparing normal to overweight soldiers, by leanness or younger to older soldiers (p>0.05). We conclude that the THOR³ OTC's Strength and Conditioning Program is effective at improving physical performance in a 6 week time frame.

Lower Body Power output differences in male and female collegiate soccer players

Brandt BL, Dawes JJ, Elder CL

Purpose: Soccer is a high intensity intermittent sport where athletes are required to possess strength, power, speed, and an optimal body composition to be successful. The purpose of this study is to determine whether there are differences in performance, body composition, and anthropometrics between athletes who have higher versus lower power output. **Methods:** Thirty-six Division II male and female soccer players underwent tests for power, speed, agility, anthropometric, and body composition measurements. Statistical analyses (SPSS 22.0) were ran to split male and female participants into high and low power output groups in terms of countermovement jump power output and countermovement jump height. Independent sample t-test was ran to compare means between groups. Significance was set at p>0.05. **Results:** Significant difference was found between low and high power output in male and female groups in weight, fat free mass, and countermovement jump (CMJ). Comparing the female low versus high power output groups significant difference was found in height, 10m sprint, 30m sprint, and T-Test. Significant differences were found between low and high CMJ height in female groups in body fat, 10m sprint, 30m sprint, and agility T-Test. The male high versus low CMJ height groups only showed significance in height. **Conclusion:** The female athletes showed significance in more tests between groups linking faster speed and agility tests to higher power output. Athletes comprised of more fat free mass showed to perform higher power output. Future studies need to further examine athletes and gender differences in power output and performance tests.

Investigation of rotary trunk power and predictors of on-field performance among collegiate club baseball and collegiate division II softball players

Jeff Brown, Craig Elder, Jay Dawes

The relationship between rotational trunk power and on-field performance variables was investigated in 20 (11 males; 9 females) collegiate club baseball players and Division II softball players. Day 1 of testing included: physiological measurements (height, body weight, body composition, and pelvic and thoracic mobility); and performance testing (vertical jump height [Just Jump Matt, Probiotics Inc., Huntsville, Alabama], and rotary power and velocity with a medicine ball [Ballistic Ball™, Assess2Perform®]). Subjects performed a self-selected warm-up on Day 2 before completing the following on field performance evaluation: 10 maximal effort overhand throws, followed by 10 maximal effort hits off of a tee evaluated using a speed gun (Pocket Coach Ball Coach PR1000-BC radar gun). Results revealed no significant correlation between rotational power and on-field performance, or between rotational velocity and on-field performance. Although no correlation was observed between vertical jump height and on-field performance measurements, significant correlations were observed between calculations of peak lower body power output and average and peak batted ball velocities (Baseball $r=0.603$, $r=0.642$; Softball $r=0.735$, $r=0.775$ respectively). The inability to control the numerous variables related to power production and velocity during a bat swing and an overhead throw may have impacted the non-significant correlations. However, this study provides support toward the use of additional variables for lower body power output, as vertical jump height alone may not be the most accurate predictor.

Relationship between two jumping tests to speed, agility, and throwing speed among Division II softball players

Richard Flores, Collin Nilson, J. Jay Dawes, Craig L. Elder

The purpose of this research was to determine the relationship between the broad jump and vertical jump to speed, agility, and throwing speed of NCAA Division II softball players. **Methods:** 21 NCAA Division II softball players (age =, height = 164.85 ± 6.01 cm, weight = 67.4 ± 9.3 kg) were studied to determine if there was a relationship between two different jumps and speed, agility, , and throwing speed. Vertical Jump height (VJ) (15.6 ± 1.8 in.) was measured using a switch mat (Just Jump™) and broad jump (BJ) distance (60.1 ± 6.1 in.) using a standard tape line. Running speed (RS) (3.4 ± 0.1 sec.) was measured via a 60 foot sprint. Agility (2.4 ± 0.1 sec.) was measured using the 505 agility test. Throwing speed (TS) (56.6 ± 4.3 mph) was measured using a speed gun (Pocket Coach Ball Coach PR1000-BC radar gun). **Statistical Analysis:** SPSS 23.0 software package was used for descriptive data analysis and correlation tests on each variable. Results and conclusions will be discussed.

Exploring older adults' beliefs about the stigmatization of depression, and their perceptions on the value

Dawn Grantham-Williams, Mary Ann Kluge

Integrated health promotion programs for older adults are scarce. As the older adult population continues to increase, multi-faceted programs that employ integrated care models are needed to address prevalent matters that concern them. The purpose of this qualitative case study was to explore older adults' beliefs about the stigmatization of depression, and their perceptions on the value of incorporating exercise as a viable treatment option. Further, it examines the design of the Healthy Living Project (HLP), an integrated health promotion program that offers behavioral health services, physical activity instruction, and nutrition guidance to qualifying older adults 60 years of age and older. Key informant semi-structured interviews were conducted with eight women who are participants in the HLP's physical activity services. Initial findings suggest the primary advantages of this program are enhanced sense of well-being, and that it is free of charge. Early indications exhibit progression in stamina, energy and confidence, suggesting this integrated health promotion program is a beneficial, safe, holistic alternative, and/or complement to treatment for depression in older adults.

Content analysis of concussion policies in the NJCAA

Nicol Hart, **Amanda Elder**

The purpose of this study was to determine the existence and content of National Junior College Athletic Association (NJCAA) written concussion policies. The analysis of current written concussion policies from NJCAA institutions was completed using the standards suggested by the National Athletic Trainers' Association (NATA) and the National Collegiate Athletic Association (NCAA). Main areas of analysis included emergency action planning, baseline concussion testing, sideline concussion testing, additional physical examination, management of concussion, and return to play criteria post-concussion. Three hundred and thirty institutions were contacted via email between October 2015 and February 2016 to ask for either their written policy or reply that they do not have a written policy. Seventy-two institutions responded either with a written policy, no written policy, or declined participation. Of the 72 responses 65.2% (n=47) returned a written policy but only 61.1% (n=44) were concussion policies, 31.9% (n=23) had no policy, 2.7% (n=2) declined.

Evaluation of Concussions Sustained by Rodeo Athletes

Mary Helfer and **Amanda Elder**

Purpose: To assess the prevalence and mechanism of injury (MOI) of concussion in professional rodeo.

Methods: Concussion injury records collected by the Justin Boots Sports Medicine Team (JSMT) between the years 2011-2014 were analyzed. Data inclusion criteria consisted of: concussions occurring at Professional Rodeo Cowboys Association events where JSMT was present, and concussions happening in bull riding, bareback riding, saddle bronc riding, steer wrestling, team roping, tie-down roping, barrel racing, bull fighting, and rodeo personnel duties. Variables analyzed included rodeo event, MOI, phase of activity when injury occurred, surface condition, and equipment worn at injury site. **Results:** Two hundred eighty-eight injury reports were analyzed. Rough stock riders sustained the majority (91.9%) of concussions, with bull riders accounting for 60.1% (n=161) of all injury incidents. Most athletes suffered concussions during the dismount stage of competition (n=248; 64.9%). The most common MOI was an individual hitting his/her head on the ground (n=138; 47.9%). Fifteen concussions were incurred by rodeo personnel. The majority of these incidents happened outside of competition (n=8; 53.3%) and were predominantly caused by equipment (n=6; 40%). Sixty bull riders reported wearing a helmet at the time of their injury. **Conclusions:** Rough stock riders, especially bull riders, are most likely to sustain concussions during rodeo competitions. However, anyone involved in rodeo events, including the personnel, are at risk for head injuries. Continued education on the importance of protective helmets, is warranted, as is determining how to prevent the rodeo athlete from hitting his/her head on the ground.

The Un-Diet Revolution: Impact of a Mindful Eating Intervention on Eating Behaviors and Weight Loss

Claire Mademann, RD, **Margaret Harris, PhD MS HC**

Objective: This study assessed the efficacy of a mindful eating and nutrition education program on eating behaviors and weight loss. **Study Design, Setting and Participants, and Intervention:** This program incorporated nutrition education taught by Registered Dietitians in addition to a mindful eating component. Eleven overweight adult women (average BMI =30; average age 52 years) from Colorado Springs enrolled in a 12-week educational intervention (The Undiet Revolution) consisting of 1.5 hours each week. Topics included mindful eating and movement, basic nutrition education, cooking demonstrations, grocery store and greenhouse tours, and stress. **Outcome Measures and Analysis:** Anthropometrics were measured on a Tanita scale at baseline, 6 and 12 weeks. Mindful eating behaviors were evaluated at baseline and 12 weeks using the Framson Mindful Eating Survey (1-4 scale), and other surveys used by Peak Nutrition Clinic. Data were analyzed using paired and independent sample t-tests and ANOVA (significance at $p \leq 0.05$), SPSS 23. **Results:** Seven women completed the study. Weight did not change over time. There was a statistically significant increase in eating awareness (2.3+/-0.6 vs 3.1+/-0.8, $p=0.02$), ability to stop when full (disinhibition) (2.4+/-0.6 vs 3.1+/-0.4, $p=0.02$), and emotional eating in response to negative states (2.2+/-0.88 vs 3.01+/-0.93, $p=0.002$) between baseline and 12 weeks. Although not significant, distracted eating and eating based on environmental cues also improved. **Conclusions and Implications:** The Undiet Revolution appeared to improve eating behaviors and mindfulness but not weight loss. Although sample size was a limiting factor, the results proved encouraging for healthier eating patterns.

The Impact of Physical Fitness on Playing Time in Division II Basketball Players

Matt Marshall, Jay Dawes, Craig Elder

Basketball is a multifaceted sport that requires an athlete possess a certain level of skill and physical prowess to be successful. Subsequently, creating a physical and performance profile that may predict an athlete's ability to perform on the court is of significant importance to coaches. However, while some research has investigated which variables may best predict athletic performance there is still considerable debate surrounding this issue. The purpose of this study was to determine what fitness and performance variables best predict playing time for male basketball players at the NCAA Division II level. Eleven DII basketball players were tested in the vertical jump, 60ft linear sprint, lane agility, the 20-meter multistage fitness test, back squat and bench press. Statistical analysis was conducted to determine which, if any, of these tests best predict playing time during the regular season.

The Effects of Forefoot Running on Chronic Exertional Compartment Syndrome: A Critically Appraised Topic

Caitlin B. Moeller, ATC; Amanda Elder, EdD, ATC

Clinical Scenario: Chronic exertional compartment syndrome (CECS) of the lower leg is a painful condition characterized by increased intracompartmental pressures during exercise that compromise blood flow, nerve, and muscular function. It has been suggested that a forefoot running protocol as a conservative intervention may reduce the symptoms of CECS in the lower leg. **Clinical Question:** Do adults with CECS have a significant reduction of symptoms after completing a forefoot running protocol compared to the currently utilized conservative treatments? **Summary of Key Findings:** The literature was searched for studies of level 4 evidence or higher that investigated the effects of a forefoot running intervention on the symptoms of CECS in the lower leg. The literature search provided 4 possible studies; 3 studies met the inclusion criteria. **Clinical Bottom Line:** There is moderate evidence to support that a forefoot running intervention improves the symptoms of CECS in the lower leg. **Strength of recommendation:** There is Grade C evidence that a forefoot running intervention improves the symptoms of CECS in the lower leg. The Centre of Evidence Based Medicine recommends a grade of C for level 4 evidence with consistent findings.

The Effects of Core Stability Based Warm-ups on Prevention of Lower Extremity Injuries Among Amateur Level Soccer Athletes: A Critically Appraised Topic

Nicholas J. Nunley, BS, ATC, Margaret M. Hunt, MS, ATC

The six domains of athletic training are injury prevention, clinical evaluation and diagnosis, immediate care, treatment/rehabilitation/reconditioning, organization and administration, and professional responsibility. Limited literature exists with regards to recognizing an orthopedically at-risk athlete and developing the appropriate injury prevention plan. Despite minimal supporting evidence, the implementation of core stability in injury prevention programs has been popularized. Core stability can be defined as the ability of the lumbopelvic-hip complex to prevent buckling, torque, and momentum of the vertebral column and return it to equilibrium following agitation. Therefore, do injury prevention programs including core stability help prevent lower extremity injuries among amateur level soccer athletes?

Physical Activity Engagement in the United States: A Qualitative Study with Saudi Arabian International Students

Randa I. Osman and **Mary Ann Kluge, PhD**

Background: Obesity has reached an epidemic rate in both children and adults in Middle Eastern countries¹. Immigrants from the Middle East to the United States are further faced with the challenges of acculturation -- the need to change their identities and adapt to new cultural practices in their host country². Differences in the availability and access to nutritious and desirable foods, lack of familiarity with recreational activities, facilities and health care, coupled with a predilection toward obesity, provides evidence that there is an urgent need to address the health and well-being of Middle Eastern immigrants. **Purpose:** The purpose of this study was to better understand how Middle Eastern International Students attending UCCS perceive physical activity and whether or not acculturation has made them more or less likely to engage in physical activity *after* moving to the United States. In addition, barriers that prevent these students from participating in physical activities are identified in order to assist the UCCS Student Health Center and Recreational Center. This will allow UCCS to provide better resources and programs to help remove these perceived barriers. **Methods:** A qualitative approach using key-informant interviews was performed with International Students who are members of the UCCS Saudi Arabian Club (n = 10). Interviews were audio recorded and transcribed verbatim for later in-depth analysis. **Findings:** Preliminary findings indicate that males are generally more active while females are less active after moving to the United States. Males are finding more motivation due to being surrounded by active individuals while women find it difficult due to lack of women only recreational facilities. In addition, both male and female participants believe the mild weather is a major motive for being more physically active in their host country.

References:

1. Musaiger, A. O., Al-Mannai, M., Tayyem, R., Al-Lalla, O., Ali, E. Y., Kalam, F., Chirane, M. (2013). Perceived Barriers to Healthy Eating and Physical Activity among Adolescents in Seven Arab Countries: A Cross-Cultural Study. *The Scientific World Journal*, 2013, 1-11.
2. Lassetter, J.H., & Callister, L.C. (2008). The impact of Migration on the Health of Voluntary Migrants in Western Societies: A review of the Literature. *Journal of Transcultural Nursing*, 20(1), 93-104.

High Power Output Soccer Players Perform Better on Linear Speed Tests

Brandon Robison, **James Dawes**, Brittany Brandt

Purpose: Acceleration and maximal velocity represent two crucial skills for success in elite soccer. Current research holds that power production provides a foundation for both. This study aimed to determine the relationship of power production to these skills, and the possible differences in linear speed between high power producing athletes, and low power producing athletes. **Methods:** Thirty-six NCAA Division II soccer players (20 males, 16 females) were tested for acceleration (10 meters), maximal velocity (30 meters), and power (CMJ). Groups were created by gender, and separated according to power output. Group 1: females with power production below the mean, Group 2: females with power production above the mean, Group 3: Males with power production below the mean, Group 4: Males with power production above the mean. CMJ height, peak power (PAPw) produced through CMJ, and power to weight ratio (P:W) were analyzed for their impact on linear speed. One-way analysis of variance (ANOVA) with pairwise comparisons were used to compare differences between gender groups (SPSS ver. . **Results:** Females with CMJ scores above the mean were significantly faster in acceleration ($p=.047$) and maximal velocity ($p=.001$). Females with PAPw above the mean were significantly in acceleration ($p=.013$), and maximal velocity ($p=.011$). Females with P:W above the mean saw significantly greater maximal velocity ($p=.001$). Males with P:W above the mean had significantly higher maximal velocity ($p=.032$). **Conclusion:** Significant relationship exists between high power output measured using CMJ and linear speed performance in collegiate soccer players. Improving power production, and power to weight ratio, may contribute to improved linear speed in these athletes.

A Comparison of Dietary Supplement Use Between Wisconsin and Colorado Adults

Jena Viesselmann, **Margaret Harris**

Dietary supplement use among those in the United States is currently somewhere between 53-70% (government statistics vs. business journal statistics). Therefore, the purpose of this study is to examine two specific populations (Colorado and Wisconsin) to see the prevalence, attitudes and behaviors of dietary supplement use. Between the two states 307 participants, both male and female, (40.67 ± 20.65 yr) were recruited for this randomized cross-sectional study. Participants took a 10 question survey on dietary supplement use and their attitudes about dietary supplement use. Both quantitative (descriptive statistics, chi squared and paired t-test -SPSS) and qualitative (themes) analyses were used to determine reasons for use and participants attitudes about dietary supplements. Those who utilized supplements mainly used them for overall health, immune function, muscle health, deficiency or to supplement their diet and energy/mood, among other reasons. Of the supplements utilized 53% of those surveyed utilize a multi-vitamin (56% Colorado vs. 49% Wisconsin), 24% used protein as a sports supplement (17% Colorado vs. 38% Wisconsin) and of the herbals and dietary supplements surveyed 35% used Fish Oil (35% for both Colorado and Wisconsin). When examining attitudes and behaviors about supplement use, 28% think supplements are more dangerous than medications and 58% inform their doctor about supplement use. This research shows that the population uses supplements, however, health care providers may not know the extent of supplement use in their patient population. More research needs to be done on the reasons why people only use certain supplements.

Content analysis of Lightning Policies in Colorado High Schools

Brianna L. Wagner, **Amanda Elder**

The purpose of this study was to identify the prevalence and content of lightning policies for high schools in high lightning risk areas of Colorado. Lightning poses a significant threat for outdoor activities. With proper preparation and guidelines this threat can be reduced or even eliminated. Multiple associations including the National Athletic Trainers' Association (NATA) and National Weather Service (NWS) have constructed guidelines to follow to ensure that athletic events are safe. Areas of analysis included use of safety slogans, chain of command, weather monitoring, safe shelter, suspension and resumption of activity, and first aid. Sixty-five high schools were included in the study. High schools were included if they were in a high lightning strike county. Thirty high schools responded, 22 (73.3%) had written policies and 8 (26.7%) did not have written policies.

Nursing

Body Weight, Physical Activity, and Psychological Stress in Baccalaureate Nursing Students

Kerry A. Peterson, PhD, DNP; Susan L. Garrett, MSN; Deborah Pina-Thomas, MSN; Melissa J. Benton, PhD

Baccalaureate nursing students are at risk for psychological stress that can impair learning. Among female college students in general, stress is related to unhealthy weight gain leading to overweight/obesity. Physical activity can modify stress and body weight. The purpose of this study was to evaluate body weight, physical activity, and psychological stress among a cohort of baccalaureate nursing students. Thirty-two students were enrolled semester 3 (spring) of a 6-semester nursing program. At the beginning and end of spring (timepoints 1-2) and the following fall (timepoints 3-4) semesters, students completed the International Physical Activity Questionnaire (IPAQ), the Nursing Academic Self-Efficacy Scale (NASES), the Depression, Anxiety and Stress Scale (DASS), and the Rosenberg Self-Esteem Scale (RSES). Body weight and BMI were stable over the 12-month period, as were scores for NASES, DASS, and RSES. Specifically, scores for depression, anxiety, and stress remained within the normal category. Overall, physical activity stayed in the moderate-vigorous range with no significant change, although a trend was seen for increased walking ($p=0.07$). Sitting time did not increase. Vigorous activity at baseline was predictive of body weight ($p<0.05$) and BMI ($p<0.05$) at timepoints 1, 2 and 3, and there was a trend for timepoint 4 (weight: $p=0.05$; BMI: $p=0.07$). However, weight and BMI were not related to moderate activity, walking, or sitting, nor was a consistent relationship found with any of the psychological variables. At mid-program, risk for weight gain was not apparent in these nursing students who exhibited a normal psychological profile with stable self-efficacy and self-esteem.

School of Public Affairs

Psychopaths v. Chronic Offenders

Zach Griswold

The FBI estimates that there are between 35-50 active serial killers in the United States at any given time (Morton). The term "serial killer" is defined as an individual who was murdered three or more people, however a look deeper into a crime of passion, a crime of acceptance, or a crime made out of frustration is different from a crime in particularly a violent murder that was planned, rehearsed, and forced from an addiction. This research focuses on the role of Antisocial Personality Disorder (ASPD) and psychopathy in criminal offending. Traits associated with these disorders include but are not limited to: disregard of feelings for other individuals, narcissism, lack of empathy, compulsive lying, manipulative, and feels "empty inside" (No emotion) (Goldberg). Comparisons will be made between chronic offenders and those with personality disorders. Case studies will be analyzed including Jeffrey Dahmer and Ted Bundy and particular emphasis will be place on understanding differences in the motives of offending and connections to criminological theories.

Capital Punishment: A Fair Sentence?

Shannon Kelly

The death penalty is much more of an in depth question than just right or wrong. This research project explores capital punishment as it relates to the intersections of social class, race, and gender. All of these factors play a significant role in relation to the death penalty and its sentencing outcomes. Current research and literature shows the discrimination within the criminal justice system that clearly discriminates against certain groups. Because these groups are so heavily oppressed, it makes us ask the question if the death penalty is truly being used as a fair and just sentence. The death penalty is a punishment that should be given to offenders that we determine are the 'worst of the worst'; not to offenders that the system discriminates against because of their social class, race, or gender. The criminal justice system must ensure capital punishment is being given as a fair sentence. This research uses current research and Bryan Stevenson's book, *Just Mercy*, to look at how the criminal justice system is using the death penalty.

Exploring the Demand of Sex Trafficking Online

Anna E. Kosloski and Stephanie Bontrager Ryon

Since the term human trafficking was coined in 2000 under the Palermo Protocol, the disciplines of Criminology and Criminal Justice have made strides in understanding the scope and consequences of human trafficking. Yet, more research is needed in regards to the prevalence and demand of human trafficking within the United States, particularly in regards to selling sex on the internet. This study attempts to fill this gap by providing an analysis of demand to purchase sex via online advertisements across 11 major U.S. cities. Additional analysis includes an overview of the intersections of race and age in demand for purchasing sex in the United States. Implications for health concerns and future research are also provided.

Women in Combat

Steven Kuhl

On December 4th, 2015, the Secretary of Defense directed the full integration of women in the Armed Forces following a thirty-day review period required by Congress (Fanning, Milley, & Dailey, 2015). Since 1994, women have not been able to officially serve in combat roles in any branch of the U.S. military. Consequently, jobs such as field artillery, infantry, and armor were not on the list of jobs that women could perform. This increased the gender gap within the military in not only those combat jobs, but in senior positions within the military as well that may, officially or unofficially, require a leader to be experienced in combat. This paper discusses the past issues that surround women in the military, the possible implications that may come from women's integration into those roles that were previously restricted to them, and if this policy should remain in effect.

Invisible Interconnections in Sex Trafficking

Keri Myers

Human trafficking, particularly sex trafficking, impacts every aspect of society in ways no immediately obvious. The intersectional nature of human trafficking keeps it from being easily addressed and dealt with. There is no one factor that predicts who can be a victim of sex trafficking. The different handling of race in both prosecution and treatment of victims, stereotypes associated with the age affects viewing an individual as a victim or a criminal, the invisibility of men in the trafficking industry, and the impacts of social class on the risks of potential victims and victims access to restorative services must be looked at individually and in connection to each other before serious strides and improvements can be made in how victims are identified, rescued, and restored back into community in a healthy way. At the conclusion of the research project, suggestions for next steps and improvements are listed for moving forward. Accurate awareness and addressing of intersectionality will drastically change how sex trafficking is identified, handled, prosecuted, and affect how victims are treated.

Undergraduate Research Academy

Biology

The role of caper in Drosophila neural development

Laura A. Bell, Logan T. Schachtner, **Eugenia C. Olesnicky Killian**

An important aspect of neuron development includes the formation and positioning of complex neuronal structures that allow neurons to receive and transmit electro-chemical signals. There are many classes of neurons, each with a particular morphological pattern that is crucial for its function in the complex inter-wired nervous system. Understanding the molecular mechanisms that govern neuron morphology is important in understanding integration of sensory input into behavior, learning, memory, and environmental responses.

RNA binding proteins (RBPs) have been shown to have a role in regulating neuron developmental pathways. In eukaryotes, post-transcriptional RNA processing allows for variable gene products and provides an additional layer of gene regulation. Because RBPs play crucial roles in the stability, function, transport, and localization of RNA within the cell, it is important to understand how these proteins communicate in molecular pathways to regulate gene expression. Although numerous diseases have been linked to defects in RBP structure and function, much remains unknown about RBP interactions and regulation. The goal of this study is to analyze the function of an RBP named *caper* in the *Drosophila* nervous system. The effect of *caper* impairment has been analyzed in both developing embryos and adult flies. Overall, loss of *caper* function has shown severe developmental and behavioral defects. Because *caper* is highly conserved across species and is known to be abnormally expressed in patients with Alzheimer and Parkinson diseases, it is important to better understand how this gene functions to regulates gene expression within the nervous system.

Chancellor's Leadership Class

Prevalence of Lower Extremity Health Issues and Associated Risk Factors in the Homeless Population

Andrew Galbraith

This study aims to investigate the prevalence of lower extremity health issues and associated risk factors in the homeless population of Colorado Springs. A survey was administered at a local soup kitchen and shelter where 120 individuals meeting inclusion criteria responded. The survey collected information on demographics, commonly associated risk factors for lower extremity pathology, self-reporting of pertinent medical history, and self-reporting of lower extremity health issues experienced in the past year. Data analysis was ongoing at time of abstract submission.

Chemistry and Biochemistry

Modeling CdSe Quantum Dot Growth Dynamics using a Novel Semi-empirical Atomistic Growth Simulation Program

Nathan Weeks and Kevin Tvrdy

Nanoparticle (NP) research is a fast growing area of science with a vast range of application that is constantly expanding. The development of new NPs made of novel materials and of various shapes, has been fervently pursued over that past twenty years, while an understanding of the mechanisms responsible for their properties and formation has lagged behind. A widely studied class of NPs are semiconductor cadmium selenide (CdSe) quantum dots (QDs). CdSe QDs have generated remarkable interest in the past decade because of their applications in biological fluorescence imaging, medical imaging, quantum dot solar cells, quantum dot lasers, and even military tracking devices. Reaction schemes have been developed to synthesize CdSe QDs of many different shapes such as rods, tetrapods, teardrops, arrows, and spheres. However, despite all of these advances, the growth dynamics for CdSe QDs are still largely unknown. The aim of this project is the development of a semi-empirical atomistic QD growth modeling program for CdSe QDs in which reaction parameters can be adjusted (such as temperature, pressure, growth solution components, precursor oxidation state, etc.) independently from one another. This computer program can be used to systematically test synthetic schemes to provide growth statistics. These growth statistics can then be tested experimentally using an *in situ* technique to provide insight into the accuracies of the modeling program. Once the modeling program is consistent with experiment it can then be modified and applied to other systems, as well as being used to formulate new reaction schemes.

English

The Implications of Human Genetic Engineering

Tania Galardy

This project takes an in-depth look at the research and analysis surrounding the topic of human genetic engineering. Specifically, what the ethical limitations are, what the effect on society may be, and what the course of action should be in moving forward with this technology. This project has a direct correlation to the topics of media, technology, and identity. A sub focus that is explored is the effect that our consumption of media sources such as television and magazines may have on the limits that genetic engineering are pushed to. As we strive to become more like the personalities we admire in popular culture, the goal posts in what engineering may be able to offer could possibly be moved forward, toward a very ethically murky area.

Geography and Environmental Studies

Forest distribution and fire patterns in the Cañon La Lagartera mangrove forest and Bahia de Jiquilisco, El Salvador

Jesse E. Miller and Cerian Gibbes

Coastal mangrove forests serve as connections between terrestrial and marine ecosystems, and are currently threatened by environmental changes occurring both on land and in the ocean. The presence and functioning of mangroves are threatened by the expansion of farmlands, graze land, aquaculture, and urbanization. The 28 km² Cañon La Lagartera Mangrove forest and the Bahia de Jiquilisco are located on the south central coast of El Salvador, east of the Rio Lempa. Bordered by the settlements of La Canoa, San Juan del Gozo, and Isla de Mendez, the mangrove forest is surrounded by agricultural lands. This research examines the distribution and local uses of this mangrove system. MODIS fire data is incorporated to explore the burning patterns used by local residents for field preparation and as a tool for manipulating the mangrove forest for resource extraction. The research employs statistical analysis of a time series of high resolution satellite images (2002 and 2014) and 14 years of MODIS fire data to quantify the spatial distribution of the mangrove and measure the significant changes in its distribution and land cover change over time.

Mechanical and Aerospace Engineering

Distillation curve based approach to evaluating hydrous ethanol volatility and heat of vaporization of other complex fuels

Stephen Burke, Brandon Patz, **Bret Windom**

During the vaporization process of a fuel droplet, the composition is constantly changing as the fluid is being distilled. This results in transitioning thermophysical and chemical properties of the fluid, which must be accounted for to accurately simulate the droplet regression and the combustion of the vapor phase. Typical vaporization models assume constant properties, primarily because the lack of data available for complex fuels as a function of fluid distilled. One particular property of interest in describing the vaporization of a fluid is the enthalpy of vaporization (H_{fg}). Assuming an ideal gas, the Clausius-Clapeyron equation can be rewritten to provide an expression for H_{fg} . Based on this derived expression, H_{fg} can be determined with the knowledge of the fluid's vapor liquid equilibrium (VLE) at varying pressures. The high enthalpy of vaporization (HOV) of ethanol when incorporated as a fuel can be favorable by reducing temperatures of the air-fuel charge, providing a reactant mixture more resistant to auto-ignition and capable of achieving higher efficiency. Using an improved distillation method, the ongoing study explores the effect of blending hydrous ethanol with gasoline (in azeotropic proportions) on the volatility of the complex fluid. Hydrous ethanol, if proven viable, would provide an excellent alternative to traditional anhydrous ethanol fuels, as it is more economic to produce. The boiling temperature, composition, and HOV of multiple petroleum ethanol blends will be evaluated as a function of distillation to show how the composition and relevant physical properties vary as the fluid evaporates.

Physics

Reaction-Diffusion Model: Application to Mucus-Penetrating Magnetic Nanoparticle Delivery

Rachel Drawbond and **Kathrin Spendier**

Excessive mucus production has been a significant cause of airway obstruction and mortality in 22 million US asthma patients. Although there are existing drugs that limit excessive mucus production, therapeutic efficacy of many drugs remains poor due to a thick mucus layer that poses a significant challenge to drug delivery. Experiments performed at UCCS, have started to investigate the effectiveness of magnetically guided nanoparticles to penetrate model mucus. In this project, we develop a simple one-dimensional, reaction-diffusion model to describe the kinetics of magnetic NP penetration through model mucus. This model will be compared to experiment to help optimize experimental design.

Psychology

Sexiness on Social Media Hurts Men Too

Alexandra Hood, **Elizabeth Daniels**

A growing body of research has examined how females who are portrayed in objectified ways in media are evaluated by viewers (e.g., Daniels & Zurbriggen, 2014). Little research has investigated how objectified men are evaluated. The present study investigated college men and women's judgements about a young man with an objectified profile photo on his social media profile.

A convenience sample of 302 college men (133) and women (169) (M age = 19.78, SD = 1.88) participated in the present investigation. Participants were primarily White/European American (43.7%, 16.2% mixed ethnicities, 6% Latino/Latina, 1% Asian American, 1% African American, 0.3% Native American).

In a between-subjects design, participants viewed a fictional Facebook profile of a young man, named Anthony, with either a sexualized (shirtless) or non-sexualized (wearing a T-shirt) profile photo. Participants completed the Interpersonal Attraction Scale (McCroskey & McCain, 1974) which measures social appeal, physical attractiveness, and task competence.

Results indicated that participants rated "non-sexy" Anthony (M = 4.15, SD = 1.07) as more socially appealing than "sexy" Anthony (M = 3.67, SD = 1.05), $F(1, 301) = 14.78, p < .01$. There was no difference in physical attractiveness between conditions. And participants rated "sexy" Anthony (M = 3.76, SD = .76) lower in task competence than "non-sexy" Anthony (M = 4.11, SD = .74), $F(1, 301) = 16.15, p < .01$.

Findings suggest that men who portray themselves in an objectified manner on Facebook risk negatively evaluations from their peers.

Failed casual recommendations and their hidden social costs

Leah Payne, **Kathleen A. Tomlin**

People frequently recommend products and experiences to their friends or acquaintances to create and maintain relationships, yet little research has examined this form of casual recommendation. Recommendation giving is form of word-of-mouth advertising which targets a specific person's interests. The current research compares casual recommendations to gift giving. Both situations serve a similar function: attempting to convey an understanding of another person's likes or interests. In a pilot study, we found that people give and receive casual recommendations three times more often than gifts. We also found people are less anxious, spend less time thinking about, and find it less important to give a good recommendation compared to a gift. However, when we examined the social costs in receiving and giving casual recommendations we found them to be equal to those of gift giving. In study 1, participants felt their friends knew them less well when they *received* a recommendation they disliked compared to one they liked. In study 2, participants felt they knew their friend less well when they *gave* a recommendation their friend disliked compared to one they liked. Gift-givers seem to be very aware of the social costs of giving a disliked gift, but recommendation-givers do not appear to take these risks into consideration. This research suggests that there is a disconnect between how people think about gifts and recommendations in terms of their social costs.

Centers

Biofrontiers

Biogenerator Based on ZnO Rods to Power Implantable Medical Devices

V. Corral-Flores, D. Bueno-Baques, A. Glushchenko

Cardiac rhythm management devices, spinal-cord stimulators, implantable drug delivery systems, among other implantable medical devices have something in common: they require a power source to function. Current implantable batteries are mainly based on lithium ion, which poses a health risk in the event of leakage or premature battery failure. Additionally, most implantable batteries have to be replaced after several years of use, subjecting the patient to successive surgeries (and their possible consequences such as the risk of infection). In an attempt to overcome these health concerns, we are working on the development of an implantable biogenerator capable of harnessing energy from the body and delivering this power to implantable medical devices, so batteries will be no longer needed. Our biogenerator is based on zinc oxide rods, which can convert mechanical energy into electricity due to their piezoelectric nature. The power source is the natural movement of the body, including blood flow, respiration and muscle contractions. The biogenerator is flexible enough to capture tiny internal motion, and we achieved this by printing flexible electrodes on a bendable plastic sheet, transferring ZnO rods from a rigid substrate to the electrode area and sealing the device with another plastic film. These biogenerators will eliminate the risk of leakage, due to their solid and sealed condition. Additionally, they are expected to perform for many decades for they work by taking advantage of a coupling property intrinsic to the material rather than a chemical reaction.

Imaging receptor clustering and membrane curvature using polarized TIRF microscopy

Rosa Machado, Justin Bendesky, Guy Hagen, Kathrin Spendier

We studied cell membrane curvature using polarized-excitation total internal fluorescence microscopy (P-TIRF). This method allows us to noninvasively evaluate vertically oriented membrane curvature, a phenomenon which may be related to receptor signaling. To do this we labeled rat basophilic leukemia (RBL-2H3) cells labeled with fluorescent Immunoglobulin E (IgE-488) and an oriented fluorescent membrane stain (dil). We imaged cells grown on coverslips, and also those that settled onto supported lipid bilayers, which mimic cell-cell contacts. IgE receptor (Fc RI) clust observed with P-TIRF microscopy using laser excitation at 488 nm and 561 nm for IgE-488 and dil, respectively. Data was collected in the form of images using two different excitation polarizations and analyzed using ImageJ. The data illustrated that within receptor patches the relative membrane curvature was very high. We are currently investigating the relationship between areas of the membrane with high curvature and cellular activity such as IgE receptor-mediated degranulation.

Index

Author(s)	Title	Page #
Noweir Alghamdi, Jason Nobles, Nate Sorensen, Zbigniew Celinski, Janusz Hankiewicz	<i>Magnetic 3-d metal alloy structures for Magnetic Resonance Imaging temperature contrast</i>	28
Holly Anderson, Jeremy Bono	<i>The Genetic Basis of Reproductive Tract Incompatibilities between Drosophila mojavensis and D. arizonae</i>	13
Tatiana Bailey, Rebecca Wilder	<i>Southern Colorado Economic Forum updates</i>	8
Lacey Hanner Bankston, Lisa Hines, Laura Fejerman, and Donglei Hu	<i>Exploring the Relationship Between Body Mass Index and Breast Cancer Susceptibility in Hispanic and Non-Hispanic White Populations</i>	13
Laura A. Bell, Logan T. Schachtner, Eugenia C. Olesnicky Killian	<i>The role of caper in Drosophila neural development</i>	37
John Boesch, Margaret Harris	<i>Body Composition Assessment of 10th Group Special Forces Soldiers</i>	30
Anastasia Borner and James Pearson	<i>Influence of pulse wave reflection upon cerebral pulsatility during acute sympathetic activation: preliminary findings</i>	13
William M. Brandon, Santiago Bukovsky- Reyes, Karen G. Dixon, Samantha Coyne, Luis E. Lowe, Janel E. Owens	<i>Development and Validation of a Silver Nanoparticle (SNaP) Antioxidant Assay for the Determination of Total Antioxidant Capacity in Whiskeys</i>	14
BL Brandt, JJ Dawes, CL Elder	<i>Lower Body Power output differences in male and female collegiate soccer players</i>	30
Holly Brasfield	<i>Technology and its Effect on the Human Brain</i>	19
Zach Bricker	<i>Investigation of near IR heptamethine cyanine dyes in cancer therapy</i>	17
Danielle Britt and Malia Jackson	<i>Race and Religion in Disney's Princess and the Frog</i>	19
Jeff Brown, Craig Elder, Jay Dawes.	<i>Investigation of rotary trunk power and predictors of on-field performance among collegiate club baseball and collegiate division II softball players.</i>	31
Bryce Brownfield, Wendy Haggren	<i>Cellulose degradation by Saccharomyces cerevisiae for the production of biofuels from diverse feedstocks</i>	17
Stephen Burke, Brandon Patz, Janel Owens, and Bret Windom	<i>Distillation curve based approach to evaluating hydrous ethanol volatility and heat of vaporization of other complex fuels</i>	39
Christopher R. Butler, Allen Schoffstall	<i>Experimental and calculated studies on the regioselective reduction of 1H-1,2,3-triazole esters</i>	5
Joshua Camacho	<i>Geography Education in Colorado</i>	27
Jonathan Cheek, James Stevens	<i>Development of a Solar Concentrator Test Platform</i>	11

Jerree Cleavenger and Tatumn McCart	<i>The Works of Tim Burton within Disney Productions</i>	20
Emma Coonan	<i>Societal Views of Humor in Relation to Gender</i>	20
V. Corral-Flores, D. Bueno-Baques, A. Glushchenko	<i>Biogenerator Based on ZnO Rods to Power Implantable Medical Devices</i>	40
Jackie Cromer, Ryan Jobman	<i>Physics-based models of commercial lithium-ion cells</i>	6
Colin Curtis, Daniel Gowing, Bret Windom, Janel Owens, Louis Lowe, Thomas Bruno	<i>Combustion of Endothermic Fuels</i>	11
Andrea Davaro, David Le, Zachary Garrett, and Andrew Subudhi	<i>Effects of Beetroot Juice on Cerebral Blood Flow</i>	14
Casey Dolen, Meghan Lybecker	<i>Antisense-RNA and Gene Regulation in E. coli</i>	14
R. Doss, D. Klimczak, A. Morgan, G. Williamson and T. Wolkow	<i>Delineation of a Rad26ATRIP motif that directs localization to microtubule organizing structures</i>	15
Rachel Drawbond, Kathrin Spendier	<i>Reaction-Diffusion Model: Application to Mucus-Penetrating Magnetic Nanoparticle Delivery</i>	39
Tom Ebersole	<i>Training for Success: Veterans Transition and Communication</i>	5
Richard Flores, Collin Nilson, J. Jay Dawes, Craig L. Elder	<i>Relationship between two jumping test to speed, agility, and throwing speed among division II softball players</i>	31
Maria Font, Jarred Bultema	<i>Antigen Loading Exosomes for Therapeutic Purposes</i>	17
Tanie Galardy	<i>The Implications of Human Genetic Engineering</i>	38
Andrew Galbraith	<i>Prevalence of Lower Extremity Health Issues and Associated Risk Factors in the Homeless Population</i>	37
Eric Gaulke, Zachary A. Pitcher, Luis E. Lowe, Janel E. Owens	<i>Analysis of the Brominated Flame Retardant Tetrabromobisphenol-A in Dust from Consumer Electronics by LC/MS/MS</i>	15
Laura George, Breanna Tracey, Allison Duensing, Allen Schoffstall	<i>Comparison of synthetic methods for copper(I)-catalyzed fluorinated triazoles</i>	8
Dawn Grantham-Williams, Mary Ann Kluge	<i>Exploring older adults' beliefs about the stigmatization of depression, and their perceptions on the value of incorporating as viable treatment option.</i>	31
Zach Griswold	<i>Psychopaths v. Chronic Offenders</i>	36
Alfredo Guillem, Carlos A. Paz de Araujo	<i>Design and Simulation of a Brainwave Controlled Neuroprosthesis</i>	9
Marah Guzman and Willie Moore	<i>The Lion King's Sexuality and Philosophies Unveiled</i>	20

Nicol Hart, Amanda Elder	<i>Content analysis of concussion policies in the NJCAA</i>	32
Jewell Anne Lee Hartman, Simon Alexander Marinelli, Devan Sebastian Cruz, Justin G.B. Case, Kyle Culhane, Anatoliy O. Pinchuk	<i>Novel Molecular Metamaterial: Extended Metal Atom Chain Exhibiting Negative Index of Refraction</i>	7
Mary Helfer and Amanda Elder	<i>Evaluation of Concussions Sustained by Rodeo Athletes</i>	32
Graham Hicok	<i>Animals, Joy, and Healing: Considering Therapy Animals in Hospital Settings</i>	20
Wesley Hileman	<i>Developing a Test Fixture for Lithium-Ion Battery Control Research</i>	9
Nicole Hoffman and Makenna Smith	<i>Daily Life of College Student Athletes</i>	20
Sophia Holm	<i>Gendered Humor</i>	21
Paul Hong, Meghan Lybecker	<i>Transcriptional Gene Regulatory roles of the Pervasive Transcripts as-OmpX, as-RpsT, and intra-YgcB</i>	15
Alexandra Hood, Elizabeth Daniels	<i>Sexiness on Social Media Hurts Men Too</i>	39
Kyle Huddle	<i>Humor In Pediatric Care</i>	21
Erin Jordan, Jeremy Bono	<i>Functional Assays of Post Mating-Prezygotic Isolating Candidate Genes in Drosophila arizonae and D. mojavensis</i>	5
Shannon Kelly	<i>"Capital Punishment: A Fair Sentence?"</i>	36
Aurore Klassen	<i>Are Demigods Superheroes?</i>	21
Anna E . Kosloski, Stephanie Bontrager Ryon	<i>Exploring the Demand of Sex Trafficking Online</i>	36
Steven Kuhl	<i>Women in Combat</i>	36
Scott Kupferman, Wilson Buswell	<i>Collaborative Teaching to Promote Inclusion: Faculty and Student Perspectives</i>	8
Shelley Lautenbach	<i>Running With Superheroes</i>	21
Nick Leonard	<i>Fans' Experience of Pro Wrestling Storylines</i>	21
Sarah Logue	<i>Disney vs. Popular Fantasy Literature: A Look at the Men</i>	22
McKenna Lovejoy, Mark Wickert, David Gardner	<i>Non-Uniformity Correction using Non-Linear Characteristic Performance Curves for Calibration</i>	6
Paul Lundquist	<i>Characterization of the Photovoltaic Silicon Solar Cell Hot Spot Reliability Problem in Partially Shaded Solar Modules</i>	9
Rosa Machado, Justin Bendesky, Guy Hagen, Kathrin Spendier	<i>Imaging receptor clustering and membrane curvature using polarized TIRF microscopy</i>	40
Claire Mademann, RD, Margaret Harris, PhD MS HC	<i>The Un-Diet Revolution: Impact of a Mindful Eating Intervention on Eating Behaviors and Weight Loss</i>	32

Ratna Malkan, Ronald Ruminski	<i>Synthesis and electrochemical, photophysical and NMR characterization of Osmium(II) complexes with high nitrogen content ligands</i>	18
Alyssa Mallette, Jill Jenkins, Thomas Wolkow, Lisa Hines	<i>Is One CURE Enough: Extended Analysis of a Course Based Undergraduate Research Experience (CURE)</i>	15
Matt Marshall, Jay Dawes, Craig Elder	<i>The Impact of Physical Fitness on Playing Time in Division II Basketball Players</i>	33
Angela Martell, Cerian Gibbs	<i>How Do Urban Policies Shape The Landscape?</i>	27
Michaela Masopust	<i>Effects of Humor on Cancer Patients</i>	22
Kimberly Mastropietro, Lisa Hines, Jugal Kalita, Pat McGuire, Phillip Morris	<i>A Mission of Transition from Military Service to STEM Professional</i>	16
Jesse E. Miller, Cerian Gibbes	<i>Forest distribution and fire patterns in the Cañon La Lagartera mangrove forest and Bahia de Jiquilisco, El Salvador.</i>	38
Caitlin B. Moeller, ATC; Amanda Elder, EdD, ATC	<i>The Effects of Forefoot Running on Chronic Exertional Compartment Syndrome: A Critically Appraised Topic</i>	33
Emily Montoya	<i>Disney: The Corruption of Innocence</i>	22
Amanda Morris	<i>Society's Impact on Disney Princesses</i>	22
Kim Morris, Meghan Lybecker	<i>Elucidating the Function of the intragenic raiA RNA</i>	16
Lorne D. Muir II, Andrea Tully, Werner W. Jenkins, Luis E. Lowe, and Janel E. Owens	<i>Determination of Opiates in Whole Blood by LC/MS/MS</i>	16
Keri Myers	<i>Invisible Interconnections in Sex Trafficking</i>	37
Malcolm Nichols, Kayla Inks, Cerian Gibbes	<i>Fire Occurrence and Impact on Land Use within El Salvador's Jiquilisco Region</i>	27
Jordi Nonell, Willie Harrison	<i>Real-World Physical-Layer Security Coding: Software Radio Proof of Concept</i>	10
Nicholas J. Nunley, BS, ATC, Margaret M. Hunt, MS, ATC	<i>The Effects of Core Stability Based Warm-ups on Prevention of Lower Extremity Injuries Among Amateur Level Soccer Athletes: A Critically Appraised Topic</i>	33
Vanessa Obetz, Damon Tomlin, Ph.D., Hasker Davis, Ph.D.	<i>Development and Dissolution of Memory Systems across the Lifespan</i>	29
Ann Odom and Amber Lamdin	<i>Evolution of Gender in Disney Films</i>	22
Randa I. Osman, Mary Ann Kluge, PhD	<i>Physical Activity Engagement in the United States : A Qualitative Study with Saudi Arabian International Students</i>	34
Kimberly Ozaki	<i>The Vagina Crutch: An Evaluation on the Use of Rape Humor in America</i>	23
Shannan Parris	<i>Offensive Humour In Relation to Minority Groups</i>	23
Leah Payne, Kathleen A. Tomlin	<i>Failed casual recommendations and their hidden social costs</i>	40
Isabella Perdichizzi	<i>Humor In Therapeutic Treatment</i>	23

Kerry A. Peterson, PhD, DNP; Susan L. Garrett, MSN; Deborah Pina- Thomas, MSN; Melissa J. Benton, PhD	<i>Body Weight, Physical Activity, and Psychological Stress in Baccalaureate Nursing Students</i>	35
Joanna Piatek	<i>Humor, Religion and “Feel Good Chemicals”</i>	23
Jessica Puzick	<i>Magneto, Comics, and the Responsibility of Social Commentary</i>	24
Alex Riley, Scott Harder	<i>Modelling and Cooperative Control of Autonomous Agents</i>	11
Jennifer Roberts, Molly Maxfield	<i>The Impact of Alzheimer’s Disease Risk Reduction Education on Dementia Worry</i>	7
Brandon Robison, James Dawes, Brittany Brandt	<i>High Power Output Soccer Players Perform Better on Linear Speed Tests</i>	34
Caleb Rolsma and Kevin Tvrdy	<i>Purity Enchantment of Single-Walled Carbon Nanotube Solutions using Iterative Gel-Based Interactions</i>	18
Austin Routt, Meghan Smith, Evangelos Economou, Kathrin Spendier PhD, Zbigniew Celinski PhD	<i>Using Magnetic Nanoparticles in a Static and Dynamic Magnetic Field to penetrate Model Mucus</i>	28
Kyle Rudy	<i>Animals’ Use of Humor</i>	24
Anna Russell, Chris Butler, Allen M. Schoffstall, Renee M. Henry	<i>Green metal binding for a brighter future</i>	18
Danielle Saunders, Jarred Bultema, Olivia Hatton	<i>The relationship between dendritic cell maturation conditions and exosome content and function</i>	18
Sam Schmidt, Willie Harrison	<i>Rate-Adaptable Convolutional Codes for Maximum Throughput</i>	10
Anna Schwecke	<i>Alice in Wonderland Reflecting ‘50s and ‘60s Culture</i>	24
Erylin Serra-Ward	<i>The Green Side of Globalization in El Salvador</i>	28
Katherine Sheafe	<i>Perception on who is the Hero and Villain in Stories</i>	24
Jacob Simon	<i>Absence of Mothers in Disney Animated Films</i>	25
Adam Smiley, Gregory Plett, M. Scott Trimboli, Willie Harrison	<i>Estimating Battery Age Using an Interacting Multiple Model Kalman Filter</i>	6
Kevin Smiley, Zbigniew Celinski and Janusz H. Hankiewicz, Karl Stupic	<i>New Application Horizons in Disease Diagnosis with Magnetic Resonance Elastography</i>	12
Meghan Smith, Alexander Riley, Kevin Smiley, Jared Strutton, Zbigniew Celinski and Janusz H. Hankiewicz	<i>Magnetic Resonance Elastography: A Detailed Diagnosis of Traumatic Brain Injury</i>	12
Alexis Spadi	<i>Gallows Humor: A Savior of Morality</i>	25

Kyli Spalding	<i>Humor's Role in Nurse-Patient Relationships</i>	25
Kelsey Stretcher	<i>Gender and "Sense of Humor"</i>	25
John Stroud, Jason Nobles, Mary Claire Rizzardi, Zbigniew Celinski, Janusz Hankiewicz	<i>Heating Tissue by Radio-Frequency for Hyperthermia Therapy</i>	29
Jared Strutton, Zbigniew Celinski and Janusz H. Hankiewicz	<i>Broadening Frequency Range of RF Devices Using a Frequency Mixer. Pulsed NMR Application</i>	12
Nathaniel Sundquist, Jackson Rowland, and Kevin Tvrdy	<i>Synthesis and Characterization of Novel Hydrogel Beads for Selective Interactions with Carbonaceous Nanomaterials</i>	19
Benjamin Syn	<i>Thankee-Sai: A Literature Review of The Gunslinger Born, its Predecessors, and Decedents</i>	26
Katie Vaillancourt, Nikki Wentworth	<i>Disney: The Dream Not Worth Living</i>	26
Taylor Van Gundy	<i>Characterization of non-coding RNAs in Escherichia coli</i>	16
Jena Viesselmann, Margaret Harris	<i>A Comparison of Dietary Supplement Use Between Wisconsin and Colorado Adults</i>	35
Paige Von Bank	<i>Deconstructing Alice in Wonderland</i>	26
Brianna L. Wagner, Amanda Elder	<i>Content analysis of Lightning Policies in Colorado High Schools</i>	35
Elissa Watson	<i>Humor Therapy in Cancer Patients</i>	26
Nathan Weeks and Kevin Tvrdy	<i>Modeling CdSe Quantum Dot Growth Dynamics using a Novel Semi-empirical Atomistic Growth Simulation Program</i>	38
Luke White, Meghan Lybecker	<i>Intragenic-narK RNA in E. coli produces a small protein of unknown function</i>	17
Paige Whitney, Mary Ann Kluge, Ph.D; Maragret Harris, Ph.D; Michele Okun, Ph.D	<i>Presenteeism and Physical Activity</i>	7
Mark Wickert	<i>Using the ARM Cortex-M4 and the CMSIS-DSP Library for Teaching Real-Time DSP</i>	10
Hayley Wilson	<i>Disney and the Brothers Grimm Fairytales</i>	27

Featured Speakers



Stephanie Bontrager Ryon

Since 2014, Ryon has been an Assistant Professor with the School of Public Affairs. Ryon holds a Bachelor of Arts in Psychology with a minor in Women's Studies from the University of Tennessee. She received her Ph.D. in Criminology and Criminal Justice from Florida State University in 2006. Ryon's previous professional experience includes working in juvenile justice and adult corrections, and several years as a private research consultant for local, regional and national organizations. Her scholarly research focuses on effective interventions for adult and juvenile offenders, sex trafficking, demand for illegal commercial sex, and sentencing disparities for disadvantaged populations. Ryon has received almost two million dollars in local, state and federal funding to support applied and academic research over the past 15 years. She has produced many technical reports and academic publications, and made several professional appearances such as panel discussions at the American Society of

Criminology, and presentations to the Connecticut Families with Service Needs Advisory Board. Blending academic and applied research, Ryon is bridging the gap between scholars and practitioners with empirical results that are accessible to both communities.

Relationships and Research

The purpose of the presentation is to discuss the relevance of relationships in research. This will include an overview of how to cultivate relationships with research goals in mind, the importance of exploring partnerships outside of academia, and how both are related to external funding opportunities. Specific examples will be provided to demonstrate the processes for making relationships work with your research agenda in a way that is beneficial to your program, the University, and your partners.



Willie Harrison

Willie Harrison received his BS/MS degrees in Electrical Engineering from Utah State University in 2007. He then earned his PhD in Electrical and Computer Engineering (ECE) from the Georgia Institute of Technology in 2012, and subsequently joined the ECE department at UCCS later that same year. Harrison has been active in the area of physical-layer security for the last decade, and his research is funded by the National Science Foundation. His research interests include physical-layer security, secrecy coding, cryptography, signal processing, and sports analytics.

Physical-Layer Security and Coimbra, Portugal

The Internet, hand-held devices, perpetual connectivity, and now the looming Internet of Things have required us to rethink security in our modern world of communication. Physical-layer security is one new area of security research that has been picking up steam over the last 40 years. The main idea is to learn the attacker's wireless channel characteristics over which they attempt to eavesdrop information. Once the characteristics are known, coded structures can be used to transmit data reliably to intended receivers, and securely against eavesdroppers. This talk will outline keyless techniques of coding for secrecy over wireless communication channels, and highlight some recent results. Furthermore, the talk will discuss a global research initiative funded by the National Science Foundation to perform this research overseas with undergraduate and graduate students from UCCS for the next three years.

Keynote Speaker



Anne Libby is Professor (tenured) and Vice Chair for Academic Affairs in the Department of Emergency Medicine at the University of Colorado Anschutz Medical Campus School of Medicine.

Libby's research training is in economic and public health: Ph.D. at Washington University in St. Louis Department of Economics, an NIMH postdoctoral fellowship at the University of California-Berkeley School of Public Health, and the Berger Fellowship at the Kempe Children's Center. Her research expertise is comparative effectiveness research and the organization and financing of health care systems, with an emphasis on behavioral health. Her current creative work focuses on a patient interactions with complex health systems, especially patient complexity and patient valuation. She served four years on the AHRQ study section on health services research and value. Her externally funded research portfolio includes numerous project and training grants from federal and philanthropic sources. She has authored numerous peer-reviewed publications. She has taught graduate health economics, outcomes research, grantsmanship, and leadership since 2005, and is a member of the Academy of Medical

Educators at the CU-Anschutz School of Medicine.

Libby is an expert on mentored research and leadership training. She co-founded faculty development programs in the Colorado Clinical Translational Sciences Institute that have trained hundreds of faculty at CU: the premier faculty development program in clinical and outcomes research, the *Clinical Faculty Scholars Program* (trained 50+ faculty scholars since 2004); a structured mentoring training program for mentor-mentee pairs, the *Colorado Mentoring Training Program* (CO-Mentor, trained 300+ since 2010); and the *Leadership for Innovative Team Science Program* (LITeS, trained 175+ senior and midcareer faculty since 2009). She is a certified Gallup Strengths Coach. Libby co-founded leadership programs for junior women faculty and *Lean-In-CU: Women in Medicine and Science*.