

# Mountain Lion Research Day 2015

## Abstract Book



Gallogly Events Center  
UCCS Campus  
Friday, April 3

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## Mountain Lion Research Day Schedule

|  |                         |   |
|--|-------------------------|---|
| Presenter Registration<br><i>Gallogly</i>                            | 7:30-8:30 a.m.          |   |
| Poster Presentations<br><i>Gallogly</i>                              | 8:30-11:30 a.m.         | Posters are available for viewing all morning   |
| Student Talks<br>University Center, 116 A & B                        | 8:30-11:00 a.m.         | Student speakers will give talks throughout the morning. See next page for details.   |
| Welcome & Featured Speaker<br><i>Gallogly</i>                        | 8:55 – 9:15 a.m.        | Jane Rigler<br><br><i>Multiple Potentialities of Performance and Research</i>   |
| Featured Speaker<br><i>Gallogly</i>                                  | 10:00 – 10:15 a.m.      | Tom Pyszczynski<br><br><i>Terror Management Theory and Morality: The Role of Death, Religion, and Our Conception of God</i>       |
| Featured Speaker<br><i>Gallogly</i>                                  | 11:00 – 11:15 a.m.      | Matt Metzger<br><br><i>Category persistence through varied role enactments: The curious survival of travel agents (1994-2010)</i> |
| Luncheon Welcome<br>Inventor of the Year Award<br><i>Berger Hall</i> | 11:45 a.m. – 12:00 p.m. | Kelli Klebe   |
| Keynote Speaker<br><i>Berger Hall</i>                                | 12:00 – 1:00 p.m.       | Thomas Duening<br><br><i>Perspiration Authenticates Inspiration: Tips from a Blue-Collar Writer</i>                               |



University of Colorado  
Colorado Springs

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and the El Pomar Institute for Innovation and  
Commercialization (EPIIC)

## Schedule of Student Talks

| Time             | University Center, room 116A  | University Center, room 116B   |
|------------------|---|--|
| 8:30-8:40 a.m.   | <p>Morgan Pinto</p> <p><i>Integration of the alpha-amylase gene into single and high-copy number loci within the Saccharomyces diastaticus genome to elicit a high degradation efficiency on a unique starch source</i></p> | <p>Rochelle Richards-Burks</p> <p><i>Regardless of Race, Color, Sex, Age, or National or Cultural Origins, or Sexual Preference: The Emergence, Codification, and Divergence of the American Witchcraft Movement</i></p> |
| 8:45-8:55 a.m.   | <p>Kathryn Prescott</p> <p><i>A Novel Approach to Modeling the Absorption Spectra and Colloidal Stability of Few- and Single-Chirality</i></p>  | <p>Jennifer Broderick</p> <p><i>Creating Her Own Destiny: Challenging Societal Norms within Medieval Prostitution</i></p>  |
| 9:20-9:30 a.m.   | <p>Hannah Ryan</p> <p><i>Computational Studies on the Substrate Binding of Human MTH1 Protein</i></p>   | <p>Lindsey Duncan</p> <p><i>An Endeavor at Civility: White Southern Women in the Civil War</i></p>   |
| 9:35-9:45 a.m.   | <p>Daniel Forand</p> <p><i>RNA-binding proteins regulate dendrite morphogenesis in C. elegans</i></p>   | <p>Nicholas Christian</p> <p><i>Electron Beam Lithography: Implementation and Applications at UCCS</i></p>   |
| 10:20-10:30 a.m. | <p>Thomas Amundson</p> <p><i>Characterization of Heat Transfer in Lepidoptera for Use in Biomimicry</i></p>   | <p>Maryanne Fisco</p> <p><i>How is CEO Personality Related to Passion for the Green Movement?</i></p>  |
| 10:35-10:45 a.m. | <p>Brandon Patz</p> <p><i>Azeotropic Volatility Behavior of Hydrous Ethanol Gasoline Mixtures</i></p>   | <p>Nathan Baumann</p> <p><i>Depressive symptomology in undergraduate students</i></p>  |

# Welcome to the 2015 UCCS Mountain Lion Research Day

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

The objectives of Mountain Lion Research Day are to:

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

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

## The El Pomar Institute for Innovation and Commercialization (EPIIC)

**Dr. Terry Boulton**  
Chair of Innovation  
and Security



**Dr. Tom Duening**  
Chair of Business and  
Entrepreneurship



**Dr. Michael Larson**  
Chair of Engineering and  
Innovation



# Abstracts

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

## Student Speakers

### Marketing, Strategy and International Business

#### ***How is CEO Personality Related to Passion for the Green Movement?***

Maryanne Fisco

Western society is growing increasingly supportive of the “Green Movement.” CEOs, as leaders of their companies, have a great deal of discretion in setting the priorities for their organizations. However, CEOs of different companies also possess different values, preferences and individual characteristics which are reflected in their personality differences. In this study, I examine CEOs personality differences and develop hypotheses about how differences in their Big Five personality traits may affect their preferences for green movement initiatives in their companies. I use a thin slice approach, though behavioral observation of publicly available CEO videos clips, and established psychometric rating scales, to assist in measuring CEOs’ personalities. Using a dictionary of sustainability-related terms, I perform a text analysis of company 10-K filings, annual reports, and letters to shareholders to identify the frequency of terms connected with sustainability and the green movement. Using this approach, I investigate the relationship between CEO personality and the level of passion for the green movement. I also investigate which specific personality traits may foster a higher level of passion and loyalty for following more environmentally sustainable strategies for business.

### Mechanical and Aerospace Engineering

#### ***Characterization of Heat Transfer in Lepidoptera for Use in Biomimicry***

Thomas R. Amundson and **Rebecca N. Webb**

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

### Biology

#### ***RNA-binding proteins regulate dendrite morphogenesis in C. elegans***

Daniel Forand, Simona Antonacci, Darrell J. Killian (E.C.), **Eugenia C. Olesnicky**

Neurons have complex morphology which allows for responding to, integrating, and propagating signals. Dendrites are key to establishing sensory fields and the synaptic connections that control cognition, behavior, and adaptive responses to the environment. A growing body of evidence highlights mRNA transport and local translational control as key processes in generating dendritic branches, maintaining cell structure, and promoting synaptic plasticity. Therefore it is important to investigate the role of RNA-binding proteins (RBPs), which are involved in mRNA processing, transport, localization, stability, and translational control, in the regulation of dendrite form and function.

Olesnick et al. (2014) conducted a genetic screen of the *Drosophila* genome and found 63 RBPs required for normal dendrite morphology in dendritic arborization (*da*) sensory neurons. An *in silico* analysis revealed 54 homologous genes in *C. elegans*. To test the hypothesis that conserved RBPs may regulate dendrite morphology in diverse animal species, we screened these 54 RBP-encoding genes in *C. elegans* for dendrite defects in the PVD sensory neuron.

Our screen identified 12 conserved RBP-encoding genes that produce a reduction in terminal dendrite branches upon loss or reduction of gene function. To determine how and when this reduction happens, we performed a time-course analysis. Further experiments confirmed that these genes are expressed in the PVD neuron and the subcellular localization of each RBP was determined. Taken together, our results highlight a fundamental role for conserved RBPs in dendrite morphogenesis.

## Chemistry and Biochemistry

### ***Integration of the alpha-amylase gene into single and high-copy number loci within the *Saccharomyces diastaticus* genome to elicit a high degradation efficiency on a unique starch source***

Morgan Pinto, Wendy Haggren, and Sonja Braun-Sand

The yeast, *Saccharomyces cerevisiae*, has been used extensively to ferment ethanol from glucose derived from starchy field crops, in particular corn, a crop used primarily for human consumption and farm animal feedstock. We propose to use a unique starch source, the Buffalo Gourd root, to serve as a feedstock for yeast fermentations. The Buffalo gourd is not utilized for human consumption or animal feedstock, thrives in arid desert-like conditions, and grows roots dedicated to immense storage of carbohydrates. A different strain of yeast, *S. diastaticus*, which naturally contains the starch digestive enzyme, glucoamylase, will be genetically modified to contain variable copy numbers of the alpha-amylase starch digestive enzyme to increase starch breakdown efficiency.

### ***A Novel Approach to Modeling the Absorption Spectra and Colloidal Stability of Few- and Single-Chirality Single Walled Carbon Nanotubes***

Kathryn Prescott and Kevin Tvrdy

Semiconducting single walled carbon nanotubes (SWNTs) have long been known to exhibit chirality-dependent, tunable bandgaps with narrow absorption and emission line widths in the visible and infrared region of the spectrum, with center wavelength positions correlating roughly with nanotube diameter due to two-dimensional quantum confinement effects. The technique of amide gel based adsorption and desorption has afforded the ability to separate preparative quantities of semiconducting SWNT into single- and few-chirality samples. Determining the purity and stability of separation based on this method is of utmost importance in understanding and improving the efficiency and breadth of gel-based SWNT separation. This work focuses on the development of a model to fit semiconducting SWNT absorbance spectra with a series of Lorentzian lineshapes, coupled with a linear combination of exponential background components. The model incorporates contributions from high energy phonon sidebands, as well as low energy sidebands, shown to be present for each unique chirality. The presence and concentration of specific chiralities are confirmed using a multi-region cross fitting technique. In addition, the stability of colloidal suspension of few- and single-chirality samples over time and through ultracentrifugation is modeled using the Lamm equation.

### ***Computational Studies on the Substrate Binding of Human MTH1 Protein***

Hannah Ryan, Megan Bultema, Sonja Braun Sand, James Stewart

The MutT Homolog 1 (MTH1) protein hydrolyzes oxidized nucleotide bases thus preventing their incorporation into DNA. This sanitizing of the dNTP pool is important for cell survival. The MTH1 mechanism is of particular interest in cancer cells, because inhibiting MTH1 may induce premature senescence and a consequent reduction in cancer cell growth. Although the structure of this protein is published, it is not known how the nucleotide shows specificity for its oxidized nucleotide ligand, 8-oxo-dGMP. In the present work, we examine the 8-oxo-dGMP specificity of MTH1 compared to binding of the non-oxidized nucleotide dGMP. We modeled the MTH1 protein with oxidized and non-oxidized nucleotides using PM7 in MOPAC 2012. This allowed a comparison

of the energetics of the various systems, and resulted in a description of the specific interactions that are responsible for binding. The results of this work will inform further structural studies of MTH1 and could provide a platform for selective targeting of this protein.

## History

### ***Creating Her Own Destiny: Challenging Societal Norms within Medieval Prostitution***

Jennifer Broderick

This paper examines medieval prostitution within the twelfth to fifteenth centuries, a time when prostitution was actively changing and redefining the social construction of sexuality and women during the Middle Ages. The region that this paper focuses on is that of Languedoc in France; along with its two cities of Toulouse and Montpellier. Avignon, which is a township, also contributed to the discussion. These areas present a picture of not only the profession of prostitution and the women involved, but also the resulting reform that took place and its effects on reformed prostitutes.

This paper attempts to prove that there was more to these women than their profession and that because of this, they became unique examples of what women could do with their lives—given a chance. During this time, when women were denied basic freedoms, there were a few who, although living in the clutches of a morally wrong profession, strived to rise above their station to persevere and ultimately better themselves in a completely different and unexpected societal area—the convents. These women successfully embraced and thrived within their newfound religious life, creating a new kind of medieval woman: one who controlled her destiny and went against social norms. This paper uses examples from the aforementioned cities, as well as examinations into various primary sources which follow a medieval prostitute from her time in a brothel to a possible marriage to a perceived wealthy man.

### ***An Endeavor at Civility: White Southern Women in the Civil War***

Lindsey Duncan

In the South, traditions, expectations, and values permeated society for generations. With the invasion of the Union Army, inherent friction existed between tradition and change. Many white women in the Confederate South faced daily difficulties in their desire to maintain their old way of life in the midst of overwhelming and comprehensive change. The women who wrote about their wartime ordeal proved that despite the location, age, and socio-economic status of the writer, women attempted to preserve the past while remaining flexible due to the unforeseen circumstances of war. Indeed, the evidence provided through these personal diaries demonstrated the juxtaposition of the chaos of war with the peace of the ordinary prevalent in each of the women's lives. Despite the trials white women endured, they did not lose hope in the Confederate cause; furthermore, their endeavor at civility exhibited the struggle to uphold Southern Honor in the midst of modern warfare.

### ***Regardless of Race, Color, Sex, Age, or National or Cultural Origins, or Sexual Preference: The Emergence, Codification, and Divergence of the American Witchcraft Movement***

Rochelle Richards-Burks

A thriving Witchcraft community has emerged in the United States as a postmodern spiritual response to mainstream religious movements. Originating in the cultural crucible of the Civil Rights Movement of the 1960s and 70s, American Witchcraft has evolved from a fringe religious experiment to the fastest growing spiritual tradition in the United States. In order to facilitate discourse and a greater acceptance of Witchcraft as a valid spiritual practice, it is necessary to provide credible analysis of the origins of American Witchcraft as a distinct reflection of the experience of Witches involved in the 1960s Civil Rights Movement in the United States. Amongst the variety of Civil Rights Movements circulating through the United States in the 1960s and 70s, 2<sup>nd</sup> Wave Feminist Goddess Spirituality exerted the most inspirational and lasting effect on American Witchcraft as it evolved into a syncretism of anti-patriarchal Goddess Spirituality and postmodern British Witchcraft. The result is a democratized American Witchcraft community, dedicated to taking a purposeful stance of complete acceptance of participant diversity and characterized by its acceptance of individuality and highly personalized



spiritual traditions. Analysis of primary source texts and their relationship to *The 13 Principles of Wiccan Belief* (1974) illustrate the divergence of American Witchcraft from its British genesis, informing the cultural sensibilities of Witches in the United States.

## **Psychology**

### ***Depressive symptomology in undergraduate students***

Nathan L Baumann, BA, Steven Jarrel, BA, & **Leilani Feliciano, PhD**

Recent research suggests a disturbing increase in mental health problems among our nation's youth (Hunt & Eisenberg, 2010; Twenge & Foster, 2010); a finding that extends to college-age students as well (lifetime prevalence rates over 50%; Vazquez, Torres, Otero, & Diaz, 2011). Of these mental health problems, depression is the most common and well-studied. In a metaanalysis by Ibrahim, Kell, Adams, and Glazebrook (2012), the prevalence rates of depressive symptoms in university studies ranged from 10% - 85%, with a weighted average of 30.6%. This is much higher than the twelve month MDD prevalence rate of 7% found in community dwelling adults reported in the DSM-5 (APA, 2013), or the lifetime prevalence rate of 16.6% for MDD reported when using DSM -IV (APA, 2000) criteria (Kessler et al., 2005). In this study, undergraduate psychology students at the University of Colorado, Colorado Springs (UCCS) took the Patient Health Questionnaire (PHQ-9; Spitzer et. al., 1999) online at UCCS. Demographic variables such as gender, race, income, education level, and marriage status, religion, and whether or not the participant was seeking psychological services were also gathered. Participants included 335 undergraduate students (Mage = 22.22, SD = 6.49, range 18-54) currently taking a psychology class at UCCS. Analysis revealed that 24.6% of the sample scored 10 or higher on the PHQ-9. These findings suggest that universities may need to take a more proactive approach to helping students adjust to college life and either increase or improve access to available resources.

# Beth-El College of Nursing and Health Sciences

## Health Sciences

### ***Age differences in push-up performance amongst male law enforcement officers***

Brittany Brandt and Robin Conroy

The 1-minute push-up test is an assessment frequently used amongst law enforcement officers to measure upper-body muscular endurance. According to the Cooper Institute for Aerobics Research (2006) this assessment is predictive of the ability to perform essential job tasks for law enforcement officers in most cases. Consequently, this assessment is frequently used by law enforcement agencies as part of their pre-hire selection process, as well as in volunteer fitness programs. However, at this time it is unclear whether there are significant differences in performance for this measure amongst officers of different ages. Therefore the purpose of this research is to determine whether there is a significant difference in push-up performance amongst male law enforcement officers of different ages. Methods: Archival data on the 1-minute push-up assessment for 518 male law enforcement officers from two different law enforcement agencies was provided to the primary investigator for analysis. Statistical Analysis: Collected data will be entered into a computer file suitable for statistical analysis using the SPSS 22.0 software package. A descriptive statistical analysis will be conducted to determine mean push-up scores for officers in each age category. A one-way analysis of variance (ANOVA) with appropriate post-hocs will also be used to compare mean differences in push-up performance amongst officers in different age categories. Results and conclusions will be discussed.

### ***Impact of Coconut Oil on Appetite, Satiety, and Gastric Processes in Postmenopausal Women***

Jamie Fernandez, Margaret Harris

Virgin coconut oil (CO) is metabolized quicker than other oils. Few cases report CO allergies. Some practitioners recommend 2-4 Tablespoons of CO/day for health benefits. Side effects from this amount of oil are unexplored. This analysis compares side effects of CO and high oleic safflower oil (SO). A mixed-methods analysis examined data from a randomized cross-over clinical trial of 12 postmenopausal females. Participants consumed either CO or SO for 28 days without altering normal diet with a 28 day washout. Surveys were given at each testing period. Qualitative analyses of survey comments were categorized by theme and compared to identify relationships. One subject showed an intolerance to CO. SO showed fewer gastric issues than CO. About 30% of subjects experienced an initial increase in gas after CO that disappeared when they incorporated the oils slowly. Improved skin softness was notable with CO compared to SO (+67% vs +15%,  $p=0.03$ ). About 30% reported decreased cravings and appetite on both oils. Though 39% of participants reported feeling heavier while using SO, there was no meaningful weight change with either oil. Participants reported feeling more satiated with CO though had a smaller appetite on SO. We conclude that allergy/intolerance to CO is possible. Negative side effects are minimized with slow oil consumption. To our knowledge, this is the first study exploring side effects of CO in a Caucasian US population. Additional research on appetite & satiety is needed to determine whether CO is helpful in attaining weight loss goals.

### ***Fall prevention exercises can be beneficial to a variety of ages in adults***

Patricia H Fryc, Mary Ann Kluge PhD

**Purpose:** To assess fall risk and improve balance among men and women through functional exercises in order to prevent falls.

**Methods:** The N'Balance program includes functional assessments to determine the individuals' lower body strength, gait, posture, vision dependency, and vestibular disproportions. The program consists of pre- and post- assessments with a 6- week intervention. Twenty-five individuals participated in this study (4 men, 21 women); eight individuals have missing data. Pre-assessments determined where improvements could be made for each individual. At the end of the 6- week program, post- assessments were performed and measured for comparison. The 6-week fall prevention intervention was one-time per week, 60 minutes per session. Classes consisted of a warm up, balance and agility exercises following the N'Balance protocol, and a cool down. A health history and a balance confidence questionnaire were also distributed and analyzed pre-post.

**Results:** Lower body strength, vestibular disproportions, and balance deficits were found in adults 38 to 60. These findings were unexpected as most fall risk assessments and fall prevention classes are recommended for individuals 60+ years of age. Improvements for the entire group were mainly seen in the timed up and go, single leg balance, and chair stands.

**Conclusion:** It is widely known that older adults struggle with maintaining balance and agility. This study supports findings that, not only older adults, but also younger adults can benefit from balance and agility programs to minimize fall risks.

### ***A Secondary Analysis of the Impact of Coconut and Safflower Oils on Body Fat Composition***

Lisa Fryda, Andrea Hutchins, Margaret Harris

**PURPOSE:** The purpose of this study was to determine the impact of coconut oil (CO) and safflower oil (SO) on body fat composition. **METHODS:** This was a crossover clinical trial where postmenopausal women (aged 45-65) were randomized to either a CO or SO diet (28 days), had a washout for 28 days, and then incorporated the other oil (28 days). Participants were measured for body weight, hip and waist circumference. DXA was used to determine fat percentage at all four testing dates. Women also recorded 28 days of food. Data were analyzed with SPSS using descriptive statistics, paired t-test, and mixed model ANOVA. The intervention sequence was not determined to be significant using repeated measures mixed ANOVA. Therefore, paired t-tests were conducted, and being used, to determine differences in pre and post oil supplementation on the all body composition variables. **RESULTS:** No significant differences were seen in any anthropometric or DXA body composition variables between pre and post oil consumption. Differences in weight were seen between CO and SO where CO showed a  $1 \pm 1.7$  lb weight gain and SO a  $0.2 \pm 2.0$  lb decrease ( $p < 0.05$ ), although clinically these differences are not considered significant. **CONCLUSIONS:** This was the first study evaluating the impact of virgin coconut oil on body composition in Caucasian post menopausal women living in the US. These results support that coconut oil can be used as part of a healthy diet. More studies need to be done with larger sample sizes and diverse populations.

### ***Age differences in vertical jump height amongst male law enforcement officers***

Adam Garner and Matt Marshall

Power is a physiological attribute that is essential in many tactical situations, such as when sprinting and dodging; lifting, carrying, siting or dragging a victim to safety; jumping and vaulting over obstacles of varying sizes; stair climbing and in use of force situations. The vertical jump is an assessment commonly performed to test explosive power of the lower body. According to the Cooper Institute of Aerobic Fitness (2006) the vertical jump is highly predictive of performing job-tasks in all cases for the law enforcement officer. However, at this time it is unclear whether there are significant differences in performance for this measure amongst officers of different ages. Therefore the purpose of this research is to determine if significant differences exist in vertical jump height performance amongst male law enforcement officers of different ages. **Methods:** Vertical jump height data for 528 male law enforcement officers from two different law enforcement agencies was provided to the primary investigator for analysis. **Statistical Analysis:** Collected data will be entered into a computer file suitable for statistical analysis using the SPSS 22.0 software package. A descriptive statistical analysis will be conducted to determine mean vertical jump height scores for officers in each age category. A one-way analysis of variance (ANOVA) with appropriate post-hocs will also be used to compare mean differences in vertical jump performance amongst officers in different age categories. Results and conclusions will be discussed.

### ***The Impact of Virgin Coconut and Safflower Oils on Lipids and Cytokines in Postmenopausal Women***

Margaret Harris, Lisa Fryda, Andrea Hutchins

Twelve women were recruited for a randomized cross-over study. They consumed 30g virgin coconut oil (CO) or high-oleic safflower oil (SO) for 28 days (28-d washout period between oils, 28 d of food records). Diet was not altered. Lipids and cytokines (proinflammatory: IL-1 $\beta$ , IL-6, and TNF- $\alpha$  & anti-inflammatory: IL10) were obtained pre/post each oil intervention after 12-hr fast. Data were analyzed using SPSS. MIXED ANOVA showed no intervention effect. Comparisons were analyzed using paired t-test. CO significantly raised total cholesterol, TC ( $+17.0 \pm 22.0$  mg/dL), low-density lipoprotein, LDL ( $+12.1 \pm 16.0$  mg/dL) & high-density lipoprotein, HDL ( $+6.3 \pm 7.1$  mg/dL) (all  $p < 0.05$ ) but lowered triglycerides, TG ( $-8.6 \pm 32.1$  mg/dL,  $p = NS$ ). SO lowered TC ( $-5.2 \pm 15.7$

mg/dL), LDL ( $-4.9 \pm 12.5$  mg/dL), HDL ( $-1.9 \pm 5.3$  mg/dL), and increased TG ( $+8.0 \pm 48.4$ ) but changes were not significant. TC and HDL were significantly different between test oils,  $p < 0.05$ . The TC/HDL ratio change showed a neutral effect of both CO and SO,  $\Delta$  pre/post each = 0 mg/dL. Cytokines results varied. One person had adverse reactions to CO & increased inflammation. CO decreased IL-1 $\beta$  (cytokine indicative for neurological degeneration) for each person who had a detected sample. CO and SO varied in impact on other cytokines individually, some showing increased inflammation, others decreasing inflammation, without consistency. Both CO & SO had neutral impacts on lipids. The varied nature of inflammatory markers suggest that there may be epigenetic interactions. More research needs to be conducted to evaluate LDL particle size. Larger sample sizes are needed to determine impact on cytokines before recommendations can be made.

### ***Age differences in sit-up performance amongst male law enforcement officers***

Lizzie Heil and Liana Tobin

The 1-minute sit-up test is an assessment frequently used amongst law enforcement officers to measure muscular endurance of the trunk. According to the Cooper Institute for Aerobics Research (2006) this assessment is predictive of the ability to perform essential job tasks for law enforcement officers in most cases. Consequently, this assessment is frequently used by law enforcement agencies as part of their pre-hire selection process, as well as volunteer fitness programs. However, at this time it is unclear whether there are significant differences in performance for this measure amongst officers of different ages. Therefore the purpose of this research is to determine whether there is a significant difference in sit-up performance amongst male law enforcement officers of different ages. **Methods:** Archival data on the 1-minute sit-up assessment for 526 male law enforcement officers from two different law enforcement agencies was provided to the primary investigator for analysis. **Statistical Analysis:** Collected data will be entered into a computer file suitable for statistical analysis using the SPSS 22.0 software package. A descriptive statistical analysis will be conducted to determine mean sit-up scores for officers in each age category. A one-way analysis of variance (ANOVA) with appropriate post-hocs will also be used to compare mean differences in sit-up performance amongst officers in different age categories. Results and conclusions will be discussed.

### ***Self-Perception and the Effectiveness of the Functional Movement Screen in Adult***

Sara Kettelkamp, Mary Ann Kluge

How one's current self and ideal self are perceived has a significant effect on self-efficacy toward physical activity (PA). Knowing that self-perceptions can improve after being exposed to a task could suggest that engaging in a functional assessment such as the Functional Movement Screen (FMS), may have a positive impact on self-perception. **PURPOSE:** This study was to determine if the FMS, a 7-item test of physical function, is suitable for the general population and if knowing the results has a positive impact on self-perception of physical abilities. **METHOD:** A 4 question pre-test of perceived flexibility, core stability, balance, and overall strength was administered to a convenience sample of 30 adults (age 20-77). After performing the FMS, scores were discussed in detail and a post-questionnaire was administered (same 4 initial questions plus a question about perceived benefits of the FMS). **RESULTS:** The average FMS score was 15 out of 21 with the hurdle step being lowest scored exercise overall (1.9). The highest percentage of asymmetries was in the shoulder mobility exercise (46%). Overall 96% of participants showed some change in self-perception with 46% showing a decrease and 29% showing an increase. 70% showed change in self-perception in more than one area questioned. **CONCLUSIONS:** Results showed that nearly all participants showed some change in their self-perception (96%) with 83% expressing they believed the information given was beneficial. With self-perception being a factor in behavior change and PA it appears that the FMS provides feedback on functional abilities that is beneficial and potentially motivating to the general population.

### ***Relationship between selected measures of fitness and performance on a physical agility test amongst law enforcement officers***

Isaiah McFarland and Parker Wise

Physical Agility Tests (PAT's) are frequently used by law enforcement agencies as a pre-employment selection test. Classically, these tests are designed to replicate general movement patterns or situations that may occur during police work, such as timed obstacle courses; running a set distance; climbing stairs, walls,

fences, ladders through windows and over barriers; jumping and/or vaulting over objects of various sizes; balancing or traversing high and low areas; carrying or pulling heavy objects to simulate victim rescues; vehicle pushes; simulated fight scenarios; and in some cases even swimming. These tasks may be performed separately, or combined as part of larger obstacle course. The purpose of this research is to determine if significant relationships exist between selected measures of physical fitness and PAT performance amongst law enforcement officers. **METHODS:** The following metrics for 87 male law enforcement officers were selected for descriptive and comparative purposes: anthropometric measures (body weight, height, Body mass index), muscular endurance (1 minute push-up and sit-up scores), muscular strength (Isometric leg/back dynamometer scores); aerobic fitness (Multi-Stage Fitness Test), and power (vertical jump height scores). **Statistical Analysis:** The provided data will be entered into a computer file suitable for statistical analysis using the SPSS 22.0 software package. A descriptive statistical analysis will be conducted to determine mean scores for each skinfold site and each measure of performance. A Pearson's correlation will be utilized to determine if significant relationships exist between selected measures of fitness and performance on a physical agility test amongst law enforcement officers. Results and discussion will be presented.

### ***Normative data for the Multi-Stage Fitness Test (MSFT) amongst male law enforcement officers***

Tiana Perry

Aerobic power has been consistently identified in the literature as a predictor of performance for a variety of physically demanding occupations, such as law enforcement officers (CIAR, 2006; Lonsway, 2008; Roberts, O'Dea, Boyce, & Mannix, 2002; Rhodes & Farenholtz, 1992; Spitler et al, 1987; Stanish, Wood, & Camapna, 1999), correctional officers, (Jamnick, Thomas, Shaw, and Gledhill, 2010) and firefighters (Perroni, Tessitore, Cortis, Lupo, D'Artibale, Cignitti, & Capranica, 2009). While not as commonly used as the 1.5 mile run, many law enforcement agencies are beginning to utilize the Multi-stage fitness test (MSFT) as another field test to measure aerobic fitness levels. This test requires the subjects to run between two 20 meter lines, while listening to pre-recorded sound signal. Participants are instructed to keep cadence with this sound signal until they are no longer physically able to maintain the set pace. However, at this time there is little information regarding normative data for this assessment within this community. Thus, the purpose of this study is to provide normative data related to the MSFT for male law enforcement officers. Results and conclusions will be discussed.

### ***Relationship between selected skinfold measurements and fitness performance amongst male law enforcement officers***

Claire Siekaniec and Andrea Vanderwoude

Physical fitness is a major concern in the law enforcement community. Thus, fitness assessments that may be used to predict performance in, critical physical job tasks in law enforcement include pushing, pulling, lifting, carrying, dragging, jumping, vaulting, crawling, sprinting, use of force, and sustained pursuit. The Cooper Institute of Aerobic Fitness (2006), recommends a physical fitness battery for law enforcement officers that includes the vertical jump, 1RM Bench Press, 1 minute sit-ups and push-ups, 300 meter and 1.5 mile run. The purpose of this study was to investigate the relationship between skinfold measurements and fitness performance amongst male law enforcement officers. **METHODS:** The following metrics for 87 male law enforcement officers were selected for descriptive and comparative purposes: anthropometric measures (body weight, 3-site skinfold), muscular endurance (1 minute push-up and sit-up scores), muscular strength (1RM bench press scores); aerobic fitness (1.5 mile run times and estimated VO<sub>2</sub> max), and anaerobic power (300 meter run and vertical jump height scores). **Statistical Analysis:** The provided data will be entered into a computer file suitable for statistical analysis using the SPSS 22.0 software package. A descriptive statistical analysis will be conducted to determine mean scores for each skinfold site and each measure of performance. A Pearson's correlation will then be used to determine if significant relationships exist between specific skinfold sites and performance in each of the fitness assessments previously discussed. Results and discussion will be presented.

### ***Motivations for Participation in Community Gardens***

Sean Svette, Margaret Harris

The purpose of this study was to examine the motivations of individuals for choosing to participate in community gardens in Colorado Springs. This is a relevant topic for health science professionals because it has been shown to increase the physical and mental health of participants. This was a cross-sectional study design. Participation was solicited to community gardeners belonging to Pike Peak Urban Gardens (PPUG) by email. Voluntary participation telephone surveys were completed by 13 middle-aged adult community gardeners. The survey contained a mix of open-ended and multiple choice questions modeled in part after a study by Armstrong.<sup>1</sup> Results were analyzed using mixed methods of quantitative and qualitative analyses using SPSS V 22. Descriptive statistics and chi squares were used to determine differences in survey responses by gender. Qualitative comments were quantified then grouped into themes. Results showed that growing organic tasteful food, strengthening surrounding communities, and personal well being were among the central themes of motivation for participation in community gardens, though this differed by gender. This was the first study to be done examining people's motivations who participate in community gardens. This study was limited by a small homogenous population. More research needs to be done to determine gender motivations for gardening, and with a larger more diverse audience.

### ***Hiring qualifications among certified athletic trainers at various employment settings and physical therapists: A comparison of education, experience, salary, and additional professional standards***

Erin Weisz, ATC

Certified athletic trainers work in a wide variety of settings. The hiring criteria for athletic training employees may vary dependent on the setting and position. The current study investigates trends and similarities in hiring qualifications among clinic, clinic with outreach, high school, and college athletic training settings as found in job postings on the National Athletic Trainers' Association (NATA) career site. Qualifications examined include education, work experience, and certification/licensures. Additionally as physical therapists report a larger annual salary than certified athletic trainers, a comparison to determine any professional deficiencies in the athletic training occupation is warranted. The current study also provides a comparison of athletic training hiring qualifications to physical therapy hiring qualifications as found in job postings on the American Physical Therapy Association (APTA) career site.

## **Nursing**

### ***Physical Activity and Stress in Undergraduate Nursing Students***

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

Physical activity decreases stress in college students. Among nursing students, stress has been linked to poor critical thinking and impaired learning ability. The purpose of this pilot study was to evaluate the relationship between physical activity and stress among undergraduate nursing students over the course of one semester. Twelve Junior-level nursing students (age:  $21.4 \pm 0.3$  years) completed the Depression Anxiety and Stress Scale, and the International Physical Activity Questionnaire during weeks 2 and 14 of the semester. There was a significant increase in walking ( $656 \pm 243$  vs.  $2,011 \pm 584$  MET min/week;  $P < 0.05$ ) and decrease in stress scores ( $14.9 \pm 2.1$  vs.  $9.6 \pm 1.9$ ;  $P < 0.05$ ), with trends for increased total activity ( $2,260 \pm 412$  vs.  $4,126 \pm 906$  MET min/week;  $P = 0.052$ ) and physical activity levels ( $2.2 \pm 0.2$  vs.  $2.6 \pm 0.2$ ;  $P = 0.08$ ). At the beginning of the semester there was no significant relationship between physical activity and stress. At the end of the semester there was a significant relationship between walking and total activity ( $r = 0.87$ ,  $P < 0.01$ ), walking and physical activity levels ( $r = 0.71$ ,  $P < 0.05$ ), total activity and physical activity levels ( $r = 0.74$ ;  $P < 0.01$ ), and physical activity levels and stress ( $r = -0.61$ ,  $P < 0.05$ ). In this group of students, stress decreased in relationship to increases in physical activity over the course of a semester. Physical activity may be a feasible intervention to alleviate stress during nursing school.

### ***Modification of Obstetric Simulation Scenarios for Fidelity in a Home-Birth Setting***

Janelle Komorowski, DNP, RN, CNM

Clinical competency and clear communication are essential for obstetric providers who encounter high-stakes, low-frequency emergencies. The challenge for these providers is to maintain infrequently used skills. The challenge is even more significant for certified professional midwives (CPMs) who manage births at home, and due to low practice volume and low-risk clientele, may rarely encounter an emergency. Access to simulation is limited for many CPMs. This project modified existing validated obstetric simulation scenarios for post-partum hemorrhage (PPH) and shoulder dystocia (SD) to provide education for CPMs. Fidelity was assessed with the Simulation Design Scale (SDS) and satisfaction and self-confidence were assessed with the Student Satisfaction and Self-confidence in Learning Scale (SSSL). Subscale scores on the SDS [Quality = 4.53 (0.4); Importance = 4.7 (0.4)] indicated that fidelity was maintained for the home birth setting, and subscale scores on the SSSL [Satisfaction = 4.65 (0.4); Self-Confidence = 4.59 (0.4)] indicated high levels of participant satisfaction and self-confidence. Finally, self-confidence specifically regarding clinical management of shoulder dystocia and postpartum hemorrhage increased 16% and 18%, respectively ( $P < 0.05$ ). Simulation scenarios intended for hospital use can be successfully adapted to the home birth setting.

### ***Parental Acceptance/Rejection and the Relationship to Health & Lifetime Experience of Abuse Among Incarcerated Women***

**Kerry Peterson, PhD, DNP, RN, PMHNP-BC; Vanessa Hoener (E.C.), MA, LAC, LPC; Barbara Joyce, PhD, RN, CNS, ANEF; Valerie Sievers, MSN, RN, CNS, SANE-A, SANE-P**

There are over 200,000 women incarcerated in United States prisons, representing 8.8 percent of the total American prison population (International Center for Prison Studies, 2014). Approximately 70% of women in the correctional system have minor children (Greenfeild, 1999). Women's involvement in the criminal justice system often has negative impacts on the well-being of their children. Many women leave prison with few tangible skills and face considerable obstacles once they reenter the community. Women are more likely to recidivate when support services are lacking or inadequate (Johnson, 2009). Therefore, it is important to understand what support services and programs may be beneficial to women in the correctional system. This study utilized the Parental Acceptance Rejection (PAR) Theory (Rohner & Rohner, 1980) to explore parental acceptance and rejection of incarcerated women. The purpose of the study was to examine the relationships between PAR and lifetime experience of abuse and documented health status. A retrospective chart audit was conducted in a community corrections setting, and 75 women met criteria for inclusion in the study. Results of this study provide support for programming and education on health related topics, post-traumatic stress, abuse (prevention, early intervention, and recovery), parenting skills, and strengthening relationships that promote well-being and support health.

# College of Business

## Marketing, Strategy and International Business

### ***Orphan's Tree: A Strategic Analysis to Benefit Russian Orphans***

Michelle Boyea, Joe Lippincott, Perry Erler

The topic of this strategic analysis research project is the local non-profit Orphans Tree, responsible for providing services to orphans in Russia. The Colorado Springs is a market filled with non-profits, and the niche Orphans Tree fills is unique. The goal of this analysis is to further understand the position this non-profit occupies and its strategy for continued growth in a saturated non-profit market. To do this, a stakeholder analysis will be completed on the organization, with emphasis on the different services which have stakeholders both local and foreign. Findings from strategic analyses of industry conditions, resources, and capabilities will also be integrated into our strategic recommendations. The insights gained from these results may be useful in the future strategic positioning of this non-profit organization.

### ***Cross-cultural perceptions***

Jenna Danielson

While CEOs of major companies operate in an increasingly global business environment, it is well known that public perceptions of individual personality traits and leadership styles differ across international contexts. Furthermore, this globalization of the business environment has increased the importance for CEOs to be able to convey an image of competence and likability in their international business practices. The main purpose of this study will be to compare and contrast how different CEO personalities are perceived across different cultures. For example, individualistic traits are rated highly in the USA, but only average in Brazil. This study will be accomplished by analyzing perceptions of CEOs rated by Americans and comparing these with Brazilian perceptions. It will focus on individualistic personality traits displayed in Hofstede's cultural dimensions as well as perceptions of CEO competence and leadership. This study will be conducted by utilizing behavioral observations of short video clips of CEO interviews. CEO personality surveys will be distributed to a sample of Brazilian and American college students in order to obtain their judgments of the traits of several CEOs.

### ***Strategic Management-Goodwill Industries***

Camille Dytan, Katrina Romero

Goodwill Industries has long been a nonprofit organization that has been established as a material goods donation site as well as a source for programs and services directed towards the disabled and the economically disadvantaged. This strategic analysis aims to describe some key factors that play a role in Goodwill's continued success in providing diverse and valuable resources for the communities of Southern Colorado. This paper will also be able to pinpoint certain factors in the industry that may be improved before becoming a potential problem. Analyses in regards to stakeholders, PESTEL, Porter's Five Forces, Key Success Factors, the SWOT, among many others, are conducted to determine the internal and external environments directly and indirectly affecting the organization. To conclude this analysis, recommendations stemming from the team's quantitative and qualitative analyses will be provided to further improve the standing of Goodwill in the nonprofit sector.

### ***The Personality Behind the Power: Industry-Specific Qualities of successful CEOs***

Jasmine Krizan

The power and prestige of CEOs is intriguing and alluring to individuals in all fields of business. The personal qualities of these influential figures have long been pondered, and questions still remain as to which qualities are consistent in most CEOs, or which qualities make CEOs successful in certain industry contexts. This study will examine the personality traits of CEOs in specific industries such as technology, food service, and retail, to determine which traits occur most consistently in CEOs belonging to a common industry. After watching a short video clip of a CEO's interview obtained from an unbiased source, the personality traits of the CEOs will be scored using the Five Factor Model personality assessment. The assessment measures



conscientiousness, openness to experience, extraversion, agreeableness, and neuroticism. The CEOs will then be grouped according to the industry they belong to, and similarities within the groups will be recorded along with differences between the groups. This will distinguish the similarities in personality among most CEOs in general and clarify which characteristics are unique to CEOs in a particular industry.

### ***Strategic Positioning for Customer Acquisition in a Crowded Market: A Strategic Analysis of Gold Camp Brewery***

Caytes Liley, Brandon McKenna, David Jacobberger

Gold Camp Brewery is a new business in an almost saturated craft brewery market in the Colorado Springs region. The main problem currently facing Gold Camp is customer acquisition and taking market share within the industry. We examine Gold Camp Brewery and their problem of attracting customers as a startup craft microbrewery. Through extensive use of structured interviews with the owners of Gold Camp, we conduct a strategic analysis of the industry conditions, identifying which industry forces exert the strongest influence over profitability. We also examine the key success factors and use this information to evaluate the appropriateness of Gold Camp's existing resources and capabilities for developing a favorable position in the Colorado Springs craft brew market. We find that Gold Camp has several differentiating characteristics that can help them on their path to success. Based on the findings of our strategic analyses, we offer several recommendations for how Gold Camp may attain their growth goals and obtain a favorable market position.

### ***Effect of Positive and Negative Information on CEO's Perceived Personality***

Charles J. MacGregor

The research to be presented will look into the sturdiness of a CEO's personal image and how perception of a CEO's personality can be changed when exposed to certain factors. The researcher will utilize 30-40 human, college-aged participants. Each participant will complete a behavioral analysis on a set CEO's after observing a short interview clip and then be randomly introduced to either positive or negative information of each CEO and, once again, watch the interviews and complete another behavioral analysis. It is the belief of the researcher that the perceived personality of the CEOs will show stronger negative trends when participants are exposed to negative stimuli about the CEOs than positive trends when participants are exposed to positive stimuli.

### ***Innovating the Process of Delivering Clean Water to Developing Regions: A Strategic Analysis of LifeWater International***

Austin Mallory, Kristen Lewis, Alisa McGoughey

*LifeWater International* is an organization that functions by using donated funds to build wells and pumps for communities around the globe that do not have access to clean water. The purpose of this research is to analyze the operations of a non-profit organization, *LifeWater International*, in order to identify key points that the organization is doing well, and hopefully find some plausible areas of improvement. The chairman of the board of directors has agreed to provide information needed to analyze the organization and acquire the necessary data. We have discovered that the organization does not have many outside influences other than limited cases of high-profile donors, but more importantly, foreign governments. Not all governments are willing to allow *LifeWater International* to help their people, and the organization would be pleased to work inside some of these currently hostile regions. In addition to this, the domain of *LifeWater International's* operations often include systems that either do not have the funds or values to provide its people with clean water. These systems have a tendency to be unstable, exposing the organization to uncertainty of future political movement. This gives our team a particular interest in the political risk that this organization faces on a daily basis. This research intends to identify many of these risks and construct a solution to some of these developing problems.

### ***The CEO Tell***

Mischa Smith

Is it possible to observe someone briefly and identify whether they have a rare dispositional constellation of traits driving them toward positions of power and influence? The purpose of this study is to examine the influence of psychopathic and sociopathic behavioral tendencies in CEOs and how these behaviors may influence their success in the business world. I hypothesize that CEOs with certain Big Five personality

profiles will demonstrate psychopathic and sociopathic behaviors, and these behaviors will help them to ascend to positions of power in large and prestigious companies. In order to test the hypothesis, videos will be observed of interviews conducted with a variety of CEOs from different companies. Narrow facets of the Big Five personality traits will be evaluated using FFM-RF and a thin slice approach to behavioral observation. I will also investigate the personal lives of these CEOs using publicly available sources in order to identify signs of sociopathic or psychopathic behaviors.

### ***Personalities, Educational Histories, and Political Contributions***

Stephany Trzos

The present study has been designed to investigate the relationships between perceived personalities, educational histories, and political contributions of the CEOs of various large companies. Video recordings of CEO interviews were used to analyze personality through behavioral displays. Specifically, participants rated CEOs on spectrums of the Big Five personality traits of openness, conscientiousness, extraversion, agreeableness, and neuroticism. Data related to the CEOs' educational histories and political contributions were obtained from secondary sources and subsequently integrated into the present research. Ultimately, the chosen measures of individuality (personalities, educational backgrounds, and political contributions) will explore correlations between the professional and personal lives of CEOs, and thus, the results of this study may have future implications with regard to evaluations and enhancements of CEO selection processes and job roles.

### ***The Mud and The Blood and The Beer: A Strategic Analysis of Great Storm Brewery***

Ryan Weber, Steven Madison, Kelly Sardella

This strategic analysis report examines Great Storm Brewery, a microbrewery in the city of Colorado Springs, Colorado. Coors, Budweiser, and Corona are usually what comes to mind for most people when asked about beer companies. These are the big names when it comes to beer and breweries, however times are changing. In 2013 craft beer made up 7.8 percent of the beer industry's market share by volume in the U.S.; which is up from 4.04 percent in 2008. Being just one of the over twenty breweries in the city, Great Storm is up against its fair share of competitors. This report dissects the microbrewery industry in Colorado Springs, the business strategy Great Storm practices, and its competitive advantage. Just brewing good beer isn't enough to set you apart in the microbrewery industry. We also took a look at deep parts of Great Storm's business strategy including their atmosphere, reputation, and creative intuition. In our research, we found what sets Great Storm apart from its competitors and came up with solutions that will leave them behind.

# College of Engineering and Applied Sciences

## Electrical and Computer Engineering

### ***A Statistical Attack on the Substitution Cipher with Lempel-Ziv Compressed Plaintext***

Parker Boyce and **Dr. Willie Harrison**

Theoretical security research often makes the assumption that plaintext to be encrypted can be made to approximate a uniform distribution, where characters are independent of other surrounding characters, through modern compression algorithms. If this were true, then statistical attacks on the ciphertext would be ineffective. However, in practice, there does not exist a universal compression algorithm that can efficiently compress text all the way to its entropy. In this work, we explore one case of this truism using the Lempel-Ziv compression algorithm and the substitution cipher. This cipher has been broken for a long time due to its vulnerability to statistical language attacks. In our setup, we first compress modern English text, and then encrypt the data. We present a novel attack that exploits the joint compression and language statistics, and we show that although the text is first compressed, the compression algorithm effectively leaves its fingerprint on the data so that the cryptographic layer can still be successfully attacked.

### ***Active Network Topology Inference using Variable Length Network Coding***

Greg Larmore and **Dr. Willie Harrison**

This project presents a technique for active network tomography that achieves perfect, deterministic topology inference. With many other topology inference techniques there is a need for bidirectional communication, unicast transmission, or multiple probes through the network. Many also require synchronization or feedback between nodes within the network. The technique herein utilizes a single unidirectional probe and does not require any additional synchronization or feedback between nodes beyond the transmission of probe messages through the network. By utilizing a variable length network code, it allows each node participating in a probe to determine the network traversed from the source of said probe. Additionally, when node anonymity is not required, broadcast transmissions can be utilized by intermediate nodes allowing for simplified transceiver hardware for wireless networks.

### ***Real-Time Adaptable Coding for Arbitrarily Changing Binary Symmetric Channels***

Sam Schmidt and **Dr. 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 a series of convolutional encoders with differing rates and will dynamically switch between them as the severity of the fading in the channel increases and decreases. 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, due to its ability to seamlessly track the encoder's transitions through an expanded Viterbi trellis. This system supplies the end users with a hassle-free solution to maximizing throughput in a practical setup without reducing the reliability of the point-to-point communications.

## Mechanical and Aerospace Engineering

### ***Fluid and Heat Transfer Characteristics of High-Velocity Hydrogen through an Open-Cell Geometry with Heat Addition***

Mario Arias

An alternative to the common combustion rocket engine is a beamed-energy rocket engine. If successful, this rocket engine would decrease the propellant and structural mass requirements below that of the

current state of the art engines, increasing the payload potential. The engine would have high-velocity hydrogen flow through a heat exchanger placed on the rocket, in order to transfer beamed-energy from a ground-based source to the fuel. The hot gas would then flow through a converging-diverging nozzle, much like a standard rocket engine. The heat exchanger would be composed of 1 mm pore diameter open-cell metal foam. This research aims to characterize the thermal and fluid behavior of hydrogen through the open-cell foam when a 10 MW beamed energy source is applied. The exit temperatures and flow rates achievable with this heat exchanger are reported.

### ***Combustion and Flame Image Processing and Analysis***

Jeffrey Baston, **Bret Windom**

This research examines the properties and effects of Low Temperature Combustion Chemistry (LTC) on the turbulent flame burning characteristics of preheated liquid fueled flames. A burner designed to replicate the turbulent mixing and combustion of a high speed combustor acted as a controlled environment to study n-heptane/air turbulent flames. n-Heptane was the chosen fuel as it experiences similar low temperature and high temperature chemical pathways to that of our real transportation fuels. Instantaneous images detailing the turbulent flame structure were collected using a technique called planar laser induced fluorescence (PLIF) imaging. The images, which were collected using a high speed laser/camera combination, identify the location of the flame edge marked by the emission of excited Hydroxyl radicals ( $\text{OH}^*$ ) which are only present in the combustion products. Raw PLIF images of the flame are currently being analyzed in MATLAB to determine flame edge lengths and local turbulent flame structures. The algorithm being developed incorporates advanced noise filtering and edge detection schemes. A fast Kuwahara filtering technique is applied to remove random noise related to the data collection while maintaining the edge integrity. The flame edges from the filtered images are then detected using a Canny edge detection scheme. Additional processing is applied to fill in gaps and remove spurious edges leaving behind a very accurate description of the flame location. To date, edges have been determined on a series of flames which have allowed for the calculation of average turbulent flame speeds and average flame lengths.

### ***Unmanned Aircraft Systems***

Ryan Bell, Stefan Doucette

With the industry of drone application in its infancy, autonomous vehicles have become increasingly prevalent. In order for UCCS to become a complete university that is capable of developing unmanned aircraft systems, a stable, modular, and reusable platform is necessary. This initial platform will become the foundation of future research, including bio-inspired design, environmental awareness, and swarm dynamics. With the objective to create an adaptable platform, current progress has been made to standardize programming methods, sensor telemetry, and communication protocols. This vehicle control system could be implemented on either air or ground based platforms, depending on future UCCS research requirements.

### ***Measurement of Vaporization Enthalpy of Complex Fuels Using Distillation Curves***

Stephen Burke, **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 thermo-physical 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 of 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. A variable pressure distillation apparatus is used as an analog for droplet vaporization and is applied in concert with thermodynamic principles to evaluate the evolving enthalpy of vaporization as function of volume distilled. This novel technique is applied to determine the varying  $H_{fg}$  of diesel fuel and is validated by comparing values determined using a previously published compositional based technique. Initial data has demonstrated the potential of a variable pressure distillation

curve approach to determine the enthalpy of vaporization of a fuel as a function of volume distilled. Validation was performed via a previously developed technique providing similar results.

### ***Investigation of the Combustion of Endothermic Fuels Using a Counterflow Flame Burner***

Colin Curtis, Rose Szczur, **Bret Windom**

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 effected areas. During this process, heat exchange occurs through phase change, sensible heat extraction, and endothermic reactions experienced by the liquid fuel. Previous work has shown that endothermic reactions have a significant effect on the structure and the physical properties of the fuel, such as volatility, density, viscosity, and speed of sound. The effect that these changes have on the combustion behavior of the reacting mixture has not been experimentally measured. The goal of our research is to experimentally investigate the effect that endothermic reactions have on fundamental flame behavior for real fuels that are used as rocket and jet propellants. In order to achieve this goal, we have developed a counterflow flame burner in order to measure extinction limits, extinction strain rates, and laminar flame speeds. The counterflow system will be coupled with a high pressure reactor which will simulate the extreme environment that causes the liquid fuel to experience endothermic reactions. Ultimately, the fundamental flame properties of the reacted fuels will be compared to those of unreacted fuels, thus allowing us to determine the effect endothermic reactions have on the combustion behavior of liquid rocket and jet propellants.

### ***Variation of Flow Properties During a Pressurized Vessel Discharge***

Aida Ferro Ardanuy and **James W. Stevens**

This paper reports a study of a pressurized flow from a finite tank. The research will analyze the evolution of this flow over time and consider the three most important regimes: a choked condition, an unchoked compressible condition and incompressible flow condition.

### ***Solar Cell Augmentation with a Compound Parabolic Concentrator***

Meghan Smith and **James W. Stevens**

Compound Parabolic Concentrators (CPCs) utilize a parabolic geometry to create a higher concentration of sunlight projected onto a surface. This work seeks to quantify the improvement in performance of a photovoltaic (PV) solar cell by utilizing a CPC to increase the total incident sunlight on the PV cell surface. This higher concentration of light results in higher output energy from the cell than would be seen from an un-aided cell. The CPC for this project was created by cutting material from a flat reflector in such a way that when the cut edges were rejoined, the reflector would fold into an approximate CPC shape.

### ***Development of the Dynamic Stereoscopic Long Range System to Analyze Flock Behavior and Formation for the Control of Robotic Swarms***

Corbin Spells

The Dynamic Stereoscopic Long Range System (DSLRS) has been developed to offer an engineering perspective on the behavior of herds and flocks of animals for bio-inspired engineering applications. The system provides the relative spacing and velocity of each member within a herd or flock. The DSLRS employs two fixed cameras which simultaneously capture stereoscopic image pairs. These image pairs are analyzed using automated software algorithms developed in this work to produce spacing data up to a range of 350 meters. Eventually, the spacing and velocity data acquired by the DSLRS will aid in the development of a control algorithm for robotic swarms based on biological behavior. A control algorithm for automated robotic swarm operation will reduce or eliminate the human element in the control loop. For instance, estimates for the Global Positioning System (GPS) satellite constellation show that continuous, human-in-the-loop space operations from the ground costs up to 85 percent of the overall budget for the GPS space mission architecture. An intelligent system, with the ability to assess situations and react based on biological instincts, may address a critical need in

autonomous operations. The DSLRS is a first step in understanding herd and flock behavior from an engineering perspective in an attempt to provide the necessary level of fidelity to develop bio-inspired control algorithms.

### ***Low-cost Automated Video Capture for a Functional Movement Screen (and Other Biomechanical Applications)***

**Steve Tragesser, Brian Hardy, Mike Schenck, Tanner Rottering, and Estelle Moore**

The Functional Movement Screen (FMS) assesses seven different motions in order to identify tightness and weakness in the body. This information can then be used to design training regimens in order to reduce the risk of injury. One weakness of FMS is the somewhat subjective nature of the scoring of the tests. This work investigates the possibility of using a video capture system to get accurate quantitative data on the subject's motion. The final design uses an off-the-shelf digital camera and LED markers. The resulting system is more than an order of magnitude less expensive than typical video capture systems, but retains a high degree of automation, requiring very little manipulation by the user in order to obtain the desired data.

### ***Computational modeling of fluid-structure interaction in intracranial aneurysms***

**Natalia Valdivieso Tamayo**

Computational simulation and analysis of intracranial aneurysms may help predict future ruptures and allow neurosurgeons to take preventive measures in advance. A computational model of an intracranial saccular aneurysm has been previously developed based on an axisymmetric, spherical geometry. Whereas this previous model only considers the case of a steady blood flow velocity, the present study will include the effect of pulsatile flow. The internal blood flow will be modeled as an oscillatory flow and implemented in a finite element model of a spherical aneurysm using the software COMSOL Multiphysics. The goal of this study is to use a more realistic flow model to investigate how the wall shear stress (WSS) and the deformation of the aneurysm are affected by the fluid-structure interaction between the blood flow and membrane wall.

### ***Droplet Evolution and Transport in Electrospray Ionization Mass Spectrometry***

**Sean Zeeck**

Mass Spectrometry (MS) is a field comprised of researchers exploring molecular components within unknown samples relevant to that user's field of study. In some fields, such as pharmaceuticals, biomarker research, or proteogenomics, the biomolecules being investigated can be significant in size (hundreds to hundreds of thousands of atoms). Electrospray Ionization (ESI) MS is a vital technique in researching large biomolecules due to its ability to prepare large molecules for detection by a mass analyzer without undo alteration to their structure, such as fragmentation. Initial MS techniques for ionization would tend to damage large molecules through methods such as electron bombardment. ESI, on the other hand, is in a category of "soft ionization" techniques which allows for the measurement of the distribution of masses within a sample without damaging the molecules the user wishes to analyze.

Optimizing the input conditions of an ESI-MS device in order to produce the best results can be a laborious task. Predominantly, ESI-MS users use a method of trial-and-error when conducting their experimentation. This method does not necessarily lead to optimal experimentation procedures and limits the knowledge gained by a user on the phenomena occurring within the ESI-MS machine. This research will lay the framework by which a computational tool will be created by determining the appropriate models to simulate natural phenomenon occurring within the ESI-MS system. This research will directly determine the models to be used when simulating droplet evaporation, fission, and gaseous transport within the continuum regime of the ESI-MS.

# College of Education

## Curriculum and Instruction

### ***21st Century Standards and Curriculum: Current Research and Practice***

Halah Ahmed Alismail

The integration of Common Core State Standards (CCSS) and 21st century skills in the curriculum is not only beneficial to students and teachers, but also necessary to prepare our youth for their future careers. In an age of education where standardized tests determine the success of our schools, it is important to allow students the creativity and use the power of technology to support necessary skills and learn in unique ways. By allowing creative thinking and gauging understanding of content standards through a portfolio based system, students can display their concept retention while producing tangible and valuable outcomes. The future of our students depends on flexibility and resourcefulness not teaching to the test. Education needs to make an instructional shift in order to ensure our students succeed as the innovators of the future. This article explores 21st century skills as they are defined and describes methods that allow students to enhance these skills. It also highlights how educators can link students' current knowledge with authentic experiences that motivate, as well as allow them to create and collaborate using the latest technologies. The article concludes with a discussion around benefits of integrating multimedia in the classroom, including giving students the opportunity to enhance academic and social skills as they communicate and share information, organize their ideas, and express opinions while preparing a project or conducting research through online experience.

**Keywords:** CCSS, 21st century skills, Integrating 21st century skills to the Curriculum, Methods of instruction  
21st Century

### ***Universal Design for Learning in Distance Education***

**Scott Kupferman, Ph.D.**

This poster presentation will share the results of a yearlong empirical study that investigated the use of universal design for learning (UDL) practices in three university distance education programs. The study began with a national analysis of current distance education practices. We then incorporated the following UDL principles across the curricula: (1) Multiple Means of Representation; (2) Multiple Means of Expression; (3) Multiple Means of Engagement. Perspectives from students, faculty, and staff will be explored. Student learning outcomes measured via a battery of formal and informal assessments will also be shared. Lastly, UDL practices will be presented in a "how-to" framework with practical examples of how faculty, staff, and students can contribute to UDL practices on their campuses.

# College of Letters, Arts, and Sciences

## Anthropology

### ***Jean Charlot's Syncretic Artistry***

Amanda L. Pierce, **Glenda L. Carne PhD**

Jean Charlot was a multi-dimensional artist and educator. Without abandoning his French identity, he relocated to Mexico in order to foster his artistic self. In Coyoacán, Charlot created numerous artistic works alongside of several significant twentieth century muralists including Orozco, Siqueiros, and Rivera. After traveling to the United States in the late 1920s, he expanded his educational career and imparted his aestheticism to the Art Students League of New York. Charlot later shared his artistry at several universities throughout the United States including Notre Dame, Saint Mary's College, and University of Hawaii. Stemming from previous research, this study investigates the syncretism behind this late artist's work. Jean Charlot succeeded in synthesizing ideas that at first seem to be paradoxical. He effectively merged knowledge of Western European culture with indigenous culture, amalgamating his European background, Catholic faith, and intrinsic artistry with an acquired understanding of indigenous cultures in the areas in which he lived and worked. This research was recently published in the *Catholic Southwest: A Journal of History and Culture*, Volume 25, fall 2014. The project is continuous, as it will be proposed to the Southwest Art History Conference, October 2015.

## Biology

### ***Benefits of an early CURE Persist in a Biology Curriculum***

Jill Jenkins, Lacey Hanner, Lisa Durrenberger, **Tom Wolkow**, and **Lisa Hines**

In an effort to engage more students in scientific thinking and practice, many educators are providing undergraduate students with research experiences. CUREs are Course-based Undergraduate Research Experiences that allow whole classes of students to address a research question of scientific interest. During a CURE, students (1) employ science practices, (2) discover, (3) address a broadly relevant or important question, (4) collaborate and (5) iteratively build upon their own findings. However, the degree to which individual CUREs integrate these five activities can vary. Three years ago, we integrated CURE called "Soakin' Up the Rays with *S. pombe*" into an introductory biology laboratory course at a public, primarily undergraduate institution. Using a randomized study design with control and experimental groups, we observed short-term gains in both knowledge and perception. To date, we continue to evaluate these students as they progress into their upper-level biology coursework. Our data indicate that the short-term benefits observed from this single CURE intervention continue to persist even one-two years after completion. Here, we summarize the extent to which our CURE integrated the five learning contexts to better define those elements that have the highest potential for a long-term impact.

### ***Investigating Reproductive Tract Molecular Incompatibilities between *Drosophila arizonae* and *Drosophila mojavensis****

Erin Jordan and **Jeremy M. Bono**

Biological speciation occurs as a result of taxa acquiring traits that reproductively isolate or limit gene flow between populations. While many behavioral/temporal traits have been identified that restrict copulation (prezygotic isolation), and traits that make hybrid offspring less fit are clearly recognized (postzygotic isolation), molecular traits that play a role post-mating, pre-zygotic isolation (PMPZ) are poorly understood. Following copulation, successful molecular coordination between the female reproductive tract and ejaculate includes bypassing the female immune system, orienting sperm to egg by chemotaxis, successful sperm storage and release, and binding sperm to egg. Failure of coordination at any of these steps results in PMPZ isolation. In species with highly promiscuous mating systems, such as *Drosophila mojavensis* and *Drosophila arizonae*, PMPZ isolation may be driven by rapid evolution of reproductive proteins involved in sexual selection and/or sexual



conflict. Previous studies in the *D. mojavensis*/*D. arizonae* system have revealed several male accessory gland protein genes that are candidates for involvement in PMPZ isolation, including an ortholog of antares which is known to play a role in release of sperm from storage in *D. melanogaster*. Here, we use the CRISPR-Cas9 genome editing system to generate a *GI20219* knockout in *D. arizonae*. We hypothesize that crosses between knock-out mutant males and wild-type (WT) *D. arizonae* females will result in lower fertility compared to a *D. arizonae* WTxWT cross.

### ***From Rucksack to Backpack Transitioning from Military Service to Successful STEM Students***

Kimberly Mastropietro, Alyssa Mallette, Elisa Sabedra, **Jugal Kalita**, **Phillip Morris**, **Lisa Hines**

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.

### ***Drosophila larp5 regulates neural development and influences viability***

Marissa Metz, Allison Pabich and **Eugenia Olesnicki Killian**

A major goal of neurobiology is to identify genes that are involved in regulating nervous system development. Preliminary investigations have shown that inactivating the *Drosophila* gene *larp5* causes aberrant development of sensory neurons in the peripheral nervous system. The current study investigated the effects of turning off *larp5* throughout the nervous system. Various neuronal cell types of the central and peripheral nervous systems were stained and investigated in *larp5* deficient embryos. The number of sensory neurons and the number of neurites within each neuron was quantified. Behavior and viability in *larp5* deficient animals was assessed. Overall, loss of *larp5* function has detrimental effects throughout the *Drosophila* nervous system and results in decreased viability. Continued work on *larp5* may have important implications for medical research in humans, as the gene is conserved in the human lineage and has been associated with Alzheimer disease.

### ***Effect of Beetroot Juice on Self-Regulated, Moderate-Intensity Exercise***

Andrea A. Vanderwoude, Jordyn N. Rienks, Elizabeth Maas, Zachary M. Blea, and **Andrew W. Subudhi**

**Introduction:** Dietary nitrate supplementation, in the form of beetroot juice, has been shown to reduce oxygen consumption at a fixed work rate. We questioned whether a similar effect would be observed during variable work rate exercise at a specific rating of perceived exertion (RPE), as is commonly prescribed for aerobic training sessions. **Methods:** Ten females (25 ± 3 years; VO<sub>2</sub>peak 37.1 ± 5.3 ml/kg/min) performed repeated 20-min cycle ergometer trials at a constant RPE of 13 (somewhat hard) on separate days to determine the reliability of total oxygen consumption (VO<sub>2</sub>) and mechanical work performed during self-regulated exercise. Using a double-blind, placebo controlled, crossover design, subjects performed two experimental RPE 13 trials 2.5 hours following ingestion of 140 ml of concentrated beetroot juice (12.9 mmol nitrate), or nitrate-depleted placebo. Following each experimental trial, subjects rode at 75W for an additional 5 min to determine the effect of beetroot juice on fixed work rate exercise. **Results:** Coefficients of variation in total VO<sub>2</sub> (L) and work performed (kJ) during the RPE 13 clamp trials were 8.2 and 9.5%, respectively. Consumption of beetroot juice did not affect total VO<sub>2</sub> or work performed during RPE 13 exercise, but lowered resting systolic blood pressure by ~5 mmHg (P=0.041) and oxygen consumption at 75W by ~4% (P=0.048), relative to placebo. **Conclusions:** Since the effect

of beetroot juice on oxygen consumption was small, and may be masked by daily variability during self-regulated exercise, it is unlikely to improve moderate-intensity training up to 20 min in duration.

### ***Drosophila rin plays a major role in neuronal morphogenesis***

Serena Younes and Eugenia Olesnicky Killian

RNA binding proteins are a large class of proteins that regulate many different aspects of RNA metabolism. RNA binding proteins have recently emerged as important regulators of neuronal development and have been implicated in various neurological disorders including Amyotrophic Lateral Sclerosis, Autism and Fragile X Syndrome. The *rasputin (rin)* gene encodes an RNA binding protein that is required for the formation of specialized neuronal processes termed dendrites with *Drosophila* sensory neurons. However, little is known of its additional requirements within the nervous system. The current study investigated the effects of eliminating *rin* function and overactivating *rin* within multiple neural subtypes in *Drosophila* embryos. Experiments consisted of staining embryos for various neuronal markers and quantifying the various defects within these neuronal cell types that arise from manipulating *rin* function. Our results indicate that manipulation of *rin* levels results in aberrant development of neuronal cell types in both the peripheral and central nervous systems. This study suggests that *rin* is broadly involved in *Drosophila* neural development.

## **Chemistry and Biochemistry**

### ***Development of low density solvent DLLME-GC/MS method for quantitation of tetrabromobisphenol-A from dust***

Christopher Barrett, Janel E. Owens, David Orban, Shannon Seebeck, Luis Lowe

The development of an alternative dispersed liquid-liquid microextraction (DLLME) protocol utilizing a low density extraction solvent, toluene, is described here for the extraction of the brominated flame retardant, tetrabromobisphenol-A (TBBPA) from dust. Method parameters of dispersive solvent type and extraction solvent type were optimized. Excellent recovery (88.9%;  $n = 5$  spike replicates) with good precision was achieved in a spike and recovery study. This developed method was utilized to survey TBBPA concentrations in dust sampled from a local electronics recycling facility from the ambient environment and 25 computer towers undergoing recycling. Concentrations of TBBPA from dust in computer towers ranged from not detected ( $n = 2$ ) to 63.5  $\mu\text{g/g}$  with a mean value of 10.8  $\mu\text{g/g}$  and median of 4.1  $\mu\text{g/g}$  TBBPA. A composite sample of dust collected from the ambient indoor environment was analyzed with resulting concentration of 35.7  $\mu\text{g/g}$ .

### ***Molecular modeling of small molecule inhibitors of CD81 EC2***

Brandon M. Bell

Exosomes are small vesicles secreted by most cells with various functions in cell-cell signaling. Proteins in the tetraspanin family including CD9, CD63, and CD81 are commonly found on exosomes. The research project involves molecular modeling of a domain of CD81 in order to develop protein-protein interaction inhibitors. After molecular modeling and screening on fragment and lead molecules *in silico*, we will test the binding affinity of these molecules *in vitro* to determine if they function as efficient inhibitors.

### ***Microwave-assisted green synthesis of silver nanoparticles for the assessment of total antioxidant capacity in fruits***

Santiago Bukovsky-Reyes, Janel E. Owens

Previous studies have used gold nanoparticle formation as a means to assess the antioxidant capacity of fruit extracts. However, the synthesis of silver nanoparticles (AgNPs) in developing an antioxidant assay has not been explored. This research presents a microwave-assisted synthesis of AgNPs guided by the principles of green chemistry to assess antioxidant capacity of fruits. Synthesis of AgNPs has been achieved by reducing  $\text{Ag}^+$  ions from ultrapure  $\text{AgNO}_3$  using standards solutions of chlorogenic acid (CGA), caffeic acid (CA), and starch. Analysis of AgNPs by UV-visible spectroscopy displayed a direct correlation to CGA, CA, and starch concentration ( $R^2 = 0.9966, 0.9791, 0.9607$  respectively). A previously developed microwave-assisted extraction (MAE) procedure for chlorogenic acid has been applied to fruits to generate extracts for antioxidant assay by this method. This

work has the potential for development of a rapid, sustainable method for surveying the antioxidant capacity of fruits.

### ***Synthesis of Di- and Tri-substituted 1H-1,2,3-triazoles***

Chris Butler, Kelly McGee, Alejandra Arroyave, **Renee Henry** and **Allen Schoffstall**

The 1H-1,2,3-triazoles are aromatic heterocycles not found in nature, which remain stable over a broad pH range and when exposed to oxidizing or reducing agents. Triazoles have been inserted in peptides in place of amino acids, allowing for their use as bioisoteres. Triazoles have also been used in place of the phosphodiester bond linking base pairs together in DNA and RNA. The triazoles have been extensively studied as antibiotics, antiviral agents and for DNA ligations. For our purposes, triazoles were to be investigated for both metal and enzyme binding.

1,3-Dipolar cycloaddition, or more specifically, Huisgen cycloaddition of an unsaturated azide and an alkyne provides a mixture of 1,4 and 1,5 isomers of a triazole. The most widely used method for the preparation of 1,4-disubstituted 1H-1,2,3-triazoles is a copper catalyst "click" chemistry reaction first proposed by Sharpless et al. and by Meldal et al. In this study a variety of novel functionalized 1,4-disubstituted and 1,4,5-trisubstituted 1,2,3-triazole derivatives are reported. These triazole derivatives were synthesized in keeping with the "green" chemistry principles laid out by the American Chemical Society. The triazolecarboxylic acids are then subjected to basic conditions in which the mono- and di-carboxylate salts are formed. These salts have been tested for their ability to form complexes with the Iron (II) species found in ferrous chloride. Although preliminary results are inconclusive, initial tests show promising results that a complex between the carboxylate salt and the iron (II) are being formed.

### ***Synthesis of disubstituted 1H-1,2,3-triazoles containing fluorine***

David Clarke, Kirsten Knobbe, Wes Robertson, **Allen Schoffstall**

1H-1,2,3-Triazoles have only recently come prominently into the synthetic chemistry fold since introduction of the copper(I)-catalyzed cycloaddition, a widely acclaimed "Click Chemistry" method, which was published in 2002. Since then, some synthetic fluorotriazole drugs have been marketed, notably two as fungicides. The 1,2,3-triazoles do not occur naturally and testing has shown that organisms do not degrade the triazole moieties of tested compounds. Fluorinated pharmaceuticals are much sought after due to their increased hydrophobicity beyond that of analogs lacking a fluorine. Fluorine atoms are highly polar and a change from a C-H bond to a C-F bond can cause significant dipole moment and pKa changes from the C-H form. These considerations led us to synthesize a series of fluorinated triazoles using Click Chemistry. We report preparation of a variety of fluorinated 1H-1,2,3-triazole derivatives characterized as 1,4 disubstituted triazole derivatives. Products were synthesized from aromatic azides and alkynes containing various regioisomers containing trifluoromethyl and fluoro substituents. Characterization by GC-MS, <sup>1</sup>H NMR, <sup>13</sup>C NMR, and IR confirmed successful synthesis of the desired fluorinated triazole products.

### ***Antigen Loading Exosomes for Therapeutic Purposes***

Maria Font, Clairelise Post, **Jarred Bultema**

Exosomes are small, heterogeneous 30-100 nm extracellular vesicles that play prominent roles in intercellular regulation and communication. Studies suggest that exosome 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 matured dendritic cells contain peptide-loaded MHC class-I and -II molecules for T-cell stimulation, as well as proteins CD63, CD81, CD9, are able to stimulate antigen-specific immune responses. Incorporation of Spy Tag into these proteins may allow an antigen to be covalently attached to exosomes through the SpyTag-Spy Catcher isopeptide bond. Atypical cloning techniques are used to insert SpyTag into specific internal protein locations. After successfully cloning SpyTag into specific protein sites, these Chimeras will be tested *in vitro* and *in vivo* in mice to judge effectiveness as an immunotherapy.

### ***Modeling some features of the reaction mechanism of chymotrypsin using semiempirical methods***

Whitney Kelly and Brittani Guerrero

The digestive enzyme chymotrypsin is a serine protease which cleaves peptide bonds near large, hydrophobic residues. Chymotrypsin is also important for activating a number of other digestive enzymes. This study addresses the energetics of the reaction mechanism of chymotrypsin using the bovine gamma-chymotrypsin protein structure (PDB ID 1AFQ) using the PM7 Hamiltonian as implemented in MOPAC2012. The lowest energy conformation of enzyme bound to substrate was found to have a number of important salt bridges that stabilize the structure. After finding the lowest energy conformation, the energy profile for the steps in the accepted mechanism was investigated. A greater understanding of the reaction energetics of chymotrypsin is of interest because there are a number of serine proteases in humans, including elastase, which is implicated in emphysema, and thrombin, which plays a role in some clotting disorders.

### ***The use of synthetic peptide Vn96 in exosome purification and protein loading***

Isabel Kirk

Exosomes are extracellular nanovesicles (40-100 nm in diameter) that are secreted by almost all cell types. Exosomes from immune cells secrete exosomes capable of inducing both innate and adaptive immune responses. The immunogenicity of exosomes employed as cancer therapy in two phase I and one phase II clinical trials, but the exosomes have been shown to have limited potency, potentially due to the reliance upon poorly understood sorting mechanisms in bioengineering of the exosomes. A recent study has produced a synthesized peptide, Vn96, which binds heat shock proteins (HSP) found on the surface of exosomes. This project investigates the potential use of synthesized peptide Vn96 in both the purification and bioengineering of exosomes for immunotherapy.

### ***Human Pepsin 3A Hydrolysis Reaction Mechanism***

Alexis N. Mascarenas, James J. Stewart, **Sonja B. Braun-Sand**

Human pepsin 3A is an aspartyl protease secreted by the gastric mucosa of the stomach and is necessary for initial protein digestion. The two aspartic acid residues in the active site facilitate hydrolytic catalysis. A previous study refined the crystal structure of human pepsin 3A and its phosphonate inhibitor (IQRP). In this study, we used MOPAC2012 to calculate the heat of formation of the enzyme-inhibitor complex in order to determine the lowest energy structure. We then converted this transition state analogue inhibitor to the peptide substrate, N-methyl acetamide, to find the most energetically favorable transition states and ultimately the reaction mechanism.

### ***Parameterization of conditions leading to 1-cinnamyl-1H-1,2,3-triazole-4-carboxylic acid***

Andrew McGrath, Chris Butler, **Renee Henry** and **Allen Schoffstall**

The EPA 2007 priority list of Superfund contaminants lists arsenic, lead and mercury as the top three of 275 hazardous substances. Unlike volatile organic compounds, metals are not removed from the environment by natural decay processes. Instead, these need to be removed from the environment to yield safer health and ecological conditions. This research project seeks to synthesize novel polycarboxylate monomers in order to bind and remove heavy metals from the environment. The oligomer can be recovered for re-use, which is a guideline set by the EPA for Sustainable Chemistry. The research goals of this project are to 1) synthesize triazole carboxylates with multiple binding sites to form complexes that remove metals from soil and water, and 2) separate and recover the carboxylates from the complexes for reuse. We use green click chemistry to build new cinnamyltriazole carboxylates, to be used in metal binding studies. Some of the organic reactions are carried out in aqueous solvents at 60 °C using microwave heating. The piece of the project reported here is to establish optimized reaction conditions for the synthesis of 1-cinnamyl-1H-1,2,3-triazole-4-carboxylate by varying catalyst, temperature, solvent and work up and isolation procedures.

### ***Using HPLC to quantitate indole production as a marker of stress response in bacterial communities***

David Orban, Eric Wagner, Christine Goolsby, Becca Read, Tharon Stewart, Karl Merz, Jr., Siobhan Barnes, Wendy Haggren, and Janel Owens

Indole, produced from tryptophan by many bacteria, serves as an inter-cellular signaling molecule. In the presence of antibiotic, indole secreted by resistant cells has been shown to induce protective measures in non-resistant cells (specifically, up-regulation of efflux pumps). This study investigates indole production by bacterial communities in the presence of starch-capped silver nanoparticles (AgNPs), which have been shown to kill bacterial cells. Cell-free supernatants were prepared for high performance liquid chromatography (HPLC) by mixing 1 mL of the supernatant with 0.5 mL of a 75/25 (v/v) mix of acetonitrile and water. Indole was detected at 280 nm using a photodiode array detector. The HPLC assay, sensitive to micromolar amounts of indole, showed the robust resumption of indole production following exposure of *Escherichia coli* to AgNPs as compared to a slower response following exposure of *E. coli* to 10 µg/mL ampicillin, which is lower than the minimum inhibitory concentration. This methodology will provide information about how the cells of a bacterial population communicate among themselves in the presence of AgNPs.

### ***Analysis of aroma compounds in whiskey by DLLME-GC/MS***

Janel E. Owens, Laura B. Zimmerman, Michael A. Gardner, Luis E. Lowe, David Orban, Christine Goolsby

While the production processes of producing whiskey are tightly regulated, the distillation and cask aging impart many of the important compounds responsible for the complex flavor that make each mature whiskey unique in taste and aroma. Understanding the chemical components of a whiskey may help producers make a better product and/or aid in the protection of this high value product. There are several well established methods for the characterization of the aroma compounds in foods and beverages such as solid phase micro-extraction or liquid-liquid extraction. Methods that can rapidly confirm authenticity are of interest. Here, aroma compounds in whiskey ( $n = 15$ ) were extracted using ultrasound-assisted dispersed liquid-liquid microextraction (DLLME) where 500 µL of whiskey (which contains ethanol, an excellent dispersive solvent) were mixed with 500 µL water and 200 µL chloroform (as extraction solvent). The chloroform extract was analyzed by gas chromatography-mass spectrometry with data manipulation by AMDIS (Automated Mass Spectral Deconvolution and Identification System) to allow for comparisons between whiskey samples and creation of a mass spectral (MS) library of target compounds. Aroma compounds commonly reported in the literature (furfural, isoamyl acetate, 5-methyl furfural, ethyl esters, phenylethyl alcohol, whiskeylactone, and vanillin) were tentatively identified based upon the match to the MS library. The integration of this green chemistry DLLME method into an upper-division analytical chemistry course is discussed.

### ***Toward the Synthesis of Water-Soluble, Highly Emissive, Semiconducting Quantum Dots***

Caleb Rolsma and Kevin Tvrđy

Quantum dots (QDs) are semiconductor nanocrystals with radii on a nanometer-scale, and contain several hundred to several thousand atoms. QDs have size-dependent properties originating from quantum confinement of excitons in the nanocrystal, including size-dependent absorbance and emission spectra. Consequently, QDs have many potential uses, including cell imaging. Cadmium selenide (CdSe) QDs were synthesized using cadmium oxide and trioctylphosphine selenide precursors in a trioctylphosphine oxide solvent, with the addition of various ligands to affect growth rates, producing QDs with approximate radii in the 1-3 nm range for different samples. After synthesis, QD surfaces were passivated using a zinc sulfide overcoating to improve emission quantum yield, followed by size-selective precipitation to narrow the size distribution within a sample. To produce water-soluble QDs, a silanization reaction was used to coat the QDs in a silica shell with hydrophilic side chains. Future plans include alterations to the silanization reaction to allow for the bioconjugation of biological molecules to the QD surfaces, which can then be used in cell imaging.

### ***Functionalized-Microsphere Hydrogel Customization for Single-Walled Carbon Nanotube Separation***

Jackson Rowland and Kevin Tvrđy

Carbon nanotubes contribute to a useful class of nanomaterials, the applicability of which is expanded when tubes of a single chirality are utilized. Single chirality nanotubes are obtained through an electrophoretic interaction with the porous hydrogel Sephacryl-S200, however because Sephacryl is synthetically designed for

size exclusion chromatography, there exists opportunity for improvement upon its functionalized polymeric structure. The method for development of a structurally stable microsphere hydrogel that can be made to chemically interact with SWNT has been determined. The chemical network configuration of the developed hydrogel will be exactly customized for optimal SWNT separation. The improved hydrogel will allow for efficient and inexpensive nanotube separations.

***Approaches to the expression and overexpression of cloned yeast hexokinase I in Saccharomyces cerevisiae***  
Hari Sridhar, Steven Orban, Joshua Diaz, Gretchen Geibel, Bryce Brownfield, **Wendy Haggren**, and **Sonja Braun-Sand**

Yeast hexokinase I (HxKI) from the single-celled bread yeast *Saccharomyces cerevisiae* shares a 33% amino acid sequence similarity to the human hexokinase isozyme IV (glucokinase). Low expression of glucokinase in liver characterizes Type 2 diabetes, and seems to be a result of several naturally occurring human mutations that affect regulation of glucokinase production or its ability to bind glucose. We use yeast as a cellular model in which to manipulate the expression level of hexokinase. Here we present several approaches we are taking to overexpress cloned yeast hexokinase I in a yeast cell which is also expressing its native version of the protein. The goal is to purify the cloned enzyme for kinetic analysis as well as to introduce mutations into the active site of hexokinase I and to purify the mutated proteins in order to correlate hexokinase structure to its function in diabetes.

***Maximizing the Emission Quantum Yield of Semiconducting Quantum Dots***

Nathan Weeks and **Kevin Tvrdy**

Synthetic methods for near-monodisperse, water-soluble, biofunctionalized quantum dots with increased quantum yield are well developed. This project involves the reproduction and refinement of these synthetic methods, with an overall goal of the further development of methods for biofunctionalizing silica coated (CdSe)ZnS Core-Shell quantum dots with novel bifunctional linker molecules. Quantum dots are powerful tools in the realm of biological imaging and intracellular tracking due to their tunable symmetric, and narrow size dependent emission peak properties, which can span the entire visible spectral range. Additionally, quantum dots experience little to no photobleaching, which is a problematic limitation of fluorescent dyes. Biofunctionalizing quantum dots with novel molecules will further enhance their applicability to biological and imaging studies in the future. Currently, the primary focus of this project is synthetic methods for ZnS overcoating. Specifically, various experimental pathways are being explored to maximize emission quantum yield, such as ZnS shell thickness and the advantages one-pot vs. two-pot syntheses.

## English

***Disney's Beauty and the Beast: A Deeper Look into Society's View on Domestic Violence***

Marina Cumming

This presentation will explore the social norms that Disney echoes from American Society, especially through depictions of domestic violence in Disney's *Beauty and the Beast*. Knowledge and understanding of domestic violence has grown and evolved in recent years. During the early nineties, the time in which *Beauty and the Beast* was released, domestic violence was still gaining awareness but was not necessarily seen as a true crime. When it comes to Disney films or any films, society has an influence on how people will act or behave in these films. Since, *Beauty and the Beast* was the first Disney film ever written by a woman, it does bring into question if this particular film is the writer's way of bringing more awareness to the problems seen in domestic violence relationships or if it is just another representation of society's influence on what we see as normal.

***Disney Depiction of Nature: From Bambi to WALL-E***

Janell Edsall

This poster will discuss Disney's depiction of nature through the films *Bambi* and *WALL-E*. In both of these works, Disney represents humans as forces of destruction, encouraging the audience to instead connect with animals and robots for their humanlike characteristics. Disney also works to enhance the environments

surrounding the main characters in order to highlight the extreme differences that occurred over time in these worlds. To understand how Disney creates human-like nature and humans as forces-of-nature, this poster will use David Payne's "Bambi" and David S. Whitley's *The Idea of Nature in Disney Animation*. Through the films *Bambi* and *WALL-E*, Disney successfully depict dramatic themes of the environment rather than people.

### ***Disney's Counterculture Creation***

Elizabeth Franco

The purpose of this research is to identify the rhetorical effect of Walt Disney on American counterculture. The counterculture otherwise known as the radical youth has been a strong part of America's history. Walt Disney is considered one of the most conventional and traditional of all major American moviemakers. Yet Douglas Brode overturns the idea of Disney as just any regular filmmaker by noting throughout his book that Disney movies play a key role in the transformation of eras, from the Eisenhower era to the radical youth of the Age of the Aquarius. Disney movies were much ahead of the time, espousing beliefs such as pacifism and introducing a new generation to feminism. In rhetorical terms, this presentation will analyze Disney's *kairotic* influence on the counterculture, especially during the sixties, as well as the ramifications of his influence today.

### ***Pretty Woman or Sleeping Beauty: Revealing Hidden Messages in Disney's Live-Action and Animated Films***

Nicole Garcia

This presentation will review the similarities and differences in the hidden messages throughout Disney's animated and live-action films, focusing especially on princesses and motherhood. The purpose is to show how live-action and animated films contradict each other when the messages are different, and reinforce a strong message when there are similarities. Whether intentional or not, all Disney films have an underlying message within. Main information comes from Lynda Haas's insights in the book *From Mouse to Mermaid* and the book *Waking Sleeping Beauty: Feminist Voices in Children's Novels*. These two books go into depth about both live-action and animated films. The question that needs to be answered is why Disney creates these hidden messages in both types of film, but then does not stay consistent.

### ***Maleficent: Good, Evil, or Other?***

Kylie Koetter

This poster will explore the Disney villainous Maleficent and her ambivalent nature. On one hand Maleficent is depicted as purely evil in *Sleeping Beauty*, dragon like and enshrouded in flames. On the other hand Maleficent is depicted innocent and good in *Maleficent* through her backstory that re-contextualizes her only seemingly wicked actions. To explain her paradoxical nature, this poster will use Amy Davis's *Good Girls and Wicked Witches* as well as Elizabeth Bell's "Somatexts at the Disney Shop" to understand how female wickedness is shown as middle-aged beauty at its peak of sexuality and authority, and the heroine is at the idealized height of puberty's graceful path. Maleficent is not necessarily bad, but rather misunderstood good.

### ***Representations of Archetypes and Myths in Star Wars***

Victoria LaPerche

The purpose of this presentation is to highlight some of the key uses of classic archetypal and mythological themes used within the Star Wars anthology. When taking a closer look at the main characters in the original trilogy, the roles that each individual plays becomes blatantly clear: Luke, the hero; Leia, the damsel; and Han Solo, the cynical anti-hero. Furthermore, these archetypal roles tie closely into the mythological themes presented in Joseph Campbell's *Hero with a Thousand Faces*, from which George Lucas was heavily inspired, explicitly by the concept of the monomyth (also known as the hero's journey), in the making of these films. "Representations of Archetypes and Myths in *Star Wars*" will make an effort to demonstrate some of the seminal components that attribute to the multi-billion dollar success of the franchise that center around this idea of ineluctable themes.

### ***Disney Giving Hope throughout Time***

Samantha McMahon and Mackenzie Schuller

This poster will present the idea that when America and the world undergo a crisis, Disney shall release a movie that will distract the American public, giving them hope to overcome this issue. Crafting a timeline of crises and Disney movies and building on Jack Zipes's observation that *Snow White and the Seven Dwarves* brought hope to Americans during the Great Depression, this work will be focus on four Disney films in particular and how these drew America's attention away from a crisis of the time: *Bambi* (1942) offered hope during World War II and the propaganda around it, *Alice in Wonderland* (1951) drew attention away from the drug problems on the rise in America and the negative affects it has on people, *The Jungle Book* (1967) premiered after Walt Disney's death to alleviate worries of the Vietnam War, and *Monsters, Inc.* (2001) helped America escape the events of September 11<sup>th</sup>. Disney has utilized the power it has to give people hope to be something better than what they are, no matter the difficulties of the time.

### ***Disney's Deceitful Definitions of Happiness, Love, and Beauty through a Platonic Lens***

Ashley Nam

This presentation analyzes how Disney falsely represents happiness, love, and beauty to impressionable viewers through Plato's *Symposium*. In Plato's *Symposium* (360 B.C), the protagonist Socrates states that beauty is the shallowest form of love. In contrast, Disney markets that love based on beauty is true and leads to a happily ever after. The external look of an individual will reflect their true internal self; in other words, there is no difference between physical beauty and inner character (Bell 1995; Berman 2014). *The Little Mermaid* (1989) and *Snow White and the Seven Dwarves* (1937) both reflect this phenomenon. Protagonist Ariel doesn't speak but still gets Prince Eric's affection in the end, while the antagonist Ursula the sea witch is the hideous villain whose life ends unhappily. Snow White is in a coma yet the Prince still falls in love with her without any knowledge of her character, while the Queen has a sinister look and is so intent on staying permanently beautiful that she is willing to kill and participate in witchcraft. Socrates believes happiness is achieved only through the love of wisdom, and that true love must be of a spiritual, eternal, and infinite nature that is completely unfazed by external aesthetics. In contrast, Disney makes physical aesthetics the basis of love. Disney's false representations of happiness, love, and beauty have negatively influenced the minds of young viewers and set them down a dangerous path of false expectations.

### ***The Unknown Power of Disney***

Wade Nelson and Ryan Warren

The Walt Disney Company is a major corporation, and is one of the top seven media conglomerates in the world, owning many major brands such as Marvel Comics, ABC, ESPN, and A&E. This poster will explore these subsidiaries and some of the many more that Disney owns and how these companies give Disney sway over on the American public. Despite the public ignorance of its influence, Disney has vast power to impact the entire world through the media it owns. Using *Mickey Mouse Monopoly* and other critical texts, this project will analyze Disney and its many subsidiaries to unearth the scope that this corporation wields over the American people.

### ***Influence of Societal Norms on Disney Princesses***

Kristina Nguyen

This poster will portray how changes in societal norms over the years directly affect the characterization of Disney princess in animated feature films. Disney has a knack for following the social norms in society such as gender roles shifting from stereotyping submissive women to independent characters. Using analysis on gender topics from books such as *Good Girls and Wicked Witches* and *From Mouse to Mermaid*, this work will analyze Disney princess films from past to present to support this statement, ultimately advocating that over time the enforcement of stereotypical roles of females in Disney films has slowly started to disappear as social norms in society change.



### ***Disney's Homosexual Villains and Transgendered Villainesses***

Emily Puffett

This presentation will focus on the villains and villainesses of the animated Disney films, and what stereotypes the villains are representing. Male villains in Disney films are often shown with homosexual tendencies, and often paired with other minority groups. Additionally, female villains are frequently illustrated with transgendered characteristics and attributes. By using filmic and animated techniques, Disney seems to portray villains and villainesses like gays, transsexuals, Hispanics and African Americans as outside and unacceptable groups in society. Information used in this presentation are the various movies, such as *Sleeping Beauty*, *Peter Pan*, *Aladdin*, and more, as well as the books *Diversity in Disney Films* and *From Mouse to Mermaid*. The presentation shows how the Walt Disney Company villainizes minority groups.

### ***Excelsior into a Digital Age through Yves Bigerel***

Benjamin Syn

This presentation will explore Yves Bigerel's revolutionary layouts in Marvel's Infinite Comics series. Bigerel uses scores of primarily single-panel pages to express nuance changes from one instant to the next, giving readers a depth of intimacy beyond what the printed page allows; furthermore, the rhetorical effect of panel transitions inflict an experience upon readers in a way impossible in the print form. To understand exactly what Bigerel is bringing to Infinite Comics, this work will build upon Scott McCloud (1994) and Will Eisner's (2008) scholarship on comics and digital comics—as well as Bigerel's (2009) own "About Digital Comics"—synthesized with film theory and criticism to unpack the breakthrough that this artist is achieving in the digital world. However, this work will also problematize that these comics can only truly function in a digital space and would be clumsy and awkward if converted to the print comic format. Thus, while Bigerel is not a comic artist in the traditional sense, he is comics' first digital native.

### ***Disney's Brand Name Scam***

Destinee Vigil

This poster will be discussing the hidden messages that Disney uses to economically dominate the world. Disney's priority on policing its name and image instead of caring about the impact it has on society has resulted in its success but at a cost. Disney makes movies for children and adults who not only want these movies, but the toys, books, and other accessories connected to this film, perpetuating the Disney brand throughout their lives. Carl Hiaasen book *Team Rodent: How Disney Devours the World* as well as the documentary *Mickey Mouse Monopoly* will help this poster unpack Former Disney CEO Michael Eisner's claim "To make money is our only obligation." This poster will ultimately advocate that fans of Disney should be taking precautions from getting swept up in Disney's brand.

## **Geography and Environmental Studies**

### ***The Effect of Aspect on Dust Covered Snow in the San Juan Mountains of Colorado***

Lauren Burgess

Dust on snow in the San Juan Mountains (SJM) of southwest Colorado accelerates end-of-season melt timing and melt rate by decreasing albedo and absorbing longwave radiation. The increase in dust deposited on snow in recent years is due in part to changes in climate and changes in land use (e.g., grazing, recreation, oil and gas development, dryland farming) across the semi-arid regions to the south and west of the SJM. Though major efforts to better understand dust/snow interactions are underway at the basin and regional levels, few studies have looked at the role of micro-topography in snow ablation processes. This study examines how different aspects (slope angles) in a mid-winter snowpack at 2865 m (9400 ft.) are altered by dust that was artificially dispersed on a clean snowpack by the author. Specifically, over the course of a week in January, 2015 that experienced a mix of cloudy and sunny days, dust settlement, dust dispersion, and snow depth were measured at each of four sites. As expected, more melting occurred on southern aspects. Other results that were not expected showed that dust was able to melt snow laterally (outward away from dusty snow into clean

snow), and dust's influence was moved downslope and concentrated by being deposited in channels via snow surface meltwater.

## Physics

### ***Suppressed concentration fluctuations in rat basophilic leukemia (RBL) cell synapse: (indirect) evidence of large signaling complexes***

Rachel Drawbond, James L. Thomas and **Kathrin Spendier**

The spatial extent of membrane receptor signaling complexes can be difficult to determine. Using a concentration fluctuation signature, we show an indirect way of determining the size of the IgE-FcεRI receptor signaling complex (IgE-RC) in rat basophilic leukemia (RBL) cells. This approach applies the concept that at high IgE-RC area fractions, randomly placed complexes cannot obey Poisson statistics, due to excluded area. When IgE-loaded RBL cells interact with a supported lipid bilayer (SLB) presenting binding ligands, IgE-RCs coalesce to form a large central patch called the mast cell synapse. RBL cells labeled with varying concentrations of fluorescent and dark anti-DNP IgE settled onto SLBs with 25 mol% DNP-lipid. Using total internal reflection fluorescence microscopy, synaptic patches were imaged. At high fractions of fluorescent IgE, the spatial variance of the fluorescence fluctuations was observed to be suppressed, compared to the variance expected from Poisson statistics. Comparison of experiment to computer models suggest that the actual size of IgE-RC is at least two times larger than reported in literature, indicating that additional cytosolic or membrane proteins may associate with IgE-RCs.

### ***Rapid One Step Microwave Synthesis of Sugar Reduced Mannan Encapsulated Size Controlled Noble Metal Nanoparticles***

Jewell Anne Lee Hartman, Jonathan Hinds, **Anatoliy O. Pinchuk**

Size controlled noble metal silver nanoparticles (AgNPs) and gold nanoparticles (AuNPs) have been synthesized using a rapid, simple, one-step microwave synthesis method by the reduction of  $\text{Ag}^+$  or  $\text{Au}^{3+}$  ions in an aqueous solution of mannan, the linear polymer of the reducing sugar mannose, acting as a reducing and encapsulating agent. Various mass ratios of  $\text{AgNO}_3$ :Mannan and  $\text{HAuCl}_4$ :Mannan were used to determine the optimal synthesis parameters and to control the size of the nanoparticles synthesized. This synthesis method provides the advantage of a fast 10 minute synthesis that exhibits the simplistic repeatability of a one-step microwave synthesis with mannan as the sole reducing agent that simultaneously functionalizes the nanoparticles. Nanoparticle size is controlled by modifying the mass ratio of metal salt precursor to mannan. The nanoparticles were characterized using UV-Visible absorption spectroscopy and nanoparticle sizes were estimated by using dynamic light scattering and scanning electron microscopy. Additionally, the experimental surface plasmon resonance was confirmed by a comparison to Mie theory calculations.

## Psychology

### ***Sugar, Spice and Everything Murder: Motivations of Female Killers***

Kristen Bowman

Throughout the development of the psychology and criminal justice fields, extensive research has been conducted on what drives male offenders to engage in violent crime. However, minimal research has been conducted on violent female offenders. The purpose of this study is to examine the different motivations behind the reasons why females kill. Three case studies of violent female offenders will be utilized to discuss how females engage in the same types of violent crime as males. Specific emphasis will be placed on females who have engaged in acts of mass murder, filicide, and serial murder. Implications for future research regarding female killers will be discussed.

### ***Attitudes Toward Juvenile and Adult Sexual Offenders***

Scott Hanneman, Timothy Kilcoyne, Nadia Al-Tabaa, Nick Vayer, Nicole Norelli, & **Robert Durham**

There are few groups within Western societies who are more explicitly disliked than sex offenders. Little is known about where the attitudes originate from, or exactly what the attitudes are. In previous attempts to create scales, the all-encompassing term “sex offender” has been used for all types of sexual offenders. The current study differentiated the larger group of sexual offenders into sub-groups and created scales for those sub-groups being adult and juvenile child molesters and rapists. The goal of the current study was to psychometrically validate a scale differentially worded for the four populations. Researchers originally created over 175 individual items, and narrowed the item bank down to 19 items that were presented to participants. 393 individuals participated in the study. The alphas for the versions of the scale ranged from 4.8 to 7.3. The need for consistent findings is obvious as public policy is based on public perceptions of this much vilified group. Four new scales were created and psychometrically evaluated to better address attitudes towards adolescent and adult child molesters and rapists.

### ***The Effects of Mortality Salience on Subjective Experience of Time***

Victoria Rowe

Death is considered a strong motivator of human behavior as it influences many decisions people make. From burial rituals to career decisions, education investments to suicide, thoughts surrounding mortality influence the way people perceive the functioning of the world and their environment. Research on terror management theory has gained insight into how individuals’ beliefs and societal roles are used as mechanisms to deflect anxiety surrounding thoughts of mortality. The present study investigated whether exposure to a reminder of mortality (mortality salience) affects perception of time. The study also investigated whether proximity to a socially-oriented ending (i.e. graduating from college) has an effect on subjective experience of time. Eighty-four graduating and non-graduating college students participated. They responded to one of two priming conditions; those in the experimental condition answered questions about mortality, and those in the control condition answered questions about dental pain. After the priming condition, participants completed a second questionnaire. The dependent variable was how accurately participants estimated the duration of time spent on the second questionnaire. Unfortunately, few graduating students participated, perhaps due to the demands of a final semester. We anticipate that this contributed to non-significant results.

# School of Public Affairs

## ***Intimate Partner Violence Among Immigrant and Undocumented Women***

Inez Angulo and **Dr. Catherine Kaukinen**

While Intimate Partner Violence (IPV) is an important social problem generally, there is a vulnerable population that has been mostly neglected. There is a consensus in current research that states that immigrant and undocumented population has not been included in IPV research and neglected in studies exploring the nature, dynamic and extent of IPV. Therefore, there is limited information of the impact of IPV within this community. Immigrant women may be particularly vulnerable to retribution, as they believe residency status may depend on their relationship with the batterer. Immigrant women's vulnerability to IPV may be exacerbated by policies like the Marriage Fraud Act (1986). Theory and further policy implications are addressed.

## ***Women Who Kill their Batterer: Explanations and Outcomes for Women***

Natassia Baxter and **Dr. Catherine Kaukinen**

The poster explores the characteristics of women victims of intimate partner violence who kill their abusers. In particular the paper highlights that research that notes that those women who kill their batterer have stronger patriarchal attitudes, were married to their partner longer (avg. 21.62 years), have lower education level, and are underemployed (Kim & Titterington, 2009). Other research finds that their spouse had an affair and that the crime arose out of sexual jealousy, and that their spouse was more likely to have substance abuse (Pretorius & Botha, 2006). In contrast, those battered women who do not kill their spouse had sought help from shelter, reported more "serious" abuse, were married for shorter periods (avg. 16.23 years), and had higher socioeconomic attainment (Kim & Titterington, 2009). The poster then highlights the primary defenses used by Defense attorney's in murder trials: 1. Battered Women's Syndrome (BWS), 2. Social Agency Framework (SAF), 3. The use of expert testimony, and 4. The use of empathy induction (Plumm & Terrance, 2009).

Kim, B., & Titterington, V. B. (2008). Abused South Korean women: A comparison of those who do and those who do not resort to lethal violence. *International journal of offender therapy and comparative criminology*.

Pretorius, H. G., & Botha, S. A. (2009). The cycle of violence and abuse in women who kill an intimate male partner: A biographical profile. *South African Journal of Psychology*, 39(2), 242-252.

## ***Intimate Partner Violence Among the Mentally Ill & Mental illness as an Outcome***

Amy Bunn and **Dr. Catherine Kaukinen**

The poster explores the relationship between mental health and intimate partner violence victimization (IPV). The majority of victims, especially women experience mental illness as an outcome of IPV. Those who experience IPV are 1.5 to 2 times more likely to be diagnosed with a mood disorder than those who did not experience IPV. Among victim's who seek help from shelters, 80% of women have at least mild depression. Among those experiencing PTSD from IPV, Coker, Weston, Creson, Justice, & Blakeney (2005) found that there were 20% of men and 24% of women. Romito and Grassi (2007) conducted a study looking at gender differences of mental illness among victims of IPV. They found that men were more likely to suffer from heavy alcohol use and suicidal ideation, whereas women were more likely to suffer from symptoms of depression, panic attacks, and eating problems. People with disabilities are at risk for disability-specific abuse which may include keeping medication from them, overdosing, sexual violence, threats to withdraw care, institutionalize, and control of necessary resources (Healey, Humphreys, & Howe, 2013). At the same time mental illness heightens the risk of victimization. Victim blaming will also keep victims from seeking help, which may have a part in the mental health outcomes from IPV.

Coker, A. L., Weston, R., Creson, D. L., Justice, B., & Blakeney, P. (2005). PTSD symptoms among men and women survivors of intimate partner violence: The role of risk and protective factors. *Violence and victims*, 20(6), 625-643.

Healey, L., Humphreys, C., & Howe, K. (2013). Inclusive domestic violence standards: strategies to improve interventions for women with disabilities?. *Violence and victims*, 28(1), 50-68.

Romito, P., & Grassi, M. (2007). Does violence affect one gender more than the other? The mental health impact of violence among male and female university students. *Social Science & Medicine*, 65(6), 1222-1234.

### ***Respect On Campus and Campus SaVE Act: Mandatory Violence Prevention Education for Students and Employees***

Carrie Finkill, MA; **Catherine Kaukinen, PhD**, Ethan Wade

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

### ***Causes and Explanations of Suicide Terrorism: A Systematic Review***

Vanessa Harmon

The frequency of suicide terrorist attacks has increased dramatically since the year 2000 creating a renewed interest in this area of study, as well as an increase in the importance of understanding individual and organizational motivations behind engagement in suicide terrorism. The following is a Systematic Review of current research in the field of causes and explanations of suicide terrorism, limited to research articles in peer reviewed journals and grey literature, excluding published books by single authors. This paper provides a brief background into the issues surrounding suicide terrorism and the evidence currently available concerning causes and motivations. It describes the strengths and limitations of currently available academic research and the conclusions that this literature presents both in terms of policy and future research efforts. Examining the information and data currently available will facilitate the progression of research, both through determining promising directions for further investigation, and through identification of potential programs to limit the risk of future attacks.

### ***An Exploratory Study of Law Enforcement Responses to Human Trafficking Crimes***

Kornrattha Henry and **Dr. Anna E. Kosloski**

Estimates indicate that millions of people around the world have been the victims of human trafficking. In the United States, human trafficking includes but is not limited to domestic servitude, forced labor, and prostitution. Current literature has focused on the needs of human trafficking victims; however, more attention is needed on understanding those on the “frontlines” of identifying and investigating human trafficking crimes. This study is based on qualitative interviews with law enforcement officers/agents across municipal, state, and federal agencies. Emphasis is placed on collaboration among agencies and perceptions of human trafficking crimes. Implications for future research will be discussed.

### ***The depression trajectories associated with dating violence***

**Dr. Catherine Kaukinen** and **Dr. Henriikka Weir**

Drawing on both research on dating violence and a growing body of work within the public health literature, the relationship between and among dating violence and depression among adolescents and youth is explored. While victims of dating violence are at higher risk for a variety of negative mental health outcomes, including depression, post-traumatic stress disorder, anxiety, negative self-perceptions, and other internalizing problems, research on the mental health trajectories of adolescents is limited to a small number of studies. Using data from the National Longitudinal Study of Adolescent Health, the present study investigated the development of self-reported depressive symptoms from age 12 to 32. Longitudinal Latent Class Analysis (LLCA), an application of group-based trajectory modeling, was utilized to investigate the patterns of depression among victims as well as perpetrators of intimate partner violence (IPV). The diverse developmental trajectories of depressive symptoms are then compared and contrasted between four distinct groups: Those who reported only IPV victimization, those who reported only IPV perpetration, those who reported both IPV victimization and

perpetration, and those who reported neither IPV victimization nor perpetration. The findings are discussed as they relate to interventions needed to address these overlapping health risks among adolescents and young adults.

### ***Children exposed to intimate partner violence: A theory and policy analysis***

April Keller and **Dr. Catherine Kaukinen**

In the United States more than 3 million children witness intimate partner violence in their homes every year. Research also shows that violent homes are more likely to contain children than non-abusive homes and that these are often very young children. We therefore explore the impact of intimate partner violence on children as well as the impacts of violence on women's parenting. We identify the factors that serve to buffer the consequences of exposure to intimate partner violence including the receipt of social support, counseling and play therapy, and healthy emotional responses from caregivers. The poster highlights the implications of theory for our understanding of the dynamic of intimate partner violence on women and children. This includes the theory of relational PTSD, Social Learning, and Attachment Theory. We conclude with a brief analysis of policy and intervention in the area.

### ***Gendered Approaches to Low-Resting Heart Rate & Antisocial Behavior***

**Dr. Anna E. Kosloski** and **Dr. Henriikka Weir**

The biosocial theoretical perspective is a growing area within criminological theory; however, a perceived lack of resources required in conducting biosocial research exists within the field. By utilizing the public version of National Longitudinal Study of Adolescent Health (Add Health) data, the present study provides an example of biosocial research that does not require the use of expensive laboratory equipment or restrictive datasets. Employing a sample of 1,629 individuals followed from age 13 to 29, a longitudinal latent class analyses (LLCA) was used to explore the relationship between low resting heart rate and antisocial behavior for both males and females. Doing so, the current study integrates a well-researched correlate of biosocial criminology with developmental theories, while also applying a fairly novel methodology of group-based trajectory modeling.

### ***Can Honor Based Violence Rates be Reduced Through Policy Reform?***

Jennifer Sullivan and **Dr. Catherine Kaukinen**

"In 'honor'-based societies, the man is recognized as head of the family and defender of its 'honor' against any behavior that would be considered as shameful or humiliating (Elakkary, et al, 2014)."

This behavior can include "adultery, premarital sexual, or nonsexual relationships, suspected pregnancy outside marriage, rape, and falling in love with an 'inappropriate' person. Women might also bear the burden of any shame resulting from a male's violations of sexual 'honor', and would be subject to honor based violence because they have fallen pregnant as victims of incest or rape. This poster first defines honor killing, highlights the context in which honor killings occur, reviews the penal code and penalties for countries with high rates of honor killing, and then highlights the policy reforms that might address honor-based violence against women. We discuss grassroots efforts including the zina ordinance in Pakistan that led to the formation of the Women's Action Forum (WAF). This group uses local media and world press to apply social pressure to jurists to eliminate or reduce sentences for victims. The WAF lobbies the state for reform of the Law of Evidence, which has given a single man the weight of the word of two women. By controlling smaller aspects of the legal system, the WAF may allow women to defend themselves without "tackling the entire system of religious law."

Elakkary, S., Franke, B., Shokri, D., Hartwig, S., Tsokos, M., & Püschel, K. (2014). Honor crimes: Review and proposed definition. *Forensic Science, Medicine, and Pathology*, 10.1, 76-82.

### ***The violence trajectories associated with dating violence: Implications for Schools***

**Dr. Henriikka Weir** and **Dr. Catherine Kaukinen**

The Centers for Disease Control and Prevention have identified the health behaviors that contribute substantially to death and disability among young people. These include, but are not limited to, sexual risk-taking, substance abuse, depression, academic (dis)engagement, and violence. Drawing on both research on dating violence and a growing body of work within the public health literature, the relationship between and

among dating violence and general violent behavior among adolescents and youth is explored. Research on the severity and trajectories of violence behaviors is limited to a small number of studies, and examinations of the connection to dating violence are even more limited. Using data from the National Longitudinal Study of Adolescent Health, a multi-wave cohort study conducted in the United States over 24-year time period, the present study investigated the development of self-reported overall violent behavior among adolescents and young adults (aged 12 to 32). Longitudinal Latent Class Analysis (LLCA), an application of group-based trajectory modeling, was utilized to investigate the patterns of violence among victims as well as perpetrators of intimate partner violence (IPV). The diverse developmental trajectories of general violent behavior were then compared and contrasted between four distinct groups: Those who reported only IPV victimization, those who reported only IPV perpetration, those who reported both IPV victimization and perpetration, and those who reported neither IPV victimization nor perpetration. The findings are discussed as they related to school policies to address violence.

# Undergraduate Research Academy

## Mechanical and Aerospace Engineering

### ***Thermal Modeling of Transistor Pair Transient Response***

Caleb Lamb, **Kyle M. Webb**, **Rebecca N. Webb**

Comparator circuits fabricated in bipolar and BiCMOS processes, particularly those utilizing trench isolation, are highly susceptible to the effects of self-heating. Trench isolation exacerbates self-heating effects by providing a high degree of thermal isolation between transistors on a chip, which may result in significant differential self-heating between nominally-matched devices – even for closely-spaced transistors. The thermal response of two transistors, 14 micron center-center, powered on and off one at a time was evaluated. Thermal maps as well as temporal temperature response were predicted.

### ***Azeotropic Volatility Behavior of Hydrous Ethanol Gasoline Mixtures***

Brandon Patz, **Bret Windom**

In the United States, the ethanol blended in our fuels is anhydrous or 200 proof, which requires an additional energy intensive process to produce due to the binary azeotrope which is formed at proportions of 95.6/4.4 mass % ethanol/water at 1 atm. To avoid this added expense, there is interest to blend gasoline with hydrous ethanol mixed in these azeotropic proportions to be used as a renewable or partially renewable fuel. In order to fully utilize the potential of hydrous ethanol blended fuels, research is needed to characterize these mixtures including the effects on relevant physical and combustion properties. 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. Results demonstrate a unique boiling behavior with the hydrous ethanol/gasoline mixtures. For samples consisting of 75–85 % hydrous ethanol by volume, the initial boiling temperatures were found to be nearly 10 °C lower than those of either ethanol or gasoline alone as a result of a complex azeotrope formed with the water, ethanol, and compounds found within the gasoline. The distilled fluid is sampled during the experiment, and the distillate compositions are determined using gas chromatography techniques. The composition has allowed for the identification of the azeotropic mixtures responsible for the reduction of boiling temperatures and the determination of the effect of hydrous ethanol on relevant thermo-chemical properties, including the enthalpy of combustion.

### ***Material Degradation of Kapton, Silver and Gold via Atomic Oxygen Plasma Exposure***

Slade Rodrigues

The Chamber for Atmospheric and Orbital Space Simulation (ChAOSS) is a ground based space simulation facility that tests and analyzes how spacecraft interact with the hostile orbiting space environment. Testing on the ground can dramatically cut the cost of orbital space related missions by providing foresight into unexpected interactions with the space environment that can lead to irreversible damage or mission failure.

The purpose of this study is to measure the material degradation associated with samples of kapton, silver and gold that have been exposed to an atomic oxygen plasma. The material degradation rate obtained in the ChAOSS facility will allow an extrapolation to foretell how the material will degrade in longer periods of exposure time. These materials are candidates in an Air Force Academy CubeSat project; this study of material degradation will aid in the prediction of mission life for the CubeSat.



## Anthropology

### ***Using Technology to Transform Practice: Shifting Viewer Response to Culturally Conditioned Fears***

Isaiah Branch-Boyle

This research looks at fear-based discrimination and how to alter the effects of socialization processes through which we learn to fear Others. Inspiration for my part of the project came from looking at how stories have been told for the last few decades. Despite significant changes in technology, sound was really the last big change in the movie industry; 3-D does not fundamentally change how stories are told. I wanted stories to be responsive to the emotions of the viewer.

With the advance of video game technology, my research team and I set out to utilize Xbox Kinect technology to monitor body heat, skeletal movement, and heart rate in order to use the viewer's nonverbal cues to change the film they are watching. For this pilot phase of the project, my team and I started with a basic concept: we would film a small story and the different paths it could take. I strapped a GoPro camera to my chest and walked through the alleys of Colorado Springs repeatedly, responding differently to other actors in the environment each time. My editor is putting the footage together to comprise the different paths, making sure the Xbox data changes the video according to the viewer's bodily responses.

In a sense, this is the choose-your-own-adventure concept applied to movies, except that rather than responding to a conscious decision on the part of the viewer, the film will respond to the viewer's implicit associations and attitudes, allowing him or her to be aware of how subconscious attitudes affect actions.

## Biology

### ***Determining the role of *caper* in *Drosophila* neural development***

Logan Schachtner, Laura Bell, Eugenia Olesnicky Killian

A vast number of genes are involved in the formation and maintenance of the nervous system. One key goal of neurobiology is to identify all the genes involved in development of the nervous system and to determine the exact roles that these genes play. Importantly, although many such genes have been associated with human neurological disorders, little is known about their molecular function. The current study focuses on the effects of knocking down the gene *caper* within the *Drosophila* nervous system. To date, very little is known about *caper* function. To better understand the requirements of *caper* in neural development, *Drosophila* embryos deficient in *caper* have been stained and examined, showing that several cell types within the peripheral and central nervous systems fail to form properly. Analysis has included quantifying the number of specific sensory neurons and also the number of neurites within each of those neurons. Overall, loss of *caper* function has been shown to cause severe nervous system defects, which may also be correlated with abnormal behavior. Future research on *caper* may lead to important medical discoveries, as this gene is conserved across nearly all species, including humans.

## Physics

### ***Electron Beam Lithography: Implementation and Applications at UCCS***

Nicholas Christian and Dr. Zbigniew Celinski

Our research project focus was to successfully implement the Electron Beam Lithography process at UCCS and begin applying this technology to various research applications in multiple departments. This process included advanced training on the Scanning Electron Microscope (SEM) and the Nano-Pattern Generation System (NPGS). Procedures for all steps in the nano-lithographic process (SEM optimization, Sample Preparation, Pattern Design, Run-File generation, Exposure, Development, Sample Viewing, Liftoff and Deposition) were fabricated, implemented and refined over the last 9 months by Nicholas Christian, a physics undergraduate student at UCCS, and overseen by Dr. Zbigniew Celinski, a physics professor at UCCS. Our

primary application of this technology so far has been in two areas: development of a Microwave Isolator Array by etching a nano-pattern into a material with tunable magnetic domain properties, and development of a SiO<sub>2</sub> bar geometry on cover glass for use in testing immune cell activation. In the latter, we study how micro-pattern induced changes in the plasma membrane curvature of rat basophilic leukemia cells influence receptor clustering in allergic responses.

### ***Energy Minimization of Magnetic Domain Walls in Nanometer-Strips***

Miriam DeJong and Karen Livesey

Magnetic recording is of fundamental importance in data storage devices such as hard disk drives and there is a push in the scientific community and electronics industry to increase the efficiency of these devices. The magnetic materials used in recording are very small, on the scale of nanometers, and designed to maximize the amount of data that can be stored in small electronic components. It has been experimentally shown that different dimensions of magnetic materials result in different energy requirements for device operation since the shape of a magnet affects the energy of the magnet. One practical way to increase the efficiency of these materials is by finding the specific material dimensions where this operation energy is minimized. Here we present energy calculations for a nanometer-sized strip of magnetic material containing a magnetic transition region known as a “domain wall.” A mathematical expression is found that will predict the dimensions that allow for manipulation of these domain walls with the lowest energy cost, for any given magnetic alloy. Results of this research can be implemented in the manufacturing of electronic devices to reduce energy consumption.

### ***Size-dependent optical properties of silver and gold nanoparticles***

Paul Pinchuk

Hamaker-Lifshitz constants are material specific constants that are used to calculate van der Waals interactions between colloidal particles. Typically, these constants do not depend on the size of the interacting particles in the colloids. However, metal nanoparticles with sizes smaller than the mean free path of the electrons in the bulk metals exhibit size-dependent dielectric complex permittivity. This leads to the size dependence of the Hamaker-Lifshitz constants for metal nanoparticles. In this work we show theoretically that scattering of the free conducting electrons inside silver nanoparticles with the size of 10 nm – 50 nm leads to their size-dependent Hamaker-Lifshitz constants.

## **Psychology**

### ***Do Able-Bodied People view People with Disabilities as Potential Dates? Effects of Television Portrayals of Disabled People on Dating Attitudes of the Able-Bodied***

Carissa Ortega

This study examines how portrayals of people with disabilities in popular television dramas affect attitudes of able-bodied people towards people with disabilities, specifically when it comes to dating. Participants signed up through the UCCS SONA system and were asked to view 1 of 3 popular television dramas which either featured a person with an ambiguous disability in a romantic relationship, a person with an obvious disability in a romantic relationship, or a romantic relationship between 2 able bodied characters. Participants were then asked to fill out a survey which evaluated their willingness to date someone with a disability. There were 30 UCCS students in each experimental group and control group; therefore, the study consisted of 90 participants in total.

### ***Determining Negligence in Cases Involving Intoxicated Drivers***

Hannah Phalen, Edie Greene

To manage the problem of intoxicated driving, many states have instituted dram shop and social host laws that hold businesses and social hosts accountable for actions of patrons and guests. Existing research raises questions about the impact of these laws because laypeople tend to blame the primary cause of harm (i.e., the driver) and not those entities who contributed to it. The present study examined how laypeople assign blame in dram shop and social host cases.

We recruited 310 participants; 174 from across the county who took the study online and 136 from the Psychology subject pool. They read vignettes about an accident involving drunk driving. We manipulated whether the driver was drinking in a bar, a friend's home, or alone, and whether the accident caused personal injury or property damage. Participants answered questions about the negligence and fault of the parties (i.e., driver, bar, social host), their contribution to the harm, and whether each party should be required to compensate the injured person. We hypothesized that participants would find the driver most liable and social hosts least liable, and would attach more blame in a case of personal injury than property damage. Results showed that participants placed relatively little fault on the bar and social host, deemed their contribution to the harm as significantly less than the driver's, and were significantly less likely to require them to compensate the injured person. These findings raise concerns about whether dram shop and social host laws fit with lay notions of fault and blame.

# Centers

## Biofrontiers

### ***Determination of the Refractive Index of an Extended Metal Atom Chain***

Justin Case, Kyle Culhane, **Dr. Anatoliy Pinchuk**

Since the development of a macroscopic negative refractive index system in 1999 by Sir John Pendry, one of the goals of modern optics has been to device microscopic, nano, or even molecular systems capable of producing similar effects. It has been previously theorized that extended metal atom chains (EMACs) featuring pyridyl-based bridging ligands might act as a molecular version of the split-ring resonators used by Pendry. This project seeks to synthesize nickel-based EMACs featuring 2,2'-dipyridylamine bridging ligands and to measure the isolated complex's refractive index over a broad range of the electromagnetic spectrum. An in-lab fabricated refractometer has been created to directly measure the real-part of the index of refraction with specifications designed for negative index metamaterials. Design features of the refractometer and characterization of the initial synthetic products will be presented here.

### ***Cell Receptor Clustering on Patterned Substrates***

Rosa Machado

In many immune responses receptor reorganization and clustering is an important step. The purpose of the presented research was to explore whether cell-surface receptor clustering would be affected by patterned substrates. Rat basophilic leukemia cells labeled with fluorescent Immunoglobulin E (IgE 488) and fluorescent membrane stain (dil), were allowed to settle on patterned substrates under gravity. Glass substrates with polymethylmethacrylate (PMMA) bars were prepared with electron beam lithography. The PMMA bars were 300 nm high, and 1  $\mu\text{m}$  wide separated by 2  $\mu\text{m}$  in between bars. Receptor clustering was observed by total internal reflection fluorescence microscopy using laser excitation of 488 nm and 561 nm for IgE 488 and dil, respectively. Data was collected in the form of images and analyzed utilizing DIPIImage and MATLAB. Specifically, masks were created in order to determine the amount of fluorescent IgE 488 and dil on the cell membrane at the location where the cell made contact with the pattern. The research is not yet completed; however, if patterned substrates do affect cell receptor clustering then the results could have medical applications in areas such as prosthetics and implants.

## Trauma, Health and Hazards Center

### ***Analysis of Domestic Violence: Veterans Participating in the VTC***

Mariya Pinchuk, Raine Lamb, *Michelle Slattery*, Mallory Dugger, Justin Miller, Chris Curley, Donya Boudeman

Many Veteran Trauma Court participants have domestic violence (DV) charges in addition to the challenges of PTSD, substance use disorders, and the transition from active duty to veteran military status. This poster explores: 1) the demographics of VTC participants with and without DV charges; 2) PTSD levels and improvement of VTC participants with and without DV charges; and 3) other program outcomes for people with and without DV charges. Domestic violence is a traumatic issue for both victim and perpetrator. This poster brings to light the prevalence of domestic violence in veteran treatment courts and explores how appropriate these cases may be for these specialty courts.

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## Featured Speakers



### **Matt Metzger**

Matt Metzger is an assistant professor of innovation and entrepreneurship in the UCCS College of Business. He received his undergraduate degree from CU Boulder, his MBA from Notre Dame and his PhD from the University of Oregon. His research investigates the dynamics of meanings applied to social collectives, with a particular emphasis on meanings in nascent and rapidly changing organizational categories.



### **Tom Pyszczynski**

Professor Tom Pyszczynski received his B.A. in psychology from the University of Wisconsin – Milwaukee (1976) and his M.A. and Ph.D in social psychology from the University of Kansas (1979 & 1980). Dr. Pyszczynski came to UCCS in 1986. His research has been funded by the National Science Foundation since 1989. He received an Alexander von Humboldt Fellowship for collaborative research with psychologists in Germany and several grants from the Dutch government for collaborative research with psychologists in the Netherlands. He and his colleagues have played a major role in the development of Experimental Existential Psychology, an emerging sub-discipline of social psychology that applies rigorous experimental methods to the study of human confrontation with existential problems such as death, freedom, isolation, and nature. He teaches a variety of courses in social psychology.

Dr. Pyszczynski's research is focused primarily on Terror Management Theory, which he developed with his colleagues Jeff Greenberg and Sheldon Solomon. Terror management theory is concerned with the role of self-esteem and cultural belief systems in providing protection against core human fears, especially the fear of death. Over the years Professor Pyszczynski and colleagues have explored the role of terror management processes in a wide range of topics, including self-esteem, self-deception, prejudice, interpersonal relations, altruism, aggression, sexual ambivalence, disgust, depression, anxiety disorders, trauma, unconscious processes, aging, human development, and terrorism. He has also conducted research on how people fool themselves into believing that their biased views follow logically from the available facts and on the role of self-regulatory processes in depression and other psychological disorders.



### **Jane Rigler**

Flutist, composer, producer and educator Jane Rigler, Ph.D. (Assistant Professor of Music at the UCCS) has performed nationally and internationally as a soloist and in ensembles in contemporary music festivals premiering new works and compositions, some written especially for her. She has been granted numerous awards and residencies nation-wide for her works that center on community building, stretching the boundaries of musical performance and audience interaction. Through her compositions and her manual *The Vocalization of the Flute* she has become known for innovations in flute performance, techniques and original musical vocabulary. Rigler's works range from solo acoustic pieces to multi-disciplinary interactive electronic ensemble works. Her electroacoustic pieces focus on concepts that deal with

connections between language, the body, space, and the environment. Deeply committed to collaboration, In 2009-10, Jane received the Japan United States Friendship Commission Fellowship and has since returned to Japan several times to premiere her sound installations and performance projects. Her website contains more info about her experiences in Japan, Spain, New York and other places: <http://www.janerigler.com>

## Keynote Speaker



**Thomas Duening**

Thomas Duening is the El Pomar Chair of Business & Entrepreneurship and Director of the Center for Entrepreneurship in the College of Business at the University of Colorado, Colorado Springs. Dr. Duening earned his MA and PhD degrees from the University of Minnesota. He was previously the Director of the Entrepreneurial Programs Office in the Ira A Fulton School of Engineering at Arizona State University. Duening is the author of many technical journal articles and 15 books on business, management, and entrepreneurship. His most recent book, "Introduction to Business", was published by Bridgepoint in October 2014. Duening also writes a popular blog for Forbes on topics in business and entrepreneurship.

### **Perspiration Authenticates Inspiration: Tips from a Blue-Collar Writer**

This talk will focus on the process of putting words on a blank sheet of paper to reify (make real) the inspiration of the researcher/aspiring writer. Many excellent ideas never make it into the world because of the challenges and fears associated with turning thoughts into written words.

Dr. Thomas Duening, author of 15 books and numerous research papers will describe his "blue collar" approach to writing. Dr. Duening has written text books, trade books, and normally has two book contracts working at any given time (he is currently working on two new books).