The 2015 Undergraduate Research and Scholarship Symposium

At this evening’s Symposium, we will recognize and honor undergraduate research, scholarship and creative works. The symposium is a celebration of the University of Denver as a place where students and faculty become partners in the co-production of knowledge. The symposium is sponsored by the Undergraduate Research Center and the Center for Community Engagement and Service Learning.

The Undergraduate Research Center is devoted to enhancing the undergraduate experience by facilitating student’s investigations that make original intellectual or creative contributions within and across disciplines.

The Center for Community Engagement & Service Learning’s mission is to educate, engage, and equip the campus community to accomplish tangible, public work that improves the lives of people in our communities.

The presentations tonight come from across academic fields including projects funded and supported by the Undergraduate Research Center and the Center for Community Engagement and Service Learning. Many of the projects are capstones or theses. The posters representing the project affiliations listed below can be found using the index at the back of the program. The abstracts that follow are organized by lead presenter’s last name.

**Partners in Scholarship (PinS)**—This program provides a unique opportunity for students to collaborate and receive funding for a project with a faculty member.

**Summer Research**—Similar to PinS, this program provides greater funding levels for deeper research over the summer.

**Travel Fund**—This program funds students whose work has been accepted to be presented at an academic conference or meeting.

**Honors Thesis**—DU’s Honors program offers a broad liberal education rooted in the arts and sciences, acts as a clearinghouse for research, internship/service opportunities and provides funding for thesis work or culminating projects.

**Center for Community Engagement & Service Learning**—Students are supported through numerous community-engaged programs including Public Achievement, Puksta Scholars, DU Service & Change and more.

**Capstone/Thesis**—Student research performed within coursework or other academic requirements at DU.

**Other**—Other noteworthy research projects taking place throughout the DU community.
**Keynote Speakers**

**Driscoll Gallery  I  5:00pm**

**Alicia Everitt | Mechanical Engineering**

*Cavitation and the Neuromuscular Response to Spinal Manipulation*

The neuromuscular response to spinal manipulation (SM) may provide insight into the mechanism of this common treatment for low back pain; however, the importance of cavitation for a successful manipulation is not fully understood. The objective of this study was to investigate the neuromuscular significance of the presence of cavitation. We hypothesized that cavitation would be associated with muscle activation responses and with time delay between the force and the muscle’s response. Four indwelling electrodes recorded muscle activity in 20 asymptomatic participants during SM. Upon analysis clear trends of higher percent muscle responses in the presence of cavitation occurred (Cohen’s d=0.8). Clear trends of shorter onset delays also occurred in the presence of cavitation (Cohen’s d=0.5). High percent muscle response could indicate pain relief, and a shorter delay indicates a faster response to manipulation. These associations could provide support for the importance many practitioners and patients place in cavitation.

Faculty Advisor: Bradley Davidson

**Jill Hamilton | Environmental Science**

*A Search for Sustainable Waters: Nevisian Marine Management through a Cultural Lens*

Coral reefs have been coined the "jeweled belt" of our planet (Earle, 2009) - incredibly diverse and fragile ecosystems, and extremely susceptible to environmental change. In the Caribbean, hard coral cover has decreased by an average of 80% since 1980 (Gardner, 2003), and off the shores of St. Kitts and Nevis, a two-island Caribbean nation, overfishing has been identified as a main threat to reef health (Bruckner, 2012). I present a blended study of quantitative marine data, case studies from other Caribbean islands and qualitative interviews with local Nevisians involved in marine industry, marine conservation groups and governmental departments on the island. Interviewees were asked to discuss changes they have seen in the marine environment during their lifetime, and suggest management options they believe would be feasible from a local perspective. My conclusions suggest small scale, locally implementable and culturally viable options for improved Nevisian marine management.

Faculty Advisors: Russell Fielding, Jim Fogelman, & Michael Kervin

**Katie Lynn-Vecqueray | Sociology, Religious Studies**

*Service Provision among Refugee Integration Organizations*

My research intends to assess how various organizations support the refugee resettlement and integration process by utilizing either corporate or grassroots approaches and initiatives. The study employed the use of qualitative methods, specifically interviews with organizations’ staff and volunteers, government officials, and network providers. In addition, participant observations at community events supplemented interview findings. Gathered data afforded insight regarding the manner in which various entities function as service providing institutions; emphasizing the following themes: evaluation of resettlement objectives, validation of refugees’ cultural narratives, the contentious definition of “self-sufficiency,” budgetary/funding limitations, community outreach to network resources, the management of employee welfare, and the costs/benefits of reliance on volunteers. Refugees’ psychological and social integration is essential, however, comprehensive integration efforts are often hindered by an emphasis on institutionalized, economic objectives. This research intends to facilitate discussion about various approaches to integration in order to promote a holistic model of empowerment and agency.

Faculty Advisor: Lisa Martinez
The 2015 Undergraduate Research and Scholarship Symposium
Poster Presentations

To find a poster presentation location, please use the map on the facing page.

Measuring Orbital Angular Momentum Of Light With A Single, Stationary Lens
Samuel Alperin  | Majors: Physics, Mathematics
Light with orbital angular momentum (OAM) is characterized by a helical phasefront, and has proven itself to be highly promising in multiple research areas including astronomical measurements of angular frequency, the design of optical tweezers, and ultra high bandwidth telecommunications. We demonstrate that the average OAM can be measured simply and accurately with only a cylindrical lens and a CCD, as opposed to current techniques which require large and complicated optical setups.
Faculty Advisor: Mark Siemens, Physics & Astronomy  | Location: A1

Higher Education Access For Economically Disadvantaged People
Aaqil Anwar  | Major: Finance
There is no way to discredit the importance of a college degree in today’s workplace. The easiest way through which people can bring themselves out of poverty is by continuing their education long after they have graduated from high school. Currently, many institutions of higher learning continue to increase their tuition rates, which as a result have created incredibly high barriers of entry for students who come from economically disadvantaged backgrounds. This study aims to examine the various methods through which people from lower economic classes are able to subsidize their pursuit of higher education in order to ensure a financially stable future. By effectively creating more access to college, there will be an increased amount of skilled labor present in our workforce, which would in turn allow for people to become more financially secure than before. A college degree is the best investment people can make for themselves.
Faculty Advisor: Ryan Hanschen, Center for Community Engagement & Service Learning  | Location: A2

Invisible War: The Effects Of Long Distance War
Yekaterina Arzhayev  | Majors: International Studies, Sociology
I studied regional commemoration events, war memorials, and museums in order to see what kind of efforts are made to preserve the memory of WWII. I found that these efforts vary across regions, including those that were sites of physical battle and those that contributed to the war primarily through industrial manufacturing. This research highlighted the contrast between the preservation efforts of those areas directly exposed to battle and those that contributed from a distance. Through interview and observation, it became apparent that the family oriented society within Russia focused a lot of its efforts on keeping the memory of the war alive. This research found that while there was not any physical fighting in the Siberian region, the people there were very keen on keeping the war as a part of their identity. This identity fell to the 2nd and 3rd generations within the society.
Faculty Advisor: Juli Parrish, English  | Location: Wall 9
Spectropolarimetry And Data Reduction
Sierra Ashley  |  Major: Physics
Shem Skikamaze

The polarization of electromagnetic waves, specifically of visible light, from distant sources in space is caused by interactions of light with gas and dust within the vacuum of space. By observing this polarization of light from distant objects it is possible to determine the shape of the scattering regions that surround them without being able to image them directly. The reduction of the data associated with these distant polarized sources is important for filtering out extraneous polarization signals from the interstellar medium as well as polarization caused by instrumentation. The goal of this project was to reduce the large amounts of raw data from the HPOL spectropolarimeter at Ritter Observatory in Toledo, Ohio, an instrument used to measure the polarization of distant stars and other bodies.

Faculty Advisor: Jennifer Hoffman, Physics & Astronomy  |  Location: A3

Investigation Of Phthalimide Derivatives As Directing Groups In Nucleopalladation Reactions
Flo Bachrach  |  Majors: Chemistry

The purpose of this research is to determine the effects of directing groups and functional groups on reactivity of substrates under palladium catalysis to produce more structurally complex molecules of pharmaceutical interest. The importance of directing groups is to aid in selecting for the correct products resulting from reactions as opposed to mixtures of possible products that would be difficult to separate. Though this work is inspired by studies conducted by renown synthetic chemists, our approach will allow for use of more varied starting materials, resulting in greater diversity of products.

Faculty Advisor: Brian Michel, Chemistry & Biochemistry  |  Location: A4

Queer Empowerment Through Representation
Caitlin Baum  |  Major: Film Studies & Production

As a queer-identifying young person, I feel particularly connected to the challenges faced by youth in the process of exploring their sexual orientation, gender identity, and how those identities shape relationships within their local, national, and global communities. LGBTQ+ (lesbian, gay, bisexual, transgender, queer, etc.) adolescents and young adults (generally aged between 12 and 24 years) are shown to be particularly at risk for mental and physical health issues, homelessness, victimization, or simply just alienation from their peers during compulsory education. During these crucial years, safe spaces and outlets for self-expression can be especially important for young people to explore their unique identities in a positive light. Next year, I hope to combine my passions for film and social justice and encourage teens involved with a local LGBTQ+ center to explore the messages they receive about queer identity in media and everyday conversation. After analyzing the impact of these messages, they will have the opportunity to collaboratively create a fictional or documentary-style film portraying how they would like to see themselves reflected on screen and in society. My vision is that by being an active hand in their own representation, LGBTQ+ youth will feel empowered to use their voice, tell their story, and find pride in every aspect of their identity.

Faculty Advisor: Ryan Hanschen, Center for Community Engagement & Service Learning  |  Location: B1
Epidemiological Changes In The Diet Of The Middle Class In Quito, Ecuador

Allison Boyd  | Majors: International Studies, Geography & the Environment

Obesity is a growing concern in Ecuador. In 2004, approximately 40% of women had a body mass index (BMI) between 25 and 30 (considered overweight), whereas 14% of women were considered obese with a BMI > 30 (Waters, 2006). Since 1990, the primary cause of death in Ecuador has changed from diseases associated with malnutrition to complications associate with obesity including heart disease, diabetes, and hypertension (Curley, 2009). This shift can be traced to profound changes in food intake; from a local, low-calorie, plant-based diet, to imported high calorie diets full of fat, sugar, and refined grains from animal-based sources (Bernstein, 2008). Here I present data regarding daily food choices among the middle/upper middle class in the Jipijapa neighborhood of Quito. A diet score developed by Rachel Ann Beyatte from the University of Kentucky based off of the USDA’s MyPlate recommendations (Beyatte, 2010), was modified to fit the needs of this study. Twenty-nine participants were asked 1) recent changes in the diet 2) where they buy food and how much they spend, and 3) about their health education. Results show that the average diet score was (22.6 out of 50 possible points; average BMI of participants = 25), indicating that middle/upper-middle class people in Ecuador eat unhealthy diets due to poor traditional eating habits and the growing middle class whom have sedentary jobs, hence changed eating habits. This research concludes with suggestions on how health programs can educate the middle/upper class in Quito on healthy diets.

Faculty Advisors: Michael Kerwin, Matthew Taylor, Geography & the Environment  | Location: B2

Neuroprotective Effects Of 4-Hydroxybenzoic Acid

Matt Brenner  | Major: Biological Sciences

My project tested the neuroprotective effect of an anthocyanin metabolite: 4-hydroxybenzoic acid. I worked with rat cerebellar granule neurons and a variety of insult compounds as models for neurodegenerative disease states.

Faculty Advisor: Daniel Linseman, Biological Sciences  | Location: B3

On The Lack Of Intergenerational Contact In The LGBT Community

Larcy Brooks  | Majors: English, Spanish, Gender & Women’s Studies

As a young person in the LGBT community, communication (or lack thereof) with my elders, is personally important. In this project, I set out to understand the different sources of a generational divide, how it presents itself in LGBT groups in the Denver area, and what these groups can do to combat the problem. My research took two primary forms: personal, interview and experienced based exploration of LGBT communities in Denver based on age; and academic research and writings on the subject. In my research, I discovered a few main sources that deserve further exploration: the disconnect between issues faced by LGBT people of different ages, the different tangible resources that LGBT people of different age groups need, and lack of historical knowledge for young LGBT people. These findings can be presented to groups working on LGBT issues in the Denver area, and can be used to start finding solutions.

Faculty Advisor: Ryan Hanschen, Center for Community Engagement & Service Learning  | Location: B4
**Poster Presentations**

**Neuroprotective Effects Of Anthocyanin Metabolite Phloroglucinol Aldehyde Against Oxidative Stress, Nitrosative Stress, Excitotoxicity, And Potassium Deprivation**

Caleb Byars  |  Major: Biological Sciences

Neurodegeneration caused by the stressors of reactive nitrogen species (RNS) and reactive oxygen species (ROS), cause apoptosis of neurons, whether in Amyotrophic Lateral Sclerosis (ALS), Parkinson’s, or Alzheimer’s. Disease functionality isn’t well known, the loss of antioxidant defense from free radical damage suggests that antioxidant compounds, the metabolites of parent antioxidants, could act as a therapeutic treatment. The metabolite of the anthocyanins Kuromarin and Callistephin, Phloroglucinol Aldehyde’s (PGA) effects on cerebellar granule neurons from RNS and ROS was the focus. H2O2 induced Oxidative Stress, while Sodium Nitroprusside (SNP) was an insult to model Nitrosative Stress. Excitotoxicity and potassium deprivation were used as comparative models using glutamate-glycine (G/G) and reducing potassium in media to 5mM (-5K). PGA was incapable of protecting cells from the insults, possibly due to structural differences between the anthocyanins, including a catechol, which phloroglucinol aldehyde lacks. There seems little potential use for PGA as a therapeutic compound.

Faculty Advisor: Daniel Linseman, Biological Sciences  |  Location: C1

**Prototype Pyrolysis Mixing Test Unit**

Matthew Clement  |  Major: Mechanical Engineering
Naji Foster, Zachary Ewers

Pyrolysis is the technology of turning organic material into fuel and fertilizer via a heat exchange process. Little research has been done on the effectiveness of mixing in a conveyor system, so the goal of this project is to provide a simplified prototype for the purpose of examining how a better mixing strategy benefits the system. It was found that adding attachments to an auger conveyor system dramatically increased how well the organic material was mixed and how evenly it was heated.

Faculty Advisor: Breigh Roszelle, Mechanical & Materials Engineering  |  Location: C2

**Aspect Ratio Repulsion And Color Grouping**

Harry Crane  |  Major: Psychology

It has been established that the visual system optimizes performance via several mechanisms, two of them being highlighting similarities and exaggerating differences. Components of each of these processes, i.e. grouping by color and aspect ratio repulsion, have previously been studied in solitude. The present study investigates both simultaneously, examining their interaction and discovering which takes precedence in the visual system.

Faculty Advisor: Timothy Sweeny, Psychology  |  Location: C3
Arabic Facial Recognition
Kristin Douglass   |   Major: Computer Science

The scope of the project for this summer will initiate the foundation for accomplishing the next stage of the project. Applications for the project range from video filming of native speakers and editing or synthesizing frame by frame motions. Once synthesized videos are completed, the videos will be shown to native perceivers to identify the cues they may be using in the recognition of the sounds of interest. The data could be then used as a teaching aid for L2 students of Arabic by training them to attend to the visual features necessary for the recognition of Arabic emphatic and pharyngeal sounds.

Faculty Advisor: Maha Foster, Languages & Literatures   |   Location: C5

Emotional Responses To Gender-Stereotypical Behavior: Nonverbal Sexism Among Popular Television Characters
Paige Dvorak   |   Majors: Psychology, Communications
Sarah Lamer

Between the ages of five and nine, children develop increasingly complex beliefs about gender and become more sensitive to social influences from the media (Witt, 2000). I examined the influence of televised behavior on children’s gender stereotypes. In two studies, I examined both the pattern of nonverbal behavior on children’s television shows in terms of gender typicality and the effect that this pattern has on children’s attitudes and behaviors regarding gender. I found that gender stereotypical characters are treated more positively than counterstereotypical characters by co-characters. However, there were no significant effects found in the second study, which examined the effects viewing this pattern had on 6-8 year-old girls. Limitations to the second study should be addressed because it was established in Study 1 that there is a pattern nonverbal bias on children’s TV shows, and that this pattern reaches children in the U.S.

Faculty Advisor: Max Weisbuch, Psychology   |   Location: D1

Racial Discrimination At Denver South High School
Ashley Edinger   |   Majors: Socio-legal Studies, Political Science
Sabrina Jain, Alexander Roth, Junki Ogawa

Racial discrimination continues to permeate throughout our nation, years after the Civil Rights Movement. The freedoms and rights of people of color are limited and restricted from the explicit and implicit biases held by people in power and structures of institutions. We see this in structures such as our educational systems, where students of color are falling prey to the achievement gap, the discipline gap, and overrepresentation in special education. To raise awareness of racial discrimination, we as Public Achievement Coaches, have acted as mentors to a group of 27 sophomores at Denver South High School, who are utilizing story telling to highlight and embrace similarities and differences among members of the South community, as well as the larger community outside the school. Through Humans of South High School, we document stories about identity and discrimination from South High School community members through photographs and captions on pages of various social media sites. Through our documentary we interview students, staff, and teachers at South and incorporates students’ spoken word poems to share personal experiences and encounters with racial discrimination. The documentary is currently in the filming process, and the social media campaign has just launched, so our results are yet to be determined. This public work endeavor hopes to inspire current and future generations to recognize the systemic and non-systemic roots of racial discrimination and empower them to take action.

Faculty Advisor: Cara DiEnno, Center for Community Engagement & Service Learning   |   Location: Wall 8
DU Farmers’ Market
Racheal Erhard  |  Major: Engineering
Chelsea Warren, Michael Nagy, Emily Thomas, Mandilyn Beck, Sara Rowse, Antonia Coteus, Allen

The annual DU Farmers’ Market was started as a student-run initiative three years ago in an attempt to unite people around a common theme, food in an effort to talk about larger food justice issues in our society. The Farmers’ Market unites DU and the greater Denver community as a way to foster conversation for the need of sustainable, organic, and local food. Serving as a focal point for the discussion of issues with sustainability through our food systems, this event is as much educational as it is about food.

Faculty Advisor: Chad King, Center for Sustainability  |  Location: D2

Natural Behavior Of Samarium Diiodide (SmI2) In Pinacol Coupling Reactions With Different Functional Group Additions
Humberto Escobedo  |  Major: Chemistry

In the undeveloped area of using the recently discovered new chemical samarium diiodide (SmI2), the project will contribute in filling the gap by making carbon-carbon bonds from two carbonyl groups, also called a pinacol reaction, to make cyclic molecules. The behavior of SmI2 in the pinacol cyclization reactions will be examined via a series of products formed from SmI2 reacting with synthesized precursors that vary from electron withdrawing groups to electron donating groups. The importance of it is establishing SmI2 natural behavior in pinacol cyclization reactions to open doors on creating selective enantiomers, that is controlling for one of the two mirror image of a molecule to be produced. The leading effect of this project is helping research in designing drugs that can interact differently and specifically in biological systems, improving drug therapy for controlled effects.

Faculty Advisor: Bryan Cowen, Chemistry & Biochemistry  |  Location: D3

Residual Hamstring Weakness In Deep Flexion After Anterior Cruciate Ligament Reconstruction
Kathryn Falkenstine  |  Major: Engineering

Anterior cruciate ligament (ACL) tears are a debilitating injury. Surgical ACL reconstruction (ACLR) involves a hamstring autograft, bone-patellar-tendon-bone autograft, or allograft from a cadaver. The project in progress measures hamstring strength at deep knee flexion after ACLR and relates these variables to functional differences between 20 participants with hamstring grafts versus 10 with other graft types and 10 controls- something not yet reported. Each participant performs strength exercises while motion capture cameras and a dynamometer measure forces, torque, and joint rotations. We anticipate that the data will show reduced strength at deep flexion in participants with hamstring grafts. Results will be used for further research and to develop physical therapy methods that address hamstring weaknesses in athletes whose sport performance may be affected.

Faculty Advisor: Bradley Davidson, Mechanical & Materials Engineering  |  Location: D4
Lipid And Protein Sorting Based On Membrane Curvature

Alec Feuerbach  I  Majors: Biochemistry, Spanish
Philip P. Cheney

Lipid and protein sorting plays a vital role in many cellular functions; however, the mechanism by which this process occurs is far from understood. One possible variable that could affect sorting is the physical shape of the lipid bilayer. In this experiment, lipid and protein sorting as a function of membrane curvature was studied on a novel supported lipid bilayer (SLB). Bulk diffusion characteristics and single particle diffusion was studied using optical fluorescence microscopy. It was found that bulk diffusion studies showed different average behaviors in molecules that did and did not sense curvature. Single particle tracking was used to show how individual particle movements contributed to these bulk characteristics.

Faculty Advisor: Michelle Knowles, Chemistry & Biochemistry  I  Location: D5

Differences In Aggressive Male Competition Behavior Accompanies The Loss Of A Sexual Signal In Threespine Sticklebacks (Gasterosteus Aculeatus)

Jolysa Gallegos  I  Majors: Biology, Psychology

Sexual signals are traits used to attract potential mates and signal dominance to competing males. Despite this central role, evolutionary loss of sexual signals is common. Several Washington populations of threespine sticklebacks (Gasterosteus aculeatus) males have lost the characteristic red throat, instead developing drab breeding and black parental colorations. We investigated how loss of a sexual signal might alter black male stickleback aggressive behavior during male competition. We hypothesized that compensatory aggressive behavior would predict which male type would establish dominance. We conducted competition trials between red and black males, determined who acquired a territory, and calculated an aggression index for each trial. Black males were more likely to establish territories and performed more aggressive behaviors when they were “winners” than red males did. This suggests that competition behavior changed following the loss of the red throat and this has likely contributed to the successful spread of this derived phenotype.

Faculty Advisor: Robin Tinghitella, Biological Sciences  I  Location: E1

Behavior Prediction Or Mental States?: Impacts On Accuracy Of Facial Emotion Identification

Dana Gau  I  Major: Psychology
Michelle Zad

Humans benefit from having the ability to analyze facial expressions and use that information to interact. While former research has explored the automatic elicitation of a mental state inference when a perceiver is shown an emotional facial expression, we propose instead a theory of social prospection in which a perceiver predicts behavior. We are testing our theory by procedurally priming either external or internal focuses (mental states and behaviors, respectively), and assessing whether this focus influences participants’ accuracy identifying emotions on faces. We predict that participants primed with an external focus will be better at identifying emotions on faces.

Faculty Advisor: Max Weisbuc, Psychology  I  Location: E2
Poster Presentations

The Invictus Initiative Study Lamp
Naomi Gaunavinaka  I  Major: Mechanical Engineering
Matthew Minuti, Arianna Vierczhalek
The purpose of The Invictus Initiative Study Lamp project is to develop a cheap, yet durable study lamp that uses renewable energy for students in western Kenya to use for studying. Many students in the town of Sigomre, Kenya do not have access to light other than expensive kerosene lamps to do their homework by after the sun has set. The study lamp serves to meet this need in order to help students to complete their homework and have the opportunity to pursue a higher education. This project explored all possible methods of using various forms of renewable energy and determined that solar energy is the best method to achieve the project goals within the defined budget.
Faculty Advisor: Wenzhong Gao, Electrical Engineering  I  Location: E3

3-Dimensional Reconstructions Of Atypical Mitochondria Proximal To Nerve Fibers In Mouse Taste Cells
By Serial Block Face Scanning Electron Microscopy
Hannah Gunther  I  Major: Biological Sciences
Type II taste cells are vital in the taste transduction of sweet, bitter, and umami stimuli, though they exhibit no vesicular mechanism of communication in classical synapses onto afferent nerve fibers. We investigated the ultrastructure of circumvallate mouse taste buds through serial block face scanning electron microscopy (SBFSEM) to track the length of a single nerve fiber and to identify atypical mitochondria located in close proximity to the nerve fiber and Type II cells. In a three dimensional reconstruction of a single nerve fiber, several atypical mitochondria were found with highly twisted, high energy tubular cristae and diameters two to three times that of typical mitochondria. The proximity of these atypical mitochondria to the nerve fiber support the indication that ATP may act as a neurotransmitter for taste transduction in Type II taste cells, and supports the notion of convergence of synaptic input from several taste cells onto nerve fibers.
Faculty Advisor: John Kinnamon, Biological Sciences  I  Location: E4

Decreased Mitochondrial Function Related To Insulin Resistance In Adolescent Girls With Type 2 Diabetes
Abhinav Gupta  I  Majors: Biology, Anthropology
We hypothesized that muscle IR would be associated with decreased mitochondrial function in youth with T2D. Subjects included 14 T2D females (Age 15.1±0.6 years; mean±SE), 16 normal weight females (15.5±0.6) and 19 obese females (Age 14.5±0.5). Youth with T2D were significantly more insulin resistant than both lean and obese controls. The time for half of the ADP made during exercise to convert to ATP was significantly longer in T2D than in both lean and obese control patients. GIR was related to oxidative phosphorylation, free fatty acids, ADP half-time, mitochondrial efficiency, Qmax, and max VO2 across all groups. In summary, youth with T2D and greater peripheral insulin resistance than lean and obese controls performing exercise at an equal workload had less conversion of ATP to ADP, slowed post-exercise ATP synthesis, and therefore decreased mitochondrial function. These results suggest mitochondrial dysfunction may be correlated with insulin resistance in youth with T2D.
Location: E5
Poster Presentations

Hip-Hop And Community In Cambodia
Joie Ha  |  Major: Anthropology
Abhinav Gupta

How can hip-hop provide a fictive kin and community to marginalized communities, specifically the youth populations in Phnom Penh, Cambodia? To study the relationship between hip-hop and Cambodia, I spent 30 days in Cambodia, conducting fieldwork at Tiny Toones, a non-governmental organization that provides Khmer, English, and Math classes alongside hip-hop dance, bboy/bgirling (breakdancing), DJing, and graffiti classes. Tiny Toones stands behind the belief that hip-hop serves as an empowerment tool and a method towards creating community for at-risk youth. This case study concluded that, although not perfect, hip-hop can successfully serve as an approach towards creating community for the youth of Cambodia.

Faculty Advisor: Dores Cruz, Anthropology  |  Location: F1

The Effects Of Nonverbal Behaviors In Fast Food Commercials On Attitudes
Molly Harris  |  Major: Psychology

Fast food commercials have been shown to impact people’s eating habits. A new model of media effects attributes the influence of TV advertisements to the nonverbal behavior depicted on TV (Weisbuch & Pauker, 2011). The aim of this study is to test whether nonverbal behavior displayed in fast food commercials influences people’s attitudes towards food by exposing participants to commercials with mostly positive or neutral nonverbal behavior. We hypothesize that participants’ attitudes will be more positive after exposure to positive than to neutral nonverbal behavior. Testing this hypothesis would improve existing knowledge about media influence processes and overeating habits.

Faculty Advisor: Max Weisbuch, Psychology  |  Location: F2

Quantifying The Effect Of Nonmagnetic Nanoscale Interfaces On Magnetization
Cameron Hickert  |  Majors: Physics, International Studies
Brad Becker

While much effort has been dedicated to studying the interplay between magnetism and light, the role of nanoscale effects — such as the role of interfaces — is only now being recognized. In particular, our lab has recently measured a surprising phenomenon in which the magneto-optical response of a magnetic material is reversed when a nonmagnetic film is added above it. This effect cannot be explained by basic theories of magnetism, suggesting an uncharacterized role of the interface in affecting bulk magnetization. It is necessary to understand the role of nonmagnetic nanofilms before conducting further research on these films in magnetic fields, so that accurate magneto-optic models and predictions can be established. The particular magneto-optic properties affecting the signal in this experiment are particularly relevant to materials science and optics research conducted at this scale. Such a strong connection to tests ongoing elsewhere in the field enables this experiment to have particular relevance.

Faculty Advisors: Mark Siemens, Xin Fan, Physics & Astronomy  |  Location: F3
**Poster Presentations**

**See-Through-Wall Ultra-Wideband Synthetic Aperture Radar**
Seth Hodsdon  |  Major: Mechanical Engineering  
Peter Schichtel, Hossain Alshedoki

The purpose of the See-Through-Wall Ultra-Wideband Synthetic Aperture Radar System is to provide the ability to detect and locate potentially dangerous personnel with concealed weapons or explosives through interior walls of a structure. The objective of this project is to develop the synthetic aperture radar system, such that military and law enforcement will be safer and more effective during dangerous operations such as hostage recovery or combat search and rescue. The members of this team have developed a system that will accomplish this task through the utilization of a small, portable radar unit that is mounted on a linear motion system. This system will move the radar unit along a linear path while "snapshots" are taken of various target objects that are located on the opposite side of a wall. These "snapshots" can then be compiled to produce a 2-dimensional image of what is on the other side of the wall.

Faculty Advisors: Ronald Delyser, Jason Zhang, Electrical & Computer Engineering  |  Location: F4

**Art For Change - Public Achievement Partnership With South High School**
Dionna Hudson  |  Majors: Sociology, Political Science  
Sarah Porter, David Lunde

The 23 tenth grade high school students in South’s Period Two AVID class, which participates in Public Achievement, constructed a video and an art project to address discrimination: a social justice issue they see daily in their school. The video has various components, which consist of introspective demonstrations of others’ perceptions of the students, students’ perceptions of themselves, and the pride students feel in the diversity of their school’s community, and how much they appreciate it. The art project will represent each of the students hand prints and a description of a few pieces of each student’s identity. The overall goal developed by the South students and their coaches is to combat forms of discrimination at their school by highlighting individual differences and intersecting identities.

Faculty Advisor: Cara DiEnno, Center for Community Engagement & Service Learning  |  Location: C4

**Whole Body Angular Momentum Strategies Following Unilateral Total Knee Arthroplasty**
Will Johnston  |  Major: Mechanical Engineering  
Brecca Gaffney

Patients recovering from total knee arthroplasty (TKA) for osteoarthritis (OA) often exhibit asymmetric movement patterns that can have adverse effects on the contralateral limb. Currently, kinematic and kinetic analysis are used to quantify these asymmetries, but likely do not accurately represent the whole-body movement strategies being used. Purpose: To assess the effects of unilateral TKA on whole-body movement patterns with frontal plane whole-body angular momentum (WBAM). Methods: Peak to peak (PP) frontal plane WBAM scaled to body mass during the gait cycle was calculated for 10 patients at three stages of TKA (2 weeks prior, 6 weeks post, and 6 months post), and subsequently compared to five age-matched healthy controls using Cohen’s d effect size. Conclusion: WBAM provides a different perspective on whole-body movement patterns than traditional inverse kinematics and indicates a side-to-side movement pattern when loading the surgical limb up to 6 months after surgery.

Location: F5
Poster Presentations

Neuroprotective Effects Of Whey Proteins Against Neurodegeneration
Neil (Sunny) Khatte | Major: Molecular Biology
Emily Leiter

Many neurodegenerative diseases are linked to oxidative stress on neuronal and glial cells caused by reactive oxygen species (ROS). The premise of this experiment is to utilize two unknown whey protein supplements (one prepared under non-denaturing conditions and one under denaturing conditions), designated as A and B, to analyze their effects on alleviating this stress. The different conditions that the proteins are prepared under affect their ability to produce glutathione, an antioxidant that should suppress the harmful conditions created by ROS. Cells were treated with glutamate and sodium nitroprusside (SNP) to simulate neurodegenerative conditions. Our results showed that supplement B protected cells with greater efficiency at a lower concentration than supplement A from SNP. Our results suggest that supplement B may be a better therapeutic and our prediction is that is was prepared under non-denaturing conditions.

Faculty Advisor: Daniel Linseman, Biological Sciences | Location: G1

Multi-System Fusion For Field-Based Quantitative Measurement Of Human Motion
Daniel Kim | Major: Electrical Engineering

This research presents the design and functionality of a portable and affordable hybrid system that is capable of combining multiple sensors to obtain measurements on segment orientation. We used a Raspberry Pi micro-computer with 14 inertial measurement unit (IMU) sensors to create a motion design "suit". A GPS was also connected to the Raspberry Pi for the localization method and this enabled us to view and collect data on the subjects trajectory. Field testing was done at Vail ski resorts with the DU Ski Team as subjects. The subject would wear a small backpack that contained the system and perform a collegiate slalom course with 28 stubby gates. However, physical improvements in the form factor would address current limitations. In order to have comparable performance with sophisticated laboratory equipment the sampling rate would need to be increased.

Faculty Advisor: Bradley Davidson, Mechanical & Materials Engineering | Location: G2

Geographic Variation In Sperm Competition In The Pacific Field Cricket, T. Oceanicus
Angus Kitchell | Majors: Ecology, Biodiversity

In mating systems where females mate with multiple males per season, males compete physically for access to females, and their sperm may also compete for access to fertilizable eggs. Accordingly, males may adjust their reproductive strategy in response to competition in their environment. If competition for mates varies across populations, we might expect reproductive investment to differ as well, but this has only rarely been tested. This project examines the impact of population density on the intensity of sperm competition in the Pacific field cricket, Teleogryllus oceanicus. Theory predicts an increase in male reproductive investment as population density increases. I gathered field data on T. oceanicus population density and reproductive investment from three islands across the species’ geographic range. Preliminary results show dramatic differences in reproductive investment across populations, but no correlation between density and reproductive investment. This suggests that additional environmental factors are driving the intensity of sperm competition.

Faculty Advisor: Robin Tinghitella, Biological Sciences | Location: G3
Poster Presentations

We’ve Come A Long Way Baby: Amazon.Com & Feminism In The New Era
Emily Krebs  |  Major: Communication Studies

Despite the vast progresses made by the American feminist movement in recent decades, it is clear that full gender equality is far from achieved; a deeply-ingrained, sociocultural system of gender ranking continues to devalue women—often quietly, but always unquestionably. To continue the fight for equality in the modern age, today’s “third-wave” feminists employ numerous methods of dissent that mirror the more nuanced, subtle forms of sexism that constrict contemporary society. However, these actions are not well-perceived by previous generations of feminists who often view direct participation in institutional reform as the only true method of progress. This paper uses a case study of Amazon.com’s customer reviews for BIC Pens for Her to call for a reconsideration of the validity of this sort of third-wave activism. Through a careful analysis of both the rhetorical content of these reviews and their online context within Web 2.0, this research suggests that consciousness-raising (read: non-institutional-based) activism—in this case, writing satirical commentary online—is indeed a form of legitimate cultural critique that creates tangible social change.

Location: G4

Representations Of The Modern South: American Injustice And The National Blame Game
Emily Krebs  |  Major: Communication Studies

Through this grant, I traveled to rural South Carolina with the intention of capturing the sorts of images of backwardness often deemed symbolic of the region (e.g. Confederate flags, crumbling old towns, cultural segregation). My hope was that these photographs would jar viewers and serve as a call to action against the social and political injustices of the region—issues that many people think are "things of the past," despite their modern survival. However, I quickly realized that this approach did not serve the project’s original social justice purpose; instead, it allowed me, and in turn my potential audience, to focus on external issues and ignore those present in our own community. So when I returned to Colorado, I captured the same sorts of images—all within the Denver Metro area—as a critique of the Othering and finger-pointing that occurs within discussions of racism, classism, and bigotry in the United States. In doing this I discovered the vast power of [manipulating] the photographic medium first-hand. By choosing what to bring into focus or crop out in both communities, I was able to directly compose certain representations and understandings of these regions. This project will be presented through a portfolio of images that highlights sociopolitical injustice in both regions, as well as in a written critique of exoticism and exploitation in photo-documentary projects as a larger genre.

Faculty Advisor: Roddy MacInnes, School of Art and Art History  |  Location: G5

Artistic Training And Emotion Regulation
Carissa Land  |  Major: Psychology

The purpose of this study was to investigate whether the type of artistic training a professional artist receives affects how often they utilize emotion regulation. It was predicted that performing artists would utilize emotion regulation more frequently than visual artists. In order to attain this data, an online questionnaire was administered. This questionnaire included a variety of questionnaires and tasks related to emotion. I am still processing my results, however, the preliminary analysis reveals promising information. Although the hypothesis was not overwhelmingly supported, the data suggests that the subject could be further investigated.

Faculty Advisor: Kateri McRae, Psychology  |  Location: H1
Biodetect 2014: Ambient Observations By A Comprehensive Suite Of Light-Induced Fluorescence Techniques During Summer Near Paris, France

Walfried Lassar  |  Major: Chemistry
Kyle Pierce

A comprehensive international measurement campaign (BIODETECT 2014) was performed on institute roofs at two contrasting sites near Paris, France. Site one was at the CEA/LSCE SUPERSITE in suburban Saclay (1.5 km south of central Paris) and the second site was Le laboratoire d’hui de la Ville de Paris (LHVP) in the heart of urban Paris. Measurements took place during late June through early August 2014. The central goal of this campaign was to determine the degree to which existing Light-Induced Fluorescence (LIF) technologies can detect biological aerosols within a complex urban environment. The focus of this poster will be an overview of measurements by LIF instruments, primarily WIBS (Wideband Integrated Bioaerosol Sensor) and UV-APS (ultraviolet aerodynamic particle sizer), with respect to observations of diurnal patterns, changes with respect to fluctuating meteorological conditions and influence from urban Paris. Single particles analyzed by the WIBS can be categorized based on the relative fluorescence intensity present in each of the three fluorescence channels, and cluster analysis can further compartmentalize observed particles to reduce data complexity. The campaign and preliminary findings will be presented. Novel experiments with UV-APS allowed for investigation of the role the instrument detector gain plays in the determination of particle fluorescence. The gain on the photomultiplier tube (PMT) was systematically ramped, and resultant fluorescent particle numbers were compared with WIBS and other LIF instruments. This alteration of the PMT gain of the UV-APS was an attempt to answer the technical question about whether the higher gain would enhance the ability of the instrument to see weakly fluorescent particles, or simply increase noise.

Faculty Advisor: Alex Huffman, Chemistry & Biochemistry  |  Location: H2

Emotional Facial Expressions As Cues For Abstracted Behavior Identification

Tammy Le  |  Major: Biochemistry

As complex social animals, it is essential for humans to be able to identify and understand the meaning of others’ behaviors. We propose that the facial expression of emotion is an important cue that humans use to construe the meaning of others’ behavior. In the proposed study, we intend to examine the effects of an expresser’s facial emotion (anger and joy), compared to neutral and blurred out faces, on the perceiver’s identification of the expresser’s action. We predict that participants’ levels of abstraction in their identification of the action will be significantly elevated in the trials with emotional facial expressions compared to the neutral expressions and the trials in which the faces are blurred out.

Faculty Advisor: Max Weisbuch, Psychology  |  Location: H3

The Neuroprotective Effects Of Whey Proteins Against Neurodegeneration

Emily Leiter  |  Major: Biological Sciences
Sunny Khattra

Many neurodegenerative diseases are linked to oxidative stress on neuronal and glial cells caused by reactive oxygen species (ROS). The premise of this experiment is to utilize two unknown whey protein supplements (one prepared under non-denaturing conditions and one under denaturing conditions), designated as A and B, to analyze their effects on alleviating this stress. The different conditions that the proteins are prepared under affect their ability to produce glutathione, an antioxidant that should suppress the harmful conditions created by ROS. Cells were treated with glutamate and sodium nitroprusside (SNP) to simulate neurodegenerative conditions. Our results showed that supplement B protected cells with greater efficiency at a lower concentration than supplement A from SNP. Our results suggest that supplement B may be a better therapeutic and our prediction is that is was prepared under non-denaturing conditions.

Faculty Advisor: Daniel Linseman, Biological Sciences  |  Location: H4
Poster Presentations

Tangible Thought
Maeve Leslie  |  Major: Studio Art

"Tangible Thought" was an exploration in mold making and casting of animal skulls. I wanted to use skulls as a dimensional surface to print photographs on to. Imagery was also explored and was considered in how it could enhance or take away from a piece overall. Many methods and processes were explored to create the pieces and other methods and materials will continue to be explored, such as rubber and plaster molds and plastic and plaster casting. Overall, many considerations had to be made regarding undercuts and other problem areas that the molds could get stuck on or could permanently fuse to, but these considerations led to the over all success of the project.

Faculty Advisor: Mia Mulvey, School of Art and Art History  |  Location: 11

An Exploration Of Mural Sized Prints Through Analogue Photography
Maeve Leslie  |  Major: Studio Art

"An Exploration of Mural Sized Prints through Analogue Photography" is an exploration of the photographic process through pinhole cameras as well as other film cameras. With this project I looked to perfect my photographic skills and techniques through a camera-less process. (The pinhole cameras are everyday objects with holes in them.) To make sure technique was being addressed, the photographs were printed at large scale, which allowed for mistakes to be more visible. Through this PINS grant I was able to work on my photographic techniques and processes that I have been able to apply towards my BFA Thesis Show this Spring.

Faculty Advisor: Roddy MacInnes, School of Art and Art History  |  Location: 12

Tensioned Structure System
Robert Lewis  |  Major: Mechanical Engineering
Danielle Jackson, Luke Skelly

Our project is a structure that can be utilized as cheap temporary housing with the capabilities of being a long-term structure. The support structure consists of PVC tubing, steel brackets, turnbuckles, and ropes going through all of the structure support members with the capability of being tensioned via turnbuckles so that the structure’s stability can be enhanced for different environmental conditions. The budget of the structure must be less than $2000. The enclosure material (walls) is made out of thin fabric, making all the pieces of the structure easily shipped.

Location: H5
Poster Presentations

Mitochondrial Protein Analysis Of Mice Muscle Tissue Samples Under High-Fat And Diabetes Stress Conditions
Kathleen Lutchi  I  Majors: Biology, Chemistry

Mitochondria are organelles that are involved in energy production, maintenance of cellular homeostasis, calcium signaling and storage, metabolite synthesis, and apoptosis. Mitochondria have shown differences in dynamics such as biogenesis, fission, fusion, and autophagy when under stress such as insulin resistance caused by high-fat diets. My project examines the vascular response and mitochondrial dynamics in precollected tissue samples of a mouse model exposed to a high fat diet and with the diabetes disorder. Based on Western blotting and densitometry analysis, I predict that there will be reduced expression of the mitochondrial content, autophagy, and fission/fusion proteins in the mice tissue samples that were exposed to high fat and diabetes conditions due to the presence of stressors on the body. By studying how obesity and high-fat diets can alter mitochondrial protein activity is particularly relevant to today’s society struggling with obesity and diabetes. Furthermore, studying cells that have been under the added stress of a high-fat diet, improvements can be made towards preventative medicine for cancer, diabetes and cardiovascular disease.

Faculty Advisors: Robert Dores, Biological Sciences & Jane E.B. Reusch, University of Colorado Hospital

Location: 13

Crowding Slows Development Of Sea Urchin Embryos; Variability In Fertilization Envelopes May Aid Dispersion Of Crowded Embryos
Dillon Lynch  I  Major: Molecular Biology

Synchronous gametogenesis and spawning within a sea urchin (Strongylocentrotus purpuratus) population favor fertilization success, but may cause excessively high population density of the resultant embryos. Increasing concentrations of embryos, from 1% to 4%, show increasing delays in development (to the first motile stage, twitching). While hypoxia in the crowded population can account for 70% of the delay, 30% is not due to reduced O2 concentration. Dilution of the crowded population, to allow faster development and escape from predation, is passive in the embryonic period, dependent on sinking of the relatively dense embryo, and turbulent water flow. We show that the raising of the fertilization envelope at fertilization appreciably increases the variability in the embryo population, and may facilitate the dispersion of the embryos.

Faculty Advisor: Dennis Barrett, Biological Sciences  I  Location: 14

SRAM Instrumented Maxle Ultimate
Paul MacNaughton  I  Major: Mechanical Engineering
Alex Gardiner, Greg Guggenheim, Ted Hintz

The DU student team is working to design an instrumented mountain bicycle axle to measure loads on the RS1 inverted mountain bike fork. The knowledge gained from this project will help SRAM with future designs for thru-axles and ensure proper testing procedures.

Faculty Advisor: Peter Laz, Mechanical & Materials Engineering  I  Location: 15
Deleterious Effects Of UV Radiation And Of Dimethyl Sulfoxide On Sea Urchin Early Development

Alena Makarova  I  Major: Biological Sciences
Katlyn Sullivan, Dillon Lynch

The effects of ultraviolet (UV) radiation as well as dimethyl sulfoxide, a vehicle for drug treatments, were tested on sea urchin embryos developing with and without fertilization envelopes. Immediately after insemination, the sea urchin egg raises a proteinaceous fertilization envelope, containing tyrosine, tryptophan and phenylalanine amino acid residues, which could potentially shield the embryo from UV radiation. The fertilization envelope (FE) decreases the density of the embryo; as a result, it tends to place the embryo higher in the water column, where damage from UV is a greater hazard. In this experiment 1-hour-old sibling embryos with and without FEs were exposed to 2400 foot-candles of sunlight at 15.1°C for 150 minutes; they were allowed to develop at 15.0 ± 0.5°C. To ask whether the FE protects against UV damage, the populations were compared for time of development to the first motile stage at about 18 hours after fertilization, and for survival over the next several days. Embryos without FEs all reached motile stages, with a half-time of 858 min after fertilization; embryos with FEs did likewise, with a half-time of 882 min, somewhat later, as is normally the case. Thus, UV exposure had no effect on development to the motile stage. However, as observed on day 2 and 3 of development, both populations of embryos stopped swimming and died, and the presence or absence of the FE made no difference. Thus, if the FE does exert a protective effect, it will have to be demonstrated using lesser exposures and monitoring later developmental stages than first motility, which was not affected by the high dosage used here, enough to cause death by day 2. Sea urchin embryos were also treated with DMSO in hopes of validating its use as a solvent for drugs. A systematic assessment of how much DMSO can be used safely showed that 0.5% DMSO (v/v) was the highest concentration that could be used without significant adverse effects.

Faculty Advisor: Dennis Barrett, Biological Sciences, Biochemistry  I  Location: J1

P.T. Fogg Fire Suppression System

Quinn Martindale-George  I  Major: Mechanical Engineering
Scott Murrow, Connor Hopkins

Residential fire suppression system for homes in rural areas. This system is aimed at combatting wildfires before they can even affect a users property. By emitting a mist around the property, the P.T. Fogg Fire Suppression System can protect the valuables of citizens in wildfire danger. Using this mist will allow the Wildfire Services to prioritize putting out the wildfire instead of protecting houses and continuing to let the wildfire spread. Installation of the P.T. Fogg Fire Suppression System will save the government millions of dollars in fire suppression costs each year.

Faculty Advisor: Jun Zhang, Electrical Engineering  I  Location: J2
Restorative Justice At South High School: Toward Mutual Ownership

Tanner Mastaw  l  Majors: International Studies, Public Policy
Josie Major, Jenna Johnson, Zion Gezaw, Tory Fox

South High School is one of few schools in the Denver Public School System with a Restorative Justice Program. Despite this, the program is underutilized and largely unknown by members of the South community. Many students believe that their voices in disciplinary action often go unheard by the administration, which leads to many conflicts and distrust between teachers and the students they serve. This project aims to improve relations between students and teachers at South High School through an expansion of Restorative Justice awareness at South. Mr. Marini’s AVID class of juniors propose to organize separate trainings for teachers and students in order to provide them with greater understanding of Restorative Justice Approaches and how to effectively employ them in their respective situations. Students will promote the trainings with various marketing strategies: most notably, the use of their weekly announcement program, Rebel Report.

Faculty Advisor: Cara DiEnno, Center for Community Engagement & Service Learning  l  Location: J4

Chronological Lifespan Of Aging Adea And Adef CHO Cell Mutants

Li Mattson  l  Major: Biological Sciences

Purines are essential building blocks of many cellular components, including RNA and DNA, signaling molecules and coenzymes. They are also important regulators of energy and information transfer, protein synthesis, and enzymatic functions. The de novo purine biosynthesis pathway utilizes 6 proteins to catalyze the conversion of PRPP to IMP in 10 steps, an additional four steps converts IMP to either AMP or GMP. There are at least 30 known defects in purine and pyrimidine biosynthesis enzymes, 17 of which are known to cause human disease. Disruption of de novo purine biosynthesis can result in the accumulation of intermediate metabolites in the body or in bodily fluids. In addition to the intermediate accumulation, these defects in enzymatic activity may lead to an alternate metabolic function within the cell. In an effort to research some of these mutations it was discovered that many of these gene alterations in the de novo purine biosynthesis pathway increased the chronological lifespan (CLS) of yeast. Some mutants also extend the lifespan in Drosophila. A chronological lifespan study can help us determine the mechanisms by which these purine mutants can have altered lifespan longevities. Mutants in each step of purine synthesis exist in Chinese hamster ovary (CHO) cells, and preliminary studies suggest that these mutants extend chronological lifespan in CHO cells, similarly to what are observed in yeast and flies. However, these are preliminary observations and the mechanism by which CLS extension occurs is not known.

Faculty Advisor: David Patterson, Biological Sciences  l  Location: J5

Ice Nucleating Particle Characterization And Freezing Chamber Apparatus

John Maurer  l  Major: Chemistry, Physics
Carolyn Schumacher, Walfried Lassar

The project aimed to construct a working freezing chamber apparatus for detection of ice nucleating particles. This was achieved through a combination of engineering, computer science and chemical theory; all of which culminated in the construction of a working device. It is the long term hope of Dr. Huffman to use the apparatus for characterization of large atmospheric aerosol particles that may play a significant role in ice nucleation and weather patterns.

Faculty Advisor: Alex Huffman, Chemistry & Biochemistry  l  Location: K1
Poster Presentations

Media Analysis Of Hydraulic Fracturing In Colorado
Larkin McCormack  |  Major: Environmental Science

Hydraulic fracturing is an extremely controversial field because there are many stakeholders involved and many potential risks and benefits associated with the practice. Colorado is an interesting and important area to study hydraulic fracturing, or ‘fracking’ because of the practice’s close proximity to people, and the state’s unique regulatory framework. In this study, 198 newspaper articles from Denver, Boulder, and Colorado Springs were coded and content analysis was preformed to illuminate possible newspaper bias in reporting the themes of economics, the environment, and public health. In addition, the narrative policy framework was applied to study how various actors were being portrayed as heroes, victims, and villains. This study is one of the first applications of the narrative policy framework to media articles. Understanding how the news media portrays hydraulic fracturing is important because general public gets much of their information from the news, and draws conclusions based on this information.

Faculty Advisor: Michael Kerwin, Benjamin Blair, Geography & the Environment  |  Location: K2

Laser Centering For Process Optimization
Kali McFadden  |  Majors: Mechanical Engineering, Electrical Engineering
Colin McMaster, Jesus Vilcas

The focus of this project is to increase the productivity in the work place by making companies processes more efficient. We are decreasing the fail rate of products as well as increasing the manufactured numbers. After performing detailed analysis on multiple design solutions, the final design was chosen that best suited the customer’s requirements. This is done by using a laser centering system to assist in placement of the products. The final design uses a series of lasers to determine distance from the product in order to tell the operator where to move the product from its current position. Our solution allows for cross-training of operators within the company as well as eliminating centering as a barrier for success. These findings assist in the optimization of product production, leading to a decrease in waste and bad parts.

Faculty Advisor: Ronald DeLyser, Electrical Engineering  |  Location: Wall 2

Phylogeny Of Melanocortin Accessory Protein Two Interaction With Melanocortin Receptors: Studies On Stingray And Melanocortin Receptors
Bridgette McNally  |  Major: Molecular Biology

Previous studies on human melanocortin receptors (MCRs) indicate that the melanocortin receptor accessory protein 2 (MRAP2) interacts with all five MCRs in various ways. In an effort to understand the phylogeny of MRAP2 interactions with MCRs, this current study was done to determine the effects on the activation of cartilaginous fish MCRs that were co-expressed with cartilaginous fish MRAP2 in Chinese Hamster Ovary cells. For these experiments, these CHO cells were stimulated with either stingray ACTH (1-24) or stingray α-MSH in the presence and absence of esMRAP2. Although esMRAP2 had no effect on the activation of srMC3R or srMC4R, statistically significant effects on the activation of srMC1R, srMC2R, and srMC5R were observed. Since humans and cartilaginous fishes last shared a common ancestor over 350 million years ago, these observations suggest that the interaction between MRAP2 and MCRs may be rooted in early evolution of the vertebrates.

Faculty Advisor: Robert Dores, Biological Sciences  |  Location: K3
**Poster Presentations**

**DU Service & Change**
Caitlin Mendenhall  |  Majors: International Studies, Spanish  
Neda Kikhia, Sarah Yaffe

DU Service and Change (DUSC) is a student organization dedicated to providing meaningful service opportunities on and off campus to DU students. DUSC addresses a general lack of understanding of the root causes of social justice issues facing the Denver community by facilitating critical reflection in all of its projects. These projects vary from weekly tutoring with the Bridge Project, to weekend volunteering at places like the Ronald McDonald House, to giant days of service involving hundreds of volunteers and community partners. By providing diverse opportunities for community engagement, DUSC increases student involvement and helps students develop an understanding of pressing concerns that affect our community and our world. Volunteer participation has increased by a third since last year and student involvement in DUSC leadership has increased by two thirds. Through its research of community issues, DUSC creates a more engaged and socially conscious campus for the generations to come.

Faculty Advisor: Ryan Hanschen, Center for Community Engagement & Service Learning  |  Location: K4

**Government Corruption Research**
Ramona Miller  |  Majors: Political Science, Film Studies & Production

Government corruption effects nearly every single person on earth as far back as centuries. Whether its consequences impact us at a conscious level or not, it is self-evident that the values of not only life, freedom, and justice are compromised at the hand of corruption. It is probably most implicate that government corruption is not something that can be solved, whereas the self-educated individual can enact change necessary to progress humanity positively. The approach can happen in multiple ways that are likely unpredictable. This project’s main route will focus on public liberation via exposure and education of past and current sources of corruption in our everyday lives. So far, I am focused on research to develop a focus and targeted community that can combat dishonest politics. So far, networking with local and state organizations/foundations are the key to covering ground in already established causes. With this comes personal investigation and research on patterns in history concerning US politics and government. Eventually, a Puksta Project will develop.

Faculty Advisor: Ryan Hanschen, Center for Community Engagement & Service Learning  |  Location: K5

**Assessing Tau Fibril Fragility**
Macy Mingus  |  Major: Chemistry

Tau, a microtubule-associated protein, has the potential to dis-associate from microtubules and aggregate into fibrils under certain cellular conditions. This can lead to a number of neurological diseases such as Alzheimer’s disease. It is postulated that Tau aggregations in one cell can fracture into smaller fibrils which then have the potential to cross into other cells. Once in a new cell, they can induce Tau fibril aggregation by the addition of free, monomeric Tau to their ends, thus propagating the disease. It was the interest of this project to investigate the fragility of fully-formed Tau fibrils to see which conditions result in the smaller Tau fibril fragments found in disease propagation. Fibrils were treated with various conditions including differing sonication times, sonication powers, cofactor concentrations, and pH environments. Sonication of fibrils showed similar breakage regardless of time, power, or cofactor concentration. pH changes did not induce fibril breakage.

Location: L1
Poster Presentations

Analysis of the CR1 “Jumping Gene” in the Mallard Genome
Brendan Monogue  |  Major: Biochemistry

While transposable elements were first observed in the 1940s, detailed study of their characteristics could not be done until recent methods of molecular genetics were developed. These sequences of DNA are able to either move (Class II transposons) or copy themselves (Class I transposons) from one position in a genetic sequence to another. They are ubiquitous throughout life (Kidwell and Lisch, 2001). Approximately half of the human genome is composed of these DNA sequences (Pray, 2008). As we are now learning, transposable elements may play an important role in the function of life. However, there are many things we still do not understand about them. While the general mechanisms of how these sequences appear in new locations in the genome are known, much remains to be learned on how these genetic sequences can be structured. This project focuses on the analysis of the CR1 transposable element in Mallard Ducks that has become “composite”, taking up a different sequence that it brings with it when it moves. This could help serve as a model for alterations and creations of transposable elements.

Faculty Advisor: Tom Quinn, Biological Sciences  |  Location: L2

Observatory Mechanization Project
Scott Murrow  |  Major: Mechanical Engineering

A mechanism was designed for the operation and opening of the 2000 lb. observatory door at the Meyer-Wombly Observatory on the summit of Mount Evans. The entire assembly was designed and fabricated in-house, and installed in the observatory in the late summer of 2014. Although initial bench tests were successful, unforeseen issues prevented full-scale tests from being conducted.

Faculty Advisor: Robert Stencil, Physics & Astronomy  |  Location: L3

A Survey Of Serranidae Species Of Genus Aethaloperca, Anyperodon, Cephalopholis, Epinephelus, And Plectropomus On Chumbe Island, Zanzibar, Tanzania
Kimberly Nesbitt  |  Majors: Biology, Cognitive Neuroscience

A census of six grouper (Serranidae) species was conducted on Chumbe Island off the coast of Unguja, Zanzibar, Tanzania during October and November 2014. The six species were counted, divided into size classes, and divided into juvenile and adult populations on both the drop-off of Chumbe Island’s reef as well as the back, shallower reef. Results showed that larger individuals inhabit the drop-off, while smaller species and juveniles inhabit the shallower reef. The Brown Marbled (Epinephelus fuscoguttatus) and Blacksaddled (Plectropomus laevis) Groupers, two of the largest fish on the reef, had numbers higher than originally believed, a sign of a healthy, complex ecosystem. Biomass of all species was determined to be 9.240g/m², highly concentrated at the drop-off of the fringing reef. Juvenile percentage of each species suggested a high success for future generations. Most of the species were found to have specific habitats on the reef, especially the large individuals.

Faculty Advisor: James Fogleman, Biological Sciences  |  Location: Wall 4
**Criminality In Adolescents Aging Out Of Foster Care: The Effects Of Maltreatment, Psychopathy, And Masculine Norms**

Leah Olguin  |  Majors: Psychology, Socio-legal Studies

Previous research has demonstrated that childhood maltreatment, psychopathy, and adherence to certain masculine norms are, independently, risk factors for criminality and aggression. Foster youth are also at an increased risk of interacting with the criminal justice system, with their transition into adulthood being a key period. The present research used data from the Mental Health Service Use of Youth Leaving Foster Care (Voyages) study which consisted of nine waves of interviews over three years. From the original sample, this study looked at 174 male participants, aged 17 at the first interview and 19 at the end. Through binary logistic regression it was found that psychopathy was the greatest predictor of having been arrested by the last interview with the combination of neglect and strongly valuing emotional control also being significant. Further research into specific risks can be used to influence interventions for at-risk youth.

*Faculty Advisor: Wyndol Furman, Psychology  |  Location: L4*

**El Sistema Youth Orchestras As A Public School Curriculum Model**

Ian Parker  |  Majors: Piano Performance, Spanish

Generally speaking, musicians exhibit higher proficiency on standardized tests (SAT, ACT, etc.) than people with no musical education. Learning to play an instrument encourages the use of multiple regions of the brain concurrently, and therefore strengthens overall cognitive function. However, music education can be very expensive, rendering it unattainable for many middle to low income families. By offering a program within the public school district for children to have access to instruments, instruction and ensemble time, we can facilitate more holistic cognitive development and enable more critical and analytical thought processes from students. Students with music educations of one sort or another tend to pursue higher levels of education than those with no musical training, regardless of what field they choose to pursue. If the percentages of young students who are also musicians increases, then the long term effects will lead to a population with a higher average education level.

*Faculty Advisor: Ryan Hanschen, Center for Community Engagement & Service Learning  |  Location: L5*

**More Meaning In Life Is Associated With Less Fear Of Eternity**

Amanda Pennington  |  Major: Psychology

Previous research has shown that the more people are afraid of death, the more meaning in life they report. There is some evidence that instead of a fear of death certain people have what appears to be the opposite, a fear of eternity. Little research has been done on this phenomenon, and it is important to understand what motivates this fear of eternity and how it relates to meaning in life. Participants answered an online survey consisting of items from ten scales measuring personality traits, fear of death/eternity, meaning in life, afterlife beliefs, and intrinsic religiousness. Fear of the unknown and fear of eternity were positively correlated in the undergraduate sample, but were not correlated in a community sample. In both samples, there was a strong negative correlation between meaning in life and fear of eternity, and strong positive correlations between meaning in life and immortality belief and intrinsic religiosity.

*Faculty Advisor: Daniel McIntosh, Psychology  |  Location: M1*
**Poster Presentations**

**MRAP2 Regulation Of Xenopus Tropicalis Melanocortin Receptors**

Bogdana Petko  | Majors: Biology, Psychology

The melanocortin receptors (MCRs) regulate physiological function. They are stimulated by ligands ACTH and α-MSH. Recent studies have examined melanocortin receptor accessory proteins (MRAP), which regulate receptor trafficking and configuration. Following the results of zebrafish MRAP2/MC4R interaction, the study’s focus was on tetrapod Xenopus tropicalis (xt) MCR response to MRAP2. Chinese Hamster Ovary (CHO) cells were transiently transfected with xtMCR 1, 3, 4, and 5, co-expressed with xtMRAP2, and stimulated with xtACTH or xt-α-MSH. Receptor sensitivity to ligands and the amount of cAMP produced was observed in the presence of xtMRAP2. xtMC3R had no significant change in either ligand sensitivity or cAMP production. xtMC1R and xtMC5R had no change in sensitivity, but both increased in cAMP production when stimulated with ACTH. Finally, xtMC4R had increases in both sensitivity to xtACTH and cAMP production. As in zebrafish, xtMRAP2 regulates xtMC4R to adequately respond to its environment and control feeding behavior.

Faculty Advisor: Robert Dores, Biological Sciences  | Location: M2

**Participation In An International Collaborative Project In Suburban Paris: Detection Of Biological Aerosol Particles And Ice Nuclei**

Kyle Pierce  | Major: Biochemistry
Wal Lassar

Bioaerosol particles are found all across the world and are critical to many life functions and environmental processes. Bioaerosol particles are small pieces of suspended biological material, including whole microorganisms or pieces of biological material. Primary biological aerosol particles (PBAP), such as bacteria, fungal spores, and pollen, can range in size from 0.1 to 100 μm and can stay suspended in the atmosphere from minutes to several days. PBAP have been shown to influence certain kinds of cloud formations by inducing the freezing of water droplets in a process called ice nucleation. Understanding the role PBAP play is essential on the global and individual levels. Dr. Huffman received an invitation to be involved in BIODTECT-2014, a large collaborative measurement project to inter-compare many different bioaerosol detection techniques. The project took place from July 7 – August 8 at a suburban research facility outside of Paris France to further understand the process these particles play on the native environment.

Faculty Advisor: Alex Huffman, Chemistry & Biochemistry  | Location: M3

**Access To Higher Education For Refugee Students**

Fatima Rezaie  | Majors: International Studies, Psychology

With more than 10 million refugees around the world, United States receives thousands of refugees each year. Because these children have missed on years of schooling, it is essential for them to continue their education upon their arrival in their new community. However, language barriers, limited resources, and lack of attention and interest have pushed refugee students away from seriously considering higher education. In order to provide college prep resources and support to high school refugee students in Denver, I have developed a partnership between the Volunteers in Partnership program (VIP) at the University of Denver (DU) and South High School. As a result, ten spots have been secured for third year refugee students to participate in a week-long college prep summer program at DU. Through this sustainable partnership and experience, the students will view college as a reality and consider it as a serious next step after high school.

Faculty Advisor: Ryan Hanschen, Center for Community Engagement & Service Learning  | Location: M4
Poster Presentations

Cognition Is Not Always Preferred In Mate Choice: The Role Of Female Cognition In Male And Female Mating Decisions
Kyle Robrock  |  Majors: Ecology, Biodiversity
Ross Minter, Clara Jenck
Communication between animals provides valuable information to receivers. Our lab studies mating interactions between the sexes. Recently, male cognition was demonstrated to play an important role in mate choice. Our lab found that female sticklebacks (Gasterosteus aculeatus) choose males who are better at solving a novel foraging task. Here, we tested whether female cognition is similarly important in mate choice, helping females to distinguish between high and low quality mates. We assessed cognition of male and female sticklebacks using the same foraging test to address 1) whether males prefer high cognition females and 2) whether high cognition females are more “choosy”. We found that the female cognition abilities we measured did not affect males’ choice of female mates or the mating decisions females made. We did, however, find differences in performance on the foraging task between the sexes. Males may experience different selection pressures than females, thus different cognitive abilities.

Faculty Advisor: Robin Tinghitella, Biological Sciences  |  Location: M5

Depletion Of Choanocytes In Sponges Using Hydroxyurea
Margaret Roth  |  Major: Biological Sciences
The body plan of sponges (phylum Porifera) has special evolutionary significance, as they have a specialized tissue called the choanoderm that exhibits striking similarity to choanoflagellates, the unicellular relatives of animals. My objective was to use hydroxyurea (HU), a cell cycle inhibitor, to deplete sponges of only choanocytes, highly proliferative cells. HU was applied prior to choanocyte differentiation during development, and after choanocyte differentiation. HU treatment regimes resulted in the loss of choanocytes, but no other detectable effects on sponge. Differential gene expression analysis was performed on choanocyte depleted sponges versus normal sponges; we hypothesize that downregulated genes are expressed in choanocytes in untreated sponges. Part of my project was to validate downregulation of candidate choanocyte genes in treated sponges using RT-PCR and semi-quantitative PCR. Preliminary data did not support results from DGE, and future experiments should continue quantitative analysis of a broader catalog of candidate choanocyte genes markers.

Faculty Advisor: Scott Nichols, Biological Sciences  |  Location: N1

Hunger Strikes Communities
Alondra Sandoval  |  Major: Computer Science
Alyssa Beckerman, Jazzy Juarez, Paige Mills
Hunger affects people all over the Denver Metro area: immigrants, low-income families, and the homeless, to name a few. According to Hunger Free Colorado, one in seven Coloradans struggles with hunger, and one in eight live at or below the poverty line. Today, many people do not understand how widely hunger affects the community or are not aware of the difficulties these citizens face. To change this, Public Achievement students at STRIVE Smart Academy volunteered at a food shelter in order to gain more knowledge about hunger in Colorado and give a helping hand toward the issue. By conducting this field-work, the students have now made their own positive impacts toward hunger in their communities and can advocate for what needs to be done to resolve this injustice to other STRIVE students and faculty, as well as their own communities.

Faculty Advisor: Cara DiEnno, Center for Community Engagement & Service Learning  |  Location: N3
**Poster Presentations**

**Woyzeck: A New Translation**

Skye Savage  |  Majors: German, Russian
Hannah Young

Woyzeck is a one act play written by Georg Büchner, a German author and activist in the early 19th century. Often considered the first "social drama," Woyzeck deals with issues of the class system in a post-Napoleonic Europe, while maintaining focus on the personal tragedies of the lower class. Büchner’s writing anticipates the Expressionism movement of the early 20th century and has fascinated generations of writers, artists, and performers. As my honors thesis for the German major, I have translated the entirety of the work from Büchner’s notes and modern adaptations, with an eye to modernizing the script and elevating Büchner’s incredibly vivid language. With the help of the DU Department of Theater, my script will be performed as part of Hannah Young’s senior capstone.

Faculty Advisor: Gabi Kathoefer, German  |  Location: N4

**Developing Quinoline Scaffolds For The Noncompetitive Inhibition Of Fructose 1,6-Bisphosphate Aldolase**

Madison Schackmuth  |  Major: Biochemistry
Ginelle Rahman

As one of the most longstanding, infectious diseases, Mycobacterium tuberculosis has had the opportunity to develop multiple forms of antibiotic resistance and therefore requires the development of novel treatment options that utilize high target specificity. The enzyme Fructose 1,6-Bisphosphate Aldolase (FBA) catalyzes the reverse aldol condensation of Fructose 1,6 Bisphosphate into glyceraldehyde 3-phosphate and dihydroxyacetone phosphate. Halting this process would inhibit M. tuberculosis from breaking down the sugars essential to its survival. Class I FBAs are found in humans and form a Schiff base intermediate while the Class II FBAs, found in bacteria, form a Zn(II) coordination complex. By developing quinoline analogs that coordinate Zn(II) and interact with a hydrophobic binding pocket, Class II FBAs can be selectively targeted though noncompetitive inhibition without significant adverse effects in humans.

Faculty Advisor: Bryan Cowen, Chemistry & Biochemistry  |  Location: N5

**Revealing The Lost Dimension**

Kevin Shanken  |  Majors: Studio Art

Through the Revealing the Lost Dimension project, I plan to experiment and explore photography in a three dimensional medium. The purpose of this project is to add depth and dimensionality to photography’s usual two dimensional medium.

Faculty Advisor: Roddy McInnes, School of Art and Art History  |  Location: O2
A Sustainable Season: The Future Of Skiing And Snowboarding In An Age Of Climate Change And Disappearing Snow

Callie Smith  |  Major: Environmental Science

This project examines the sustainability of the winter sports industry (specifically skiing and snowboarding) in the face of global climate change. Overall, it aims to discover potential changes the industry would need to make in order to adapt to warming temperatures. Through surveys of existing literature and an analysis of the current practices of ski resorts, categories were determined in which the industry most needed to modify - on-mountain buildings, renewable energy implementation, artificial snow elimination, and shortening the ski season. From these propositions, the future of the industry is addressed. Overall, the sports are set to change quite a lot over the coming years. The implications of the research and analysis show a much less profitable season and many negative changes for consumers of the industry. The true choice is whether resorts will adapt to and live with the changing climate or give in by reinvesting themselves in warmer seasons.

Faculty Advisor: Michael Kerwin, Geography & the Environment  |  Location: O3

Characterization Of Epithelial Dynamics In An In Vitro Model

Celia Smits  |  Major: Molecular Biology

Wound healing is an integral function of epithelial cells in many tissue types, particularly those facing the harsh environment of the intestinal lumen. Using an in vitro model of the intestinal epithelium and a mechanically induced scratch, we have attempted to further characterize the dynamics of individual cell-cell interfaces and the migration of the entire cell layer during the process of wound healing. We have found that the cell monolayer heals in distinct steps—each having unique biophysical characteristics—and have shown that epithelial cells throughout the cell layer acquire unique topological and migratory characteristics depending on their proximity to the scratch.

Faculty Advisor: Dinah Loerke, Physics & Astronomy  |  Location: O4

Micro Quadrotor System

Wyatt Stanland  |  Major: Electrical Engineering
Amdom Giday, Antoinette Prather

The Micro Quadrotor System is a small, rotary wing aircraft that will eventually be incorporated into the multi-vehicle control testbed system in the Cyber-Physical Systems Laboratory in CMK 100, advised by Dr. Kyoung Dae Kim. The hardware prototype is controlled by a software app that can be downloaded to a smart device. The Micro Quadrotor System is controlled using the latest in flight controller software on an advanced hardware platform. The Micro Quadrotor System is controlled over a Wi-Fi connection using a smart device and can stream live video from an onboard camera directly to your screen, emulating First Person View. The impact of the drone industry stretches from agriculture to disaster relief to package delivery and even to self-driving cars. With a projected market of $82 billion in 2025, there are significant advancements on the horizon for unmanned drone technology.

Faculty Advisor: Kyoung Dae Kim, Electrical Engineering  |  Location: O5
Poster Presentations

Analyzing The Phylogeny Of The Melanocortin-2-Receptor
Katlyn Sullivan  |  Major: Molecular Biology
Melanocortin-2 receptor (MC2R) gene evolution in teleosts and tetrapods corresponds to strict ligand activation selectivity for ACTH, while MC2R activation in at least one species of cartilaginous fish, Callorhynynchus mili (elephant shark), lacks selectivity. Therefore the objectives of this thesis are to determine if the ligand selectivity properties observed for elephant shark MC2R are the same in another species of cartilaginous fish, Dasyatis akajei (Japanese stingray), as well as to perform a phylogenetic analysis of the primary sequences of human, elephant shark, and stingray MC2R orthologs. Expression of the respective MC2R orthologs in Chinese Hamster Ovaries (CHO) cells revealed that des-acetyl-a-MSH is a better ligand than ACTH, for cartilaginous MC2R activation. Phylogenetic analyses indicated evidence that the ancestral divergence in the MC2R amino acid sequences led to noteworthy transformations, which may have contributed to the distinct functional properties between cartilaginous and tetrapod MC2R orthologs.
Faculty Advisor: Robert Dores, Biological Sciences | Location: P1

Sea Urchin Fertilization: Manipulating The Diameter Of The Fertilization Envelope Influences The Buoyancy Of The Embryo And The Timing Of Its Development
Katlyn Sullivan  |  Major: Molecular Biology
In the three minutes after sea urchin (Strongylocentrotus purpuratus) gametes are mixed, the vitelline envelope rises off the surface of the egg to generate a perivitelline space; the envelope is thickened and hardened by contents of the exocyteded cortical granules to make the fertilization envelope. By fertilizing in concentrations of the hydrophilic polymers polyvinyl pyrrolidone or polyethylene glycol, from 0.5% to 3% (w/v), we have controlled the diameter of the fertilization envelope and thus the volume of the perivitelline space. We find that embryos with smaller diameters settle more rapidly through the water column, as expected. In each of three trials, varying the volume of the perivitelline space also exerted major effects on the time when the swimming larvae hatched from their fertilization envelopes; but the effects differed in extent and direction, in unpredictable ways. Variability in fertilization diameters in a natural population would have survival value in facilitating the dispersion of the embryos.
Faculty Advisor: Dennis Barrett, Biological Sciences | Location: P2

The Heliospheric Economy: A Framework And Quantitative Techniques To Estimate Human Expansion Into The Solar System
Thomas Tarler  |  Majors: Economics, Mathematics
Despite more than 50 years of human space exploration, no paper in the field of economics has been published regarding the theory of a space-based economy. The aim of this paper is to develop quantitative techniques to estimate conditions of the human heliospheric expansion. An empirical analysis of current space commercialization and reasoning from first economic principles yields an evolutionary prisoner’s dilemma game on a dynamically scaled heterogenous Newman-Watts Small World Network to generate a new space. The analysis allows for scalar measurements of behavior, market structures, wealth, and technological prowess, with time measured relative to the system. Four major phases of heliospheric expansion become evident, in which the dynamic of the economic environment drives further exploration. Further research could combine empirical estimations of parameters with computer simulations to prove results to inform long-term business plans or public policy to further incentivize human heliospheric domination.
Location: P3
**Validation Of A Clinical Test To Assess Hip Abductor Muscle Control In Patients With Hip Arthroplasty**

Kathryn Thompson  | Major: Mechanical Engineering

Total hip arthroplasty is a common reconstructive surgery, with approximately 332,000 performed in 2010 and anticipated to reach over 500,000 each year by 2030. Functional deficits still remain after surgery, and are linked to weak hip abductors. Hip abductor performance can be measured by assessing the stability of the pelvis during single limb stance for 30 seconds. Clinical inference from the single limb stance test may be enhanced by the addition of quantitative postural measures but these are difficult to measure. The purpose of this investigation is to assess the validity of using still-frames taken from video recordings to measure pelvis, torso, pelvis on femoral, and torso on pelvis postural angles by comparing to motion capture system. The average angle error between the Vicon and video method was within 2.5 degrees for all angles. Overall, the video-based method is a good estimate of postural measures during a single limb stance.

Faculty Advisor: Bradley Davidson, Mechanical & Materials Engineering  | Location: P4

**DC To AC Inverter**

VuToan Tran  | Major: Engineering
Casey Litow, Nick Young

The basic design is to develop a DC-to-DC converter and DC-to-AC inverter that can be easily presented to a customer in which they can see the internal components and measure all inputs and outputs. This product will be used as a tool by the sales team to safely and clearly demonstrate the purpose and use of inverters. This inverter could later on be installed as a subsystem of a bigger systems. For example, the inverter can be used in an electric or hybrid car system. It can convert DC power from the car battery to AC to power user’s devices while driving. Also, the inverter can be part of a solar power system that convert DC power generated from the solar panels and create an output of AC power to run everyday devices.

Location: P5

**Socioeconomic Status, Sleep Problems and Mental Health in Children**

Naomi Wallace  | Major: Psychology

Previous research has shown that low socioeconomic status (SES) is associated with higher levels of both physical and mental illness. Additionally, low SES is associated with higher levels of sleep problems and shorter sleep duration. A growing body of research shows that sleep problems are related to many mental health disorders. These associations point toward a potential mediation model such that sleep explains some of the relationship between SES and mental health. The current study explored this relationship in 8- to 10-year-old children from low- to middle-income households. Using both mother- and child-report questionnaires, the current study found that income was negatively associated with internalizing symptoms. Trend-level findings suggest a relationship between income and sleep anxiety, where children from lower income households have higher sleep anxiety. Additionally, a trend level, positive association between sleep problems and overall mental health problems was found. These findings demonstrate a need for future research to more closely examine the relationships among SES, sleep problems and mental health.

Faculty Advisor: Pilyoung Kim, Psychology  | O1
A Stakeholder Analysis Of Conservation Efforts In Baan Tha Klang, Thailand
Chelsea Warren  |  Major: Environmental Science

Asian elephants are endangered species under CITES, considered a flagship species in conservation efforts, and a keystone species in ecosystems. In Thailand, elephants are intertwined in the culture, religion, royalty, and history, although the groups traditionally working with elephants are heavily marginalized. Of the 3000 elephants left in Thailand, 2000 are employed in the growing tourism industry. I investigated to the extent that different stakeholders within a conservation group are dealing with problems of tourism which leads to commodification and animal welfare concerns, yet provides employment for the captive elephant population. This study utilized in-depth qualitative stakeholder interviews as an opportunity to qualify perceptions of the different groups, as well as, examine the power relationships between demographics. Conclusions include the importance of bottom-up decision-making and emphasize economic empowerment of communities. Conservation efforts must include the voice of the mahouts who directly work and depend on elephants for their livelihoods.

Faculty Advisor: Michael Kerwin, Geography & The Environment  |  Location: Wall 1

Education Of Gender Identity And Expression Through Social Media: “I Am > Campaign”
Arimus Wells  |  Majors: Public Policy, Sociology
Neda Kikhia, Jackie Curry

The traditional binary forms of gender have been used by everyday individuals to classify and associate simplistic traits of humans by creating boxes for “males” and “females.” This rigid approach to establishing gender norms, where both populations are taught to abide by created social norms, limits self-expression and discussion around various gender expressions. This research addresses the lack of education around gender expression, fluidity, and existence of other identities than the binaries. To further educate on the issue, high school students participating in College Track, partnered with University of Denver’s Public Achievement Program, established a campaign and multiple social networking profiles, around the “I Am > Campaign” (I am more than) to raise awareness and provide information through a widely accessible platform. By the end, students will measure their success by the diversity and active participation of their audience. The research is still being conducted, but will conclude before the symposium.

Faculty Advisor: Cara DiEnno, Center for Community Engagement & Service Learning  |  Location: Wall 3

Effect Of Surface Changes Of Repeated Readings On Bilingual Memory
Emily Wheeler  |  Majors: Psychology, Spanish

Bilinguals have a better episodic and semantic memory than monolinguals, and this increased memory is referred to as the “bilingual advantage.” When bilinguals are able to read repeated information in both languages, they remember it better than if the information was repeated in one language. There are several theoretical possibilities to explain this phenomenon, and this study aimed to clarify the cause of this increased benefit. This study compared groups that read repeated information in English, in Spanish, and backtranslated English that mirrored translation into a different language. The groups were tested on their retention of the information through free recall and true/false questions. The results show that the group that read the information in both languages responded to content items more quickly but responded to inference items more slowly than the other two groups. The results indicate that while reading in two languages may aid in content retention, it makes it more difficult to infer new things about the material.

Faculty Advisor: George Potts, Psychology  |  Location: Wall 5
The Effect Of Reactive Oxygen Species And Superoxide Dismutase On Pulmonary Hypertension

David Wideman  |  Majors: Chemistry, Molecular Biology

It is believed that oxidative stress and reactive oxygen species (ROS) cause pulmonary hypertension (high blood pressure of the lungs), a condition that has numerous negative effects on overall health and causes to heart disease. This project explores the relationship between ROS, Superoxide dismutase (SOD – the enzyme that reduces the amount of ROS in the system), and pulmonary hypertension. In this project cell culture models were exposed to varying levels of ROS and SOD, then analyzed using Electron Paramagnetic Resonance (EPR) to determine the concentration of specific ROS in the sample in order to look for a connection between SOD and ROS levels. If a connection between increasing SOD concentration and a reduction in ROS species can be accurately defined it would pave the way for new treatment methods for pulmonary hypertension, in turn reducing heart disease and helping to correct a rapidly growing health problem in the US.

Faculty Advisor: Larry Berliner, Chemistry & Biochemistry  |  Location: Wall 6

Rain Water Capture System

Irene Wilson  |  Major: Mechanical Engineering
Alicia Everitt, Alisha Alomia

A problem exists in Nicaragua where 15% of rural communities do not have access to improved drinking water. The Engineering Design Team was challenged to create a Rain Water Capture System (RWCS) for a rural community of 200 people. The main requirements were to create a sustainable and affordable system sourcing all materials locally. Research was conducted, designs were finalized, and a prototype of the filtration system was created. The final prototype is a bio sand filter combined with a charcoal layer. This design will transform rainwater to a potable drinking source. Testing of the prototype is in progress to see if the filter for the RWCS will effectively produce potable water.

Faculty Advisor: Ronald DeLyser, Electrical & Computer Engineering  |  Location: Wall 7

Higher Education Access For African American Males

Mawukle Yebuah  |  Major: International Business

As an 18 year old Black male in college, I realized that many of my Black peers would not be able to obtain a college degree or even access higher education. I realized that for many of them it was not because they didn’t have what it took, it was because they fell victim to a system that never intended for them to succeed. In the State of Colorado, Black Males are graduating high school at rates lower than that of their white peers. There is a systematic breakdown in the education system in which they are put to learn, as well as a breakdown in the lack of support they are receiving from the community. Through personal mentoring and research, and partnerships with community organization like The Black Male Initiative Summit (BMIS), I have developed my project to help address the issues Black males face in our current education system. It is critical we address this issue now because our current system is leaving many of our Black males in society uneducated and disempowered, which results in further marginalization of the African American community.

Faculty Advisor: Ryan Hanschen, Center for Community Engagement & Service Learning  |  Location: J3
Poster Presentations

Covidien/Medtronic Capnography

Greta Zimmerman  l  Majors: Mechanical Engineering
Ali Ellickson, Roger Sayre, Joseph Woolpert

The focus of this project is to increase patient comfort while wearing capnography lines. This was done to reduce high contact areas such as the ears, face, and upper lip. Design methods were accomplished through rapid prototyping and patient surveys. Implications result in a new product to increase patient comfort.

Faculty Advisor: Ronald DeLyser, Electrical Engineering  l  Location: N2

A Performance of the Firebringers Opera By Chappell Kingsland

Jared Giammanco  l  Majors: Vocal Performance
Grace Clark, Kate Paterson, Theresa Kesser, Nathan Crowder, Dominic Ellerbee, Paul ZinkJosh Goo, Kierra Aiello, Kyle Hughes, Danni SniderWren Schuyler, and Victoria Minton

Mile High Opera is a company of students, faculty and alumni from the University of Denver’s Lamont School of Music and Department of Theatre. Our mission is to reach new audiences with the dynamic form of musical storytelling known as opera.

Faculty Advisor: Chappell Kingsland, Music  l  Location: Details about the performance can be found on the facing page
Mile High Opera presents

The Firebringers

Rainbow Crow  Coyote  Owl  Eagle

A chamber opera based on fire origin myths

Rainbow Crow - Lenape (North America)
Prometheus - Ancient Greeks
Murile and the Moon-Chief - Chagga (Kenya & Tanzania)

Libretto by Ben Allen-Kingsland
Music by Chappell Kingsland

Saturday, May 9, 2015
Performances at 7:00 and 8:30pm
Williams Recital Salon - Lamont School of Music - University of Denver
Free - All ages welcome

Mile High Opera is a company of students, faculty and alumni from the University of Denver's Lamont School of Music and Department of Theatre. Our mission is to reach new audiences with the dynamic form of musical storytelling known as opera.
## Index by Presentation Affiliation

### Partners in Scholarship

<table>
<thead>
<tr>
<th>Name</th>
<th>Affiliation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alperin, A1</td>
<td>Le, H3</td>
</tr>
<tr>
<td>Arzhayev, Wall 9</td>
<td>Leiter, H4</td>
</tr>
<tr>
<td>Ashley, A3</td>
<td>Leslie, I2</td>
</tr>
<tr>
<td>Bachrach, A4</td>
<td>Lutchi, I3</td>
</tr>
<tr>
<td>Byars, C1</td>
<td>Lynch, I4</td>
</tr>
<tr>
<td>Dvorak, D1</td>
<td>Makarova, J1</td>
</tr>
<tr>
<td>Escobedo, D3</td>
<td>Mattson, J5</td>
</tr>
<tr>
<td>Everitt, Keynote</td>
<td>Maurer, K1</td>
</tr>
<tr>
<td>Falkenstine, D4</td>
<td>Mingus, L1</td>
</tr>
<tr>
<td>Gau, E2</td>
<td>Monoglu, L2</td>
</tr>
<tr>
<td>Giammanco, Theater</td>
<td>Murrow, L3</td>
</tr>
<tr>
<td>Hamilton, Keynote</td>
<td>Pierce, M3</td>
</tr>
<tr>
<td>Harris, F2</td>
<td>Shanken, O2</td>
</tr>
<tr>
<td>Hickert, F3</td>
<td>Sullivan, P2</td>
</tr>
<tr>
<td>Khatter, G1</td>
<td>Wallace, O1</td>
</tr>
<tr>
<td>Kitchell, G3</td>
<td>Warren, Wall 1</td>
</tr>
<tr>
<td>Land, H1</td>
<td>Wheeler, Wall 5</td>
</tr>
<tr>
<td>Lassar, H2</td>
<td>Wideman, Wall 6</td>
</tr>
</tbody>
</table>

### Other Student Research

<table>
<thead>
<tr>
<th>Name</th>
<th>Affiliation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Erhard, D2</td>
<td>MacNaughton, I5</td>
</tr>
<tr>
<td>Gupta, E5</td>
<td>Smith, O3</td>
</tr>
</tbody>
</table>
INDEX BY PRESENTATION AFFILIATION

Center for Community Engagement & Service Learning

Anwar, A2
Baum, B1
Brooks, B4
Edinger, Wall 8
Hudson, C4
Mastaw, J4
Mendenhall, K4
Miller, K5
Parker, L5
Rezaie, M4
Sandoval, N3
Wells, Wall 3
Yebuah, J3

Summer Research

Boyd, B2
Brenner, B3
Byars, C1
Douglas, C5
Everitt, Keynote
Feuerbach, D5
Gallegos, E1
Ha, F1
Hamilton, Keynote
Johnston, F5
Kim, G2
Krebs, G5
Leslie, I1
Mattson, J5
Maurer, K1
Mingus, L1
Pennington, M1
Pierce, M3
Robrock, M5
Smits, O4
Thompson, P4
Wallace, O1

Travel Fund

Everitt, Keynote
Krebs, G4
# Index by Presentation Affiliation

## Honors Thesis

<table>
<thead>
<tr>
<th>Byars, C1</th>
<th>Mattson, J5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crane, C3</td>
<td>McNally, K3</td>
</tr>
<tr>
<td>Dvorak, D1</td>
<td>Nesbitt, Wall 4</td>
</tr>
<tr>
<td>Escobedo, D3</td>
<td>Olguin, L4</td>
</tr>
<tr>
<td>Gallegos, E1</td>
<td>Petko, M2</td>
</tr>
<tr>
<td>Gunther, E4</td>
<td>Roth, N1</td>
</tr>
<tr>
<td>Ha, F1</td>
<td>Savage, N4</td>
</tr>
<tr>
<td>Hickert, F3</td>
<td>Schackmuth, N5</td>
</tr>
<tr>
<td>Kitchell, G3</td>
<td>Sullivan, P1</td>
</tr>
<tr>
<td>Land, H1</td>
<td>Tarler, P3</td>
</tr>
<tr>
<td>Lutchi, I3</td>
<td>Warren, Wall 1</td>
</tr>
<tr>
<td>Lynch, I4</td>
<td>Wheeler, Wall 5</td>
</tr>
</tbody>
</table>

## Capstone/Thesis

<table>
<thead>
<tr>
<th>Boyd, B2</th>
<th>McFadden, Wall 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clement, C2</td>
<td>Stanland, O5</td>
</tr>
<tr>
<td>Gaunavinaka, E3</td>
<td>Tran, P5</td>
</tr>
<tr>
<td>Hodsdon, F4</td>
<td>Wallace, O1</td>
</tr>
<tr>
<td>Lewis, H5</td>
<td>Wilson, Wall 7</td>
</tr>
<tr>
<td>Martindale-George, J2</td>
<td>Zimmerman, N2</td>
</tr>
<tr>
<td>McCormack, K2</td>
<td></td>
</tr>
</tbody>
</table>
To learn more about our programs, please visit:

The Undergraduate Research Center
http://www.du.edu/urc/

The Center for Community Engagement and Service Learning
http://www.du.edu/ccesl/

A Very Special Thank You To:

Jaclyn Abeloe
Brad Benz
Francisco Chacon
Cara DiEnno
Sarah Hart Micke
Sarah Hoffman
Iman Jodeh
Heather Martin
Chelsea Montes de Oca
Lauren Salvador
The Writing Center