University of Colorado Denver

19th Annual

Research and Creative Activities Symposium

Friday April 29, 2016
Student Commons Building

WELCOME TO THE 19th Annual
RESEARCH and CREATIVE ACTIVITIES SYMPOSIUM

BIGGER, **faster**… and a bit more **RAUCOUS**!

Symposium Schedule

9:00 – 10:00 Check-in, Set-up, Support Lynx Desk, Student Commons Building (SC)

Registration is not necessary this year; support staff will be available to answer questions.

10:00 – 12:00 Poster Sessions 1 & 3: Students assigned odd-numbers will be available to present and discuss posters and exhibits showcasing their scholarly activities.

Session 1: Presentations 1001-1055, Student Commons 1st floor hallways

Session 3: Presentations 2001-2101, 2nd floor hallways, **SC 2500**

10:00 – 11:00 Session III: Papers in Philosophy **SC 1401**

Students will deliver timed oral presentations showcasing their scholarly activities as part of each Session I-XI.

10:00 – 11:00 Session VI: Cultural Foundations of Industrial Change in America **SC 1500**

10:30 – 11:30 Session IX: Papers in the Basic Life Sciences **SC 1600**

11:00 – 11:45 Session I: Papers in Education **SC 1300**

11:00 – 1:00 Lunch **SC 2600**

11:15 – 12:15 Session IV: Papers in Social Sciences and Humanities **SC 1401**

11:15 – 12:15 Session VII: Identity and Community Life in Colorado History **SC 1500**

12:00 – 1:30 Session II: Health and Education Disparities **SC 1300**

12:00 – 1:00 Session X: Papers in Basic Life Sciences **SC 1600**

12:15 – 2:15 Poster Sessions 2 & 4: Students assigned even-numbers will be available to present and discuss posters and exhibits showcasing their scholarly activities.

Session 2: Presentations 1002-1054, Student Commons 1st floor hallways

Session 4: Presentations 2002-2100, 2nd floor hallways, SC 2500

12:30 – 1:45 Session VIII: Papers in Social Sciences, Humanities, and Public Affairs **SC 1500**

1:00 – 2:15 Session V: Foucault: Punitive Society and Psychiatric Power **SC 1401**

1:15 – 2:15 Session XI: Papers in Ecology and the Environment **SC 1600**

2:30 – 3:30 Convened Session **SC 2600**

Welcome Vice Chancellor Richard J. Traystman, Office of Research
Comments Provost Rod Nairn, Office of the Provost
LYNx Talk Why Investing in Undergraduate Research Opportunities Pays Off: the Tanzania field school experiences
Dr. Charles Musiba, Anthropology, with Alex Pelissero, Lucyna Bowland, Rachel McPherson, and Sewasew Assefa
Awards Associate Vice Chancellor Jeff Franklin, Office of Undergraduate Experiences; Dr. Jordan Hill, CLAS Interdisciplinary Council

3:30 – 5:30 Wonder Women of STEM **SC 2500**

Panel of STEM professionals each describing her career path and experiences that have helped them to succeed in their careers. Sponsored by CU Denver WiSTEM student organization.

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University of Colorado Denver

Office of Undergraduate Experiences
Lawrence Street Center, Suite 1400

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Welcome to the 19th annual Research & Creative Activities Symposium or RaCAS — a truly multidisciplinary event that honors undergraduate and graduate student scholarly activities of all types from all disciplines. With representation from the School of Education and Human Development and College of Arts and Media through the School of Nursing and the Colorado School of Public Health, this year's symposium continues to expand participation from schools and colleges at CU Denver and CU AMC, ultimately celebrating all student research, creative, and other scholarly activities at the University of Colorado.

Today, RaCAS will showcase the scholarly activities of nearly 300 undergraduate and graduate students delivering over 180 presentations in an increasingly professionally-relevant setting. This year, students will be communicating their scholarly activities through readings, puppetry, design, oral presentations, dance, posters, moderated discussions, film, and other exhibits. RaCAS provides students who present with an opportunity to "taste" what it's like to be a professional in the discipline, while providing other students with an opportunity to become inspired, connect with a mentor, start toward presenting at next year's symposium.

As before, we will recognize outstanding presentations, with attendees able to cast votes for these "people's choice" awards based on a number of widely applicable criteria. Perhaps more importantly, this will provide an opportunity to provide presenters with constructive feedback. Votes may be cast by cell phone or tablet, with voting stations also located at the Lynx Desk.

RaCAS depends this year, as in previous years, on the support of Dr. Richard J. Traystman, Distinguished University Professor and Vice Chancellor for Research. We also thank Provost Roderick Nairn, whose support has been unwavering, and the staff in the Experiential Learning Center, especially its Assistant Director Lesley Bishop — they have been instrumental in making RaCAS happen. Finally, we thank the faculty who mentor our students in these High-Impact Practices (or HIPs), experiences through which student learning is accelerated by engaging with real-world problems and opportunities. RaCAS truly celebrates *Learning with Purpose*, the CU Denver way. Together we are working to make RaCAS one of the most exciting annual events on the University calendar.

Let's spend today learning, critiquing, admiring, questioning, and marveling at the work that our students, and the faculty members who mentor them, have accomplished. RaCAS shows us what is possible, what the future promises, and what the fruits of university learning look like at their best.

Dr. Leo P. Bruederle
Director of Undergraduate Research and Creative Activities

Dr. Jeff Franklin
Associate Vice Chancellor for Undergraduate Experiences

Gravimetric Analysis of Particulate Matter in Diesel Exhaust

Riley Abel, Mechanical Engineering,
DC - College of Engineering and Applied Science

Mentor: Dr. Matthew Thornton,
DC - College of Engineering and Applied Science

The diesel engine auto-cycle is a physically and chemically complex combustion process in which noxious gases and by-products are produced and emitted. In order to reduce the levels of particulate matter (PM) and oxides of nitrogen (NOx) from the combustion process, emissions control components are installed on diesel engines to trap and oxidize PM and chemically reduce NOx. These exhaust after treatment components provide a systematic approach to reducing the amount of pollutants released into the atmosphere, decreasing the contribution to ozone formation, improving air quality and decreasing health impacts. Our research has been on the durability and in-use performance of diesel particle filters (DPFs) in medium and heavy-duty applications. For this research program we have performed evaluations of the DPF component independently of the other emission reduction systems, looking at the degradation of its function after a series of controlled progressive failures. This was done in order to simulate real-world damage which could result from improper control, neglected maintenance, product defects or a result of tampering. The primary test method has focused on PM measurements of exhaust sampled by an AVL Micro Soot Sensor (MSS) and comparing these results with gravimetric PM measurements taken at the same time over the Federal Test Procedure (FTP).

Cortical Physiology as a Therapeutic Target in Parkinson Disease-Related Dementia and Cognitive Dysfunction

Shanae Aerts, Psychology,
DC - College of Liberal Arts and Sciences

Mentor: Dr. Benzi Kluger,
AMC - School of Medicine

Parkinson Disease (PD) is the second-most common neurodegenerative disease. PD associated dementia is the leading cause of nursing home placement in the disease. Current treatments for dementia and mild cognitive impairment have minimal effects on symptoms or progression. Repetitive transcranial magnetic stimulation (rTMS), a non-invasive method of cortical stimulation, has been shown to improve cognitive function in healthy older adults. The aim of this study is to determine if rTMS willinduce changes in cognitive function in persons with both PD and mild cognitive impairment and if these improvements can be measured through neuropsychological testing. Forty-two subjects (32 male), with Montreal Cognitive Assessment baseline score of 24.57 ± 0.57, were randomized (21 to real rTMS vs. 22 to sham (placebo) rTMS). They underwent neuropsychological testing and magnetoencephalography (MEG) recording, both before and after treatment. Preliminary analysis suggests that rTMS does affect network connectivity in brain areas related to cognition but does not improve cognitive function. Statistical analysis is currently being finalized to compare baseline with post-rTMS time points as well as comparing sham rTMS to real rTMS. This study will help determine if rTMS is an efficacious treatment for cognitive impairment in PD and improve knowledge of the neurobiological mechanisms of PD-related cognitive dysfunction.

Seeking Patterns in Natural Medicine Analogs: Merging Chemical Education and Computational Chemistry

Addilynn Beach, Psychology,
DC - College of Liberal Arts and Sciences

Emily Milner, Chemistry,
DC - College of Liberal Arts and Sciences

Sarah Williams,
DC - College of Liberal Arts and Sciences

Mentor: Dr. Karen Knaus,
DC - College of Liberal Arts and Sciences

In this poster, we share the unique process our team is using to understand structural variation in a natural medicine compound. We use a combination of chemical intuition, computational calculational methods and statistical tools to look carefully for emerging patterns in the data that reflect relationships between structure and bioactivities of compounds. If you are interested in the chemistry of natural medicine, computational chemistry and are curious to learn more, please join us for an interactive poster discussion.

Head Array Sensor System (HASS)

Kailey Beck, Bioengineering,
DC - College of Engineering and Applied Science

Moana Sato, Bioengineering,
DC - College of Engineering and Applied Science

Robert Wood, Bioengineering,
DC - College of Engineering and Applied Science

Cameron Mattson, Bioengineering,
DC - College of Engineering and Applied Science

Alexander Ho, Bioengineering,
DC – College of Engineering and Applied Science

Dominic Isaacs, Bioengineering,
DC – College of Engineering and Applied Science

Alexander Kayyali, Bioengineering,
DC – College of Engineering and Applied Science

Mentor: Mr. Craig Lanning,
DC - College of Engineering and Applied Science

For those confined to wheelchairs operated with a head array drive mechanism, it is vital to have a method to provide notification when the array is out of alignment and close to becoming inoperable. This prototype, designed to work on the STEALTH system head array, incorporates a series of Inertial Measurement Unit (IMU) sensors to track relative position and provide notification of misalignment. An embedded controller analyzes incoming IMU data and uses color codinwg to indicate the deviation of the current position from the chosen “home position”. A green light will indicate that the array arm is in proper alignment. A yellow light will indicate slight misalignment. A red light will indicate major misalignment and loss of control. Directions are then provided via an LCD screen on the back of the chair for how to put the indicated array arm back into place. When the array is inoperable but the sensors do not signal a misalignment, the caretaker will know that the adjustments must be made with the user’s position or the recline of the chair. This prototype will help avoid the time consuming guesswork associated with readjusting head array positions. It will simplify the daily task of head array fitting for caretakers by taking one of the most challenging - and frustrating - parts of their day and making it easier.

Product Labeling and Geographic Origins of Colorado Honeys

Ashley Bouck, Environmental Studies,
DC - College of Liberal Arts and Sciences

Mentor: Dr. Christy Briles,
DC - College of Liberal Arts and Sciences

Honey characterization is based on the determination of its chemical, physical and/or biological properties, including the pollen it contains. The field of melissopalynology, or the study of pollen in honey, is used in the quality control of honey through an analysis of the abundance and concentration of individual pollen types found in it. Honey's floral source and the processing methods used by beekeepers determine the price of and demand for a particular honey. Honeys that are raw and unfiltered with a specified floral source are more expensive than those that have undergone filtration and have no specified source. Clover, wildflower, and alfalfa are the primary honey varieties produced in Colorado, with clover honey bringing the highest price ($2.25/lb wholesale). I analyzed fifteen samples of raw and unfiltered Colorado honeys in order to determine and characterize floral sources, the general location of where the pollen was sourced, and whether the samples were indeed raw and unfiltered. The results of the research suggest that five of the fifteen samples had below average pollen concentrations, three were mislabeled with regard to dominant floral source, and five samples had pollen from outside Colorado (e.g.,. Mexico). Three of the suspect samples were from the same company. In all, eight out of the fifteen honey samples examined were determined to be different than what they claimed on their label. The results highlight the need for more stringent labeling protocols for Colorado honeys, and better regulations to protect abiding honey companies in Colorado and for consumer health.

Synthesis of an Injectable Biomaterial for Bone Regeneration

Ryan Brody, Bioengineering,
DC - College of Engineering and Applied Science

Mentor: Dr. Daewon Park,
DC - College of Engineering and Applied Science

Over 4 million procedures involving bone grafts are performed annually around the world, and many of these treatments display delayed healing or non-union. Additionally, the bone graft implantation procedure is highly invasive and is accompanied by an increased risk for many post-operative complications. The focus of this project is to synthesize a novel injectable biomaterial that stimulates bone regeneration, in order to effectively treat bone defects in a minimally invasive manner. The bone-regenerating properties of this material are drawn from the use of hydroxyapatite, the main mineral component of bone and a commonly used synthetic bone graft material. Hydroxyapatite nanoparticles are then chemically conjugated to polymeric biomaterials to improve biocompatibility and to develop reverse thermal gel (RTG) characteristics, so that the material is a liquid a room temperature and becomes a solid gel at elevated temperatures such as body temperature.

Developmental Tasks Fostered Through Parental Values

Chelsey Brown, Psychology,
DC - College of Liberal Arts and Sciences

Mentor: Dr. Angele Fauchier,
AMC - School of Medicine

My study will explore the influence of parental values and child functioning at developmental psychopathology tasks on adult functioning. We will analyze childhood competence in the developmental psychopathology tasks and adult functioning in the realms of these developmental tasks, and see how they correlate to how these adults' parents emphasized and helped foster those specific skills during their childhood. Childhood experiences will include to what extent their parents fostered different developmental psychopathology tasks such as emotional regulation, peer relationships, extra-curricular activities, obedience, and academic achievement, as well as how successful respondents believe themselves to have been at each of those tasks. We examined the childhood experiences (focusing on age 10) of 3950 undergraduates from 8 universities around the United States. Survey data were collected from these participants using the International Parenting Study Questionnaire that asked about their childhood experiences, current functioning, and attitudes. These developmental tasks are essential to child development and based on the data we receive from these young adults, we will gain a deeper insight into how influential parental values upon certain tasks during childhood can be on an adult's functioning at those tasks.

The Future As Seen From the Present

Kara Brown, Fine Arts, Sculpture,
DC - College of Arts and Media

Mentor: Maria Buszek,
DC – College of Arts and Media

The summer of 2015 marked the occurrence of the 56th Biennale de Venezia held in Venice, Italy. This event is one of the most prestigious and widely recognized of the art world do to its international scope. Today it is difficult to distinguish common themes that unite artists in the way that cubism or fauvism did during the twentieth century. My research focuses on determining whether there are themes that have recently begun to develop as a response to the current global state of affairs. In order to do this, I used funding from the UROP grant to attend the Biennale de Venezia for one week in June of 2015. I took extensive notes and documentation of my findings which are presented as part of a media exhibition alongside sculptures and art inspired by work I saw at the Biennale. Since the scope of my project covers artistic subject matter, the research I conducted has informed a formal line of inquiry as well as inspired my own artistic practice. Ultimately I have found that the two are more closely linked than they initially appear.

Breaking Down Metric Confines in Songwriting

Autumn Buysse, Music, Singer/Songwriter,
DC - College of Arts and Media

Mentor: Mr. Owen Kortz,
DC - College of Arts and Media

In a world enveloped by the simple and compound time signatures of 4/4 and 6/8, many singer-songwriter majors at the University of Colorado Denver are challenging these metric confines. I will exhibit some songs I have written over the last two semesters that push these boundaries. This study steps into the murkier waters of less common time signatures to demonstrate how odd techniques do not always end up sounding strange at all. It then delves into the music theory responsible for this effect. This investigation seeks to show how rhythmic ingenuity can engender more innovation overall in the songwriting process, as opposed to common time signatures with classic backbeats.

Vita Inclinata Technologies LLC.

Caleb Carr, Psychology/Political Science,
DC - College of Liberal Arts and Sciences

Dominick Kuljis, Chemistry,
DC - College of Liberal Arts and Sciences

Sami Dean, Physics,
DC - College of Engineering and Applied Science

Viddya Karunagaran, Computer Science,
DC - College of Engineering and Applied Science

Carl Mirita, Chemistry,
DC - College of Liberal Arts and Sciences

Mentor: Dr. Randall Tagg,
DC - College of Liberal Arts and Sciences

Vita Inclinata's technology consists of a novel control system, correcting for unwanted movement caused by the environment or by operators, integrated with a robust, precise hoisting system. While innovative, it is completely feasible; a network of sensors on both the bottom of the rope as well as the helicopter provide data regarding sway and movement perturbations, which are read several times per second by a microcontroller to minimize motion. This type of technology provides a solution that addresses a dire need of rescue helicopter personnel on a daily basis. Our technology will be able to ensure that rescuers are safe, effective, and can treat a patient with the most care possible by minimizing the chaotic swinging of the cable during rescue extractions.

Cultural Diversity in the Classroom

Elisse Chase, Mathematics Education,
DC - College of Liberal Arts and Sciences

Mentor: Dr. Amy Boele,
DC - School of Educationand Human Development

Research has shown that Students of Color in urban contexts receive starkly different educational opportunities, as compared to their White peers. This led me to question where discrepancies in the treatment of students of could stem from, and why race appeared to be an underlying factor. I also began to question what kind of impact the preferential treatment was having on the White students in comparison to the kind of impact that the disengaged pedagogy was having on the Latino students. After observing multiple classrooms and interviewing teachers and students, I compiled my data sources to analyze teacher response to race in the urban classroom. I found that one teacher used instructional activities that required more preparation for her predominately White class than the activities for her predominately Latino class. Additionally, the same kinds of student disengagement behaviors were differently attributed across the two classes, with disparate expectations. When students in the predominately Latino class received a lesson with well-prepared instructional activities, access to high-level ideas, and content with cultural relevance, they were much more engaged. I concluded that urban schools in America cater to the ideology of normal by overlooking how some teachers favor White students over Latino students, and that this favoring is a symptom of ignorance on behalf of White teachers not understanding the needs of Students of Color. In my analysis, I decipher why this occurs and how to end preferential treatment in the classroom.

VIRTUENOMICS: Aristotle's Liberality and the Creation of a Sustainable Economic System

Joseph Chase, Philosophy,
DC - College of Liberal Arts and Sciences

Mentor: Dr. Candice Shelby,
DC - College of Liberal Arts and Sciences

By examining Aristotle's doctrine of the mean as it applies to the virtue of liberality and his ideas regarding distributive and rectificatory justice, we can develop an economic framework that is virtuous, profitable, and sustainable. These concepts of justice and liberality converge with one another around the idea of proportional exchange: a just and virtuous exchange of resources will never be simply equal or one-for-one; what makes an exchange just and virtuous is the purpose and proportion of resources given (and how they were acquired by the giver in the first place) and received (if one takes too much or from the wrong sources, the exchange cannot be virtuous). When exchanges are not proportional, applying the principles of justice can elucidate who must compensated and in what amount to restore a virtuous balance. The creation of money as a means of exchange between disparate resources allows for this virtuous paradigm to function, but if the currency becomes an end unto itself rather than a means toward a higher purpose, the economy will cease to function within the framework of justice and virtue and will become exploitative and unsustainable. Applying a synthesis of these ideas--liberality, justice, and means of exchange-- to individuals, organizations, and States allows us to envision a system that provides sustainable access to resources and opportunity for all levels of society.

Ethnography of Novel Drugs of Abuse

Christopher Chow, Biology/Chemistry, DC – College of Liberal Arts and Sciences

Alex Yale, Medicine,
AMC - School of Medicine

Elsa Alaswad,
DC - College of Liberal Arts and Sciences

Mentor: Dr. Andrew Monte,
AMC - School of Medicine

With the recent legalization of marijuana, the topic of recreational use of mind altering substances has seen renewed interest in the mainstream. In addition to rising marijuana use, novel substances of abuse like synthetic cannabinoids, nontraditional opiates, cathinones and other synthetics have burst onto the scene with alarming results. Our research group has attempted to characterize users of these novel synthetic drugs of abuse through an ethnographic study at the music festival venue. We have attempted to interview self-reported users of these substances and we haveobtained urine screenings to evaluate if the drugs taken match the description provided.

Pharmacotherapeutic Potential of Disrupting Neuromodulation of Hyper-dopaminergic Neural Activity in the Co-morbid Expression of Schizophrenia and Drug Addiction

Taylor Coomer, Biology,
DC - College of Liberal Arts and Sciences

Jacqueline Gallegos, Psychology,
DC - College of Liberal Arts and Sciences

Noah Rauscher, Psychology,
DC - College of Liberal Arts and Sciences

Patricia Ello, Biology,
DC - College of Liberal Arts and Sciences

Karl Sanders, Biology,
DC – College of Liberal Arts and Sciences

Othercollaborators: Dr. Raibatak Das, Dr. Erik Oleson,
DC – College of Liberal Arts and Sciences

Mentor: Dr. Erik Oleson,
DC - College of Liberal Arts and Sciences

Schizophrenia is a debilitating psychopathology that is exacerbated by patients showing a predilection for addictive behavior. The high co-morbidity between schizophrenia and drug addiction theoretically arises from a hyperdopaminergic state in schizophrenia, pre-sensitizing the neural mechanisms that invigorate drug seeking. Our research attempts to establish the causality of DA in eliciting a pro-psychotic response in a conditioned avoidance task, which is a classical screen with high predictive validity for determining the efficacy of anti-psychotic drugs. We then attempt to counteract that response pharmacologically. Historically, both typical and atypical antipsychotics target the dopamine D2 receptor, but a number of issues exist with these pharmacotherapies that result in poor compliance. We propose an alternative method of treatment that targets upstream modulators of DAergic neurons in the mesocorticolimbic pathway that will potentially ameliorate both the schizophrenic symptoms and drug-seeking behavior. To achieve this, our group artificially induces a hyperdopaminergic state in transgenic rats by utilizing Gq-coupled DREADD virus technology. We then systemically administer antagonists of the cannabinoid CB1 receptor and orexin OX1 receptor, which we have previouslydemonstrated to modulate DA neural activity. Preliminary results show a DREADD-induced hyper-dopaminergic state elicits a pro-psychotic response in a classic pharmacological screen, as well as increases locomotor activity and motivation for cocaine; whereas, an anti-psychotic response and reduced motivation for cocaine is observed when either the CB1 or OX1 antagonist drug is administered. These results show promise for targeting upstream modulators of DA function in the treatment of co-morbid diagnoses of schizophrenia and drug addiction.

AKT Inhibition Promotes the Genomic Instability of Activated B Cells

Stephanie Cung, Biology,
DC - College of Liberal Arts and Sciences

Mentor: Dr. Jing H. Wang,
AMC - School of Medicine

Incorrect juxtaposition of pieces of chromosomes leads to chromosomal translocation. Leukemia and lymphoma are often associated with cancer type-specific chromosomal translocations. These can be caused by increased DNA double stranded breaks (DSBs) at immunoglobulin (Ig) or non-Ig loci in B cells, whose main function is to produce antibody. In particular, DSBs at Igh locus, which is the gene encoding the heavy chain of antibodies, are an essential intermediate during class switch recombination (CSR), a process for generating different isotypes of antibodies. We previously showed that inhibition of phosphoinositide 3-kinase (PI3K) enhanced the level of CSR. In this project, we investigated whether inhibiting AKT, an effector kinase acting downstream of PI3K, would affect the level of CSR-related chromosomal breaks or translocations. To do so, we isolated splenic B cells and activated them in vitro for 4 days in the presence or absence of AKT inhibitors. Metaphase spreads were prepared from the activated B cells and subjected to fluorescence in situ hybridization (FISH) with DNA probes specific for Igh locus to detect chromosomal breaks or translocations. Our results show that AKT inhibition does increase the percentage of Igh locus chromosomal breaks and translocations. Additionally, AKT inhibition further promoted the level of Igh locus chromosomal abnormalities in the absence of Ligase 4 and Ataxia Telangiectasia Mutated proteins, both of which are important to the DNA repair pathway. Our findings reveal a critical role of PI3K/AKT pathway in regulating genomic instability of B cells and have important implications in treatment of B cell lymphomas.

The Impact of Nutrient Pollution on Ammonia-Oxidizing Microbial Communities Residing in Freshwater Ecosystems

Nicklaus Deevers, Biology, DC - College of Liberal Arts and Sciences

Andrew Boddicker, Biology, DC - College of Liberal Arts and Sciences

Colin Beacom, DC - College of Liberal Arts and Sciences

Mentor: Dr. Annika C. Moiser, DC - College of Liberal Arts and Sciences

Microbial nitrification (the oxidation of ammonia into nitrite and nitrate) is thought to be a critical, rate-limiting step in the removal of nitrogen pollution from freshwater systems. Here, we enriched ammonia-oxidizing bacteria (AOB, which oxidize ammonia to nitrite) and nitrite-oxidizing bacteria (NOB, which oxidize nitrite to nitrate) in cultures derived from freshwater streams in the Denver metropolitan area. Functional gene PCR and Illumina MiSeq sequence analyses showed that cultures contain NOB belonging to the Nitrobacter genus and AOB belonging to the betaproteobacteria phylum. Nitrite production and consumption in the enrichment cultures have been monitored for more than one year. We investigated the impact of nutrient pollution on the growth and survival of freshwater AOB and NOB by exposing the enrichment cultures to elevated nitrite environments (up to 100mM nitrite). Growth was monitored by measuring changes in nitrite and nitrate concentrations. Understanding the physiology of these organisms will shed light onto how well these organisms may adapt to changing concentrations of nitrite that could be observed in the case of nutrient pollution, and how these changes affect the global nitrogen cycle in freshwater ecosystems. This research will help to preserve the resources these freshwater ecosystems provide for the Denver metropolitan area.

Protein-membrane Binding: Detection Using Single Molecule TIRF Microscopy

Marissa DeLima, Biology,
DC - College of Liberal Arts and Sciences

Mentor: Dr. Jefferson Knight,
DC - College of Liberal Arts and Sciences

This exhibit demonstrates biomolecular interactions such as the cumulative effect of multivalent attractions on interfacial protein-membrane binding. We have shown the stoichiometry of peripheral protein-membrane interactions can be measured based on single-molecule diffusion using supported lipid bilayers. Here we apply this technique to granuphilin, a synaptotagmin-like protein containing tandem membrane-targeting C2 domains, C2A and C2B. Granuphilin C2A binds simple lipid membranes containing anionic lipids such as phosphatidylserine (PS), but C2B affinity for PS is undetectable using standard approaches. Here, we set out to determine the PS affinity of C2B based on a comparison of the diffusion rates of the C2A domain and the C2AB tandem on supported lipid bilayers. Total internal reflection florescence (TIRF) microscopy with single particle tracking was used to identify diffusion constants of each individual or tandem C2 domain. Granuphilin C2A displays a lateral diffusion constant comparable to other C2 domains. However, the diffusion of the granuphilin C2AB tandem on the same membrane appears to be slower; suggesting substantial PS contacts for the C2B domain within the C2AB tandem. This effect represents a weak but potentially physiologically relevant interaction that influences the membrane-bound state of this strong membrane binding protein. This research shows an exciting new approach to looking at protein-membrane interactions using single molecule techniques.

How to Improve Pubovaginal Sling Outcomes: Comparison of Two Techniques for Sling Tensioning in 177 patients

Tyler Doumaney, Biology,
DC - College of Liberal Arts and Sciences

Tamara Lhungay, Medicine,
AMC - School of Medicine

Mentor: Dr. Michael Maccini,
AMC - School of Medicine

Autologous pubovaginal slings (PVS) are the gold standard of treatment for urinary incontinence. Recently, patient complications, such as postoperative retention, have sparked renewed interest in the safety and efficacy of this method. Our objective was to determine if standardization of the tensioning technique improved outcomes and reoperation rates. To assess this we retrospectively analyzed 177 patients, of which 168 had sufficient data for analysis, and separated them into two groups dependent on tensioning technique. Group 1 consisted of patients who were operated on between 2006 and 2013 with no standardized method of sling tensioning. Group 2 consisted of patients who were operated on between 2013-2016 using a standardized method. We obtained and analyzed information on preoperative variables and postoperative outcomes (e.g. continence, retention, reoperation, etc.) Our results showed that the standardized tensioning group (group 2) had a decreased risk of post-op retention and reoperation (odds ratio = 0.41 and 0.22, respectively.) From this, our data suggests that standardizing tensioning technique for autologous PVS placement reduces the risk of postoperative retention and reoperation. We suggest further exploration into the implementation of a standardized tensioning technique to improve patient outcomes.

Doodling in the Classroom

Hannah Dreier, Elementary Education,
DC - School of Education and Human Development

Mentor: Ms. Kobi Nelson,
DC - School of Education and Human Development

Over the course of my first semester, something that seemed to continually pop up in the observations that I made in the classroom I was assigned to, was student doodling. It was very prominent in several students, and I was curious as to how this affected their work. I focused on 3 particular students and decided that there were 3 types of "doodlers". The first type of doodler was a focused doodler. One student often used doodling as a way to channel his attention in the classroom and in the lesson. I was curious to see what would happen if I encouraged his doodling. I made him a notebook for drawing specifically and allowed him to use it during particular times of the day. During the times he was allowed the notebook, he was noticeably more engaged in the discussion and was less likely to act out and cause other students to become off task. The second type of doodler was the "nonchalant doodler". This was the doodler that doodled when he was done with work, when he was listening to a lecture and didn't really realize he was doodling, or would just go above and beyond when asked to draw pictures or diagrams. The last type of doodler was the "off-task doodler". This student often drew pictures instead of completing work, used drawing as a distraction during lessons, and often got himself and other students off task with his doodling. My overall conclusion was that for some students, doodling can be a very effective tool in the classroom, and for others, it's better left in art class.

Body Temperature Monitoring for Multiple Sclerosis Patients

Jessica Durr, Bioengineering,
DC - College of Engineering and Applied Science

Julianne Hirt, Bioengineering,
DC - College of Engineering and Applied Science

Mentor: Dr. Craig Lanning,
DC - College of Engineering and Applied Science

Multiple Sclerosis affects 2.5 million people around the world by destroying their nervous system. It does this by destroying the myelin sheath that surrounds the axon of a neuron. When this portion of a neuron is weakened, the ability of the neurons to conduct and transmit electrical signals is impeded. One of the symptoms that can occur when this portion of the nervous system is weakened is the inability of a person to regulate their core body temperature. A safe range can vary but it is considered dangerous when the temperature is below 95°F or above 100°F. When this occurs it can cause additional symptoms, mainly spasticity and blurred vision. Our research has shown that there is a need for a way to help MS patients monitor their core body temperature. Our concept consists of a clip that can be attached to hip of the user that will take regular thermal readings to ensure that the person is within a safe range. An LCD screen will display the temperature to the user and, if it leaves a safe range, the clip will notify the user and wirelessly communicate with the thermostat within the user's home to turn on the heating or cooling system. In the future, we would like to expand this product to wirelessly connect with a cell phone that can alert care givers and/or family members if the temperature fails to return to a safe range in a certain amount of time saving the life of the user.

Furniture for Fun

Kaitlyn Elliott, Biology,
DC - College of Liberal Arts and Sciences

Hannah Stobaugh, Elementary Education,
DC - School of Education and Human Development

Adan Ramos, Architecture,
DC - College of Architecture and Planning

Mentor: Ms. Christina Wilson,
DC - Business School

Furniture for Fun is a community outreach project designed to bring furniture made from recycled materials and career education to local, underprivileged elementary schools. The first successful implementation of this project was on November 19th and 20th this year at Ruby Hill Strive Prep Academy. Adan Ramos and team designed and built nine full sized recycled cardboard chairs. Hannah Stobaugh designed and implemented a lesson that exposed first and second graders to the fields of art and architecture over the course of two days. On the first day the kids were taught about construction and built mini chair models from cardboard like architects do before building a building. The second day the big cardboard chairs were brought in and the kids painted them. The students showed retention of new learning when asked the question “what does an architect do?” They provided examples such as skyscrapers, schools, big and small houses, banks, mansions, the cafeteria, the floors and ceilings etc. These answers showed that the students have adopted architects into their future career schemas. We plan to continue this project at Ruby Hill and expand to other schools connected to the Colorado I Have a Dream Program. We are now also considering what other projects the children could participate in to help produce more needed furniture for Ruby Hill while adding to their schemas.

Neuroscience Outreach in Denver

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Mentor: Dr. Erik Oleson,
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As Science, Technology, Engineering and Math (STEM) jobs grow increasingly prevalent in society, it is important to equip students with the skills and resources to succeed in STEM fields. U.S. college students are faltering on STEM assessments in comparison to their European and Asian counterparts creating a need to bolster science education in the United States. Neuroscience specifically is an aspect of science that is often underemphasized in both primary and secondary levels of education. The goal of my research project is to develop a neuroscience outreach program for children in the Denver metro area and increase interest in neuroscience and STEM fields. The program will involve undergraduate-driven interactive stations on the topics of brain anatomy, plasticity, careers in science, two-point discrimination etc. Pre-and post-surveys will be administered to collect information on participant gender and topic interest. The goals of this outreach event include increasing interest and learning in neuroscience and STEM careers, providing undergraduate volunteers with the opportunities to teach and serve in the community, and providing survey data that can elucidate the effectiveness of outreach programs and the effects of gender on STEM and STEM career interest.

Exploring a Novel Model of Sucrose Addiction: Assessment of Behavioral and Neurochemical Changes Produced by distinct Behavioral Histories of Sucrose Access

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Mentor: Dr. Erik Oleson,
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About 2/3 of Americans are either overweight or obese, and this number only seems to be growing. The healthcare costs associated with this epidemic are anywhere between $147 billion-$210 billion. Obesity related deaths are the second leading cause of preventable death with an estimated 300,000 deaths per year (NIH, 2010). Studies have shown that on average, Americans consume about 500-800 more calories per day than needed because of the availability of food, more specifically, carbohydrate rich and sucrose enriched foods (Flegal et al, 2000). Research is needed to understand the neural basis of obesity. To accomplish this, good models of sucrose addiction are needed. Here, we propose to 1) develop and validate a novel model of sucrose addiction, 2) assess whether the reward circuitry in the brain is altered by different histories of sucrose intake in rats. We will monitor changes in water intake, regular chow intake and sucrose intake over 24hr cycles in which rats are given either unlimited, intermittent or no access to sucrose for a month. After this month, we will run a battery of behavioral tests to assess whether rats show an addictive behavioral phenotype, similar to drug addiction models. Finally we will use fast-scan cyclic voltammetry to assess whether dopamine release is altered by these distinct behavioral histories.

100 Hours: Classical Painting as a Reaction to Global Capitalism

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Mentor: Ms. Melissa Furness,
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In this series of paintings, I take the position that time is a contemporary metric for authenticity in art. Throughout the history of human culture, specifically Western culture, the measurement of an artifact's authenticity has shifted. It is my position that these changes in cultural logic are results of the political economy of the time. For the purposes of my research, I focus on three periods corresponding to art history: Modernism, Postmodernism, and contemporary times. During Modernism—the golden age of capitalism—innovation and progress were the values that determined authenticity. This gave rise to the "cult of authenticity." Postmodernism and the age of global capitalism lacked a specific measure of genuineness. This age was marked by pluralism and the abandonment of grand narratives. Recently, however, a new age of authenticity has emerged—one marked by the fetishized appropriation of time laden historical processes and products. I am examining this new authenticity through the act of painting. In my most recent work, I have looked to the past both for my images and methods, employing traditional oil painting practices, such as paint mulling, grisailles painting, and glazes, as well as the imagery of Théodore Géricault for subject matter. With this work, I am attempting to emphasize the extended time that these processes employ and how this strain of contemporary art practice is a reaction to global capitalism.

Evidence of Ant-mediated Seed Dispersal in Colorado Front Range Populations of Lilac Penstemon (Penstemon gracilis Nutt., Plantaginaceae)

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Mentor: Dr. Leo P. Bruederle,
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Mutualistic relationships (mutualisms) are those in which the relationship benefits all species involved. One type of mutualism, myrmecochory, involves the dispersal of seeds by ants. This interaction between species has resulted in the evolution of certain traits that facilitate this relationship to the benefit of both mutualists. With myrmecochory, one such trait is the presence of a structure referred to as an elaiosome, composed of substances (e.g., proteins, fatty acids, lipids) that attract ants to seeds. The seed is brought to the ant nest, the elaiosome consumed, and the seed is discarded either in the tunnels of the nest or just outside. This behavior can aid in the survival of the seedling by reducing potentially negative effects of density-dependent factors such as competition, as well as aiding in avoidance of predation. Studies have shown that among myrmecochorous plants, elaiosome size normally increases with seed size, and influences rate of dispersal. However, the fatty acid oleic acid has been shown to attract ants to disperse seeds at the highest rate and often without a proportional reward. This study investigates the relative size and composition of elaiosome like structures in Lilac Penstemon (Penstemon gracilis) along the Front Range of Colorado. Here, I present preliminary data on relative size and composition of these structures that were collected from Front Range populations of Lilac Penstemon. Further investigation will aid in understanding the development of co-evolutionary relationships between species.

Histopathological Examination of Fathead Minnow Testes and Ovaries

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Harman Kang, Biology,
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Brigitte Nguyen, Public Health,
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Daniel Bor, Biology,
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Mentor: Dr. Alan Vajda,
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Endocrine disrupting compounds (EDCs) from agricultural, industrial, and municipal sources can be found in many surface waters with potential adverse implications for human and ecosystem health. These contaminants are capable of interfering with the regulation of vertebrate reproduction at numerous loci, and can disrupt the development of primary and secondary sexual characteristics. Our lab hypothesizes that watershed-scale land use patterns will correlate with the chemical profile of the water and the molecular/cellular biological effects in exposed organisms. Since 2002, large populations of fish deaths have occurred throughout the Chesapeake Basin, including the Shenandoah River. A high incidence of gonadal intersex among fish has lead to a focus on endocrine disruption as a contributor to the kills. The Shenandoah River watershed is an ideal microcosm for testing our landscape-based hypothesis. However, the exact cause of the fish kills has yet to be determined. To evaluate the endocrine-disrupting potential of agricultural, urban, and forest-dominated landscapes we exposed fish to Shenandoah River water on-site under flow-through conditions for up to 21 days. Gonads were dissected and prepared histologically to be examined for cellular discrepancies and evidence of reproductive disruption. In order to prepare the samples, one gonad from each fish was preserved in 10% neutral-buffered formalin until ready to be processed for histology. Cross-sections of testes and ovaries were examined for the gametogenetic stage, sperm and egg abundance, and histopathological abnormalities. Observations of gonadal histology will be discussed in relation to landscape-scale contaminant exposure.

"A Conversation about the Diabetes Prevention Program" Video

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Mentor: Dr. Lisa Keranen,
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Undergraduate Creative Activity Diabetes is a chronic disease reaching epidemic proportions in the United States, over the past several decades it has exponentially increased. The Diabetes Prevention Program (DPP) is a year-long program and is composed of a nutrition and physical exercise regimen along with recommended lifestyle changes. It is a proven lifestyle change and community-based program to prevent diabetes among participants, especially because, according to the CDC, 1 in 3 Colorado adults has pre-diabetes. Working as part of a service-learning partnership with the Colorado School of Public Health's Center for Public Health Practice and the Families Forward Resource Center, we created a short form digital work to promote the Diabetes Prevention Program and to encourage community members to see if they qualify for the free program. Although DPP is offered to anyone, this video was intended for residents of North Aurora, Montbello, and Green Valley Ranch. We drew from narrative theory and health campaign rhetoric to share the stories of Larry Maynard, a Montbello Librarian, and Kim Farmer, owner of Mile High Fitness to create audience identification. From project conception and proposal through storyboarding and editing, we worked together and in consultation with classmates and peer mentors to create this health promotion.

The MAGL Inhibitor MJN110 Alters Social Behavior and Differentially Impacts mTOR Phosphorylation in Astrocytes and Neurons in the Medial Prefrontal Cortex of Adolescent Rats.

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Other collaborator: Esteban Loetz

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The mammalian target of rapamycin (mTOR) is a protein kinase expressed in neurons and glial cells with an important role in plasticity through regulation of protein synthesis. Activation of mTOR through phosphorylation (p-mTOR) can be mediated by numerous extracellular signals, but the effects of the endocannabinoid system on mTOR phosphorylation are unknown. 2-arachidonoylglycerol (2AG) is one of the primary endocannabinoids present in the brain, and is broken down largely by the enzyme MAGL. The novel compound MJN110 is a potent MAGL inhibitor shown to increase central 2AG levels. Here, two doses (1 and 5 mg/kg) of MJN110 or vehicle were administered systemically to adolescent rats prior to a single social encounter with a novel adolescent rat. The lower dose of MJN110 increased play behaviors, while the higher dose decreased social interaction, including play behaviors. p-mTOR expression was assessed using immunohistochemistry (IHC) in the prelimbic (PL) and infralimbic (IL) regions of the medial prefrontal cortex (mPFC). Cells were identified as neurons or glia based on morphology. In vehicle treated rats, a novel social encounter increased glial p-mTOR expression in PL and IL. The higher dose of MJN110 produced a robust decrease in glial p-mTOR expression, and an increase in neuronal p-mTOR expression. Double-label fluorescent IHC revealed that p-mTOR was expressed in astrocytes but not in microglia. These results suggest that 2AG has opposite and dose-dependent effects on social behavior as well as on mTOR phosphorylation in neurons and astrocytes. In a separate experiment, astroglial p-mTOR expression was greater in the mPFC in adolescent rats than in adults. These results suggest that astroglial mTOR signaling in the mPFC may be involved in adolescent social behavior, and is modulated by the endocannabinoid 2AG.

A Method for Providing Mobility Feedback to Users of Assistive Devices

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Mentor: Mr. Craig Lanning,
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Following a serious injury, individuals often must use assistive walkers to move around and relearn important mobility patterns. The road to recovery can be long and the enthusiasm for physical therapy can quickly wane. This project is a method for encouraging activity through an engaging, game-like feedback system that tracks the movement and position of the walker. The main function of the device uses an accelerometer and gyroscope in tandem to measure movements of the assistive walker across six axes. Contained within a removable, protective housing are the sensors, a dedicated power supply, and a LCD screen used to provide feedback to the user. Additionally, two buttons are attached near the walker handles to mimic a more traditional gaming experience. Additionally, this device creates a platform for continued research and development to provide productive entertainment, reward the use of the walker, and increase the pace of recovery.

A Small Puppet Theater Company for Spanish-Speakers

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The Denver Children's Affairs reported that 39% of the students in Denver public schools are Spanish speakers, including non-English language learners. It has been our experience that in Denver there are very few sources of live educational entertainment available for this demographic group. By taking advantage of the whimsical and theatrical components of puppet theater, we have been determined to bring Spanish speaking families together and stimulate an exciting acquisition of knowledge for Hispanic children (as well as their parents) on crucial aspects of healthy childhood development. With a storyline based on Walt Disney's Alice in Wonderland, we have incorporated information regarding healthy diets, oral hygiene, and immunizations into the adventures of our protagonist Alicia and her friend Andi the Cheshire Cat as they save the inhabitants of the enchanted forest from the evil King Viruso and his bacteria henchmen. Our goal is that after watching these performances, the Hispanic parents and children will have acquired basic fundamental information about these three topics. The parents will then be able to encourage their children to consistently implement this newly acquired knowledge into their lives so that they may be more prepared for the next upcoming stage in their children's physical and mental development.

Human Identification Based on Gait

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It is a common observation that people can be recognized by the way they walk, and there is considerable support for the notion that gait signature is unique for each individual. A unique advantage of gait as a biometric is that it offers potential for identity recognition at a distance, with low resolution, or when other biometrics might not be perceivable. With this in mind, our research focuses on developing various methods for extracting and classifying these gait signatures with the goal of identifying individuals in a passive, non-intrusive way. Toward this end, we utilize the recent availability and affordability of 3D sensors (such as the Microsoft Kinect) to extract skeletal data from human subjects. These skeletal data capture the trajectory of joints in the human body during the gait cycle, enabling us to rigorously analyze and classify movement patterns and features that constitute the gait signature. In particular, we introduce three different methods of gait identification and will compare their performance in terms of accuracy and efficiency. We will also present a live demonstration of these gait identification methods.

Combined QM/MM Dynamics Simulations of Proton Transfer in E. coli CLC Chloride Ion Transport Protein

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The CLC family of transmembrane proteins include both Cl– channels and Cl–/H+ antiporters, which play critical roles in many cellular processes, such as extreme acid response in E. coli and acidification of membranes in humans. The E. coli CLC (EcCLC) antiporter has been extensively characterized; however, it remains a mystery how the proton is shuttled through a largely hydrophobic gap of ~15 Å between the two gating glutamic acid residues. Previous molecular dynamics studies have suggested transient formation of a water wire in this gap which could provide a pathway for proton transport. Here, we aim to elucidate the detailed process of proton transport through EcCLC by performing combined QM/MM dynamics simulations, in which the proton is treated explicitly and the reorganization of the covalent and hydrogen bonds during proton relay is described quantum mechanically. Acknowledgments: This project is supported by the NSF(CHE-09523337 and CHE-1564349), XSEDE (CHE-140070), Camille and Henry Dreyfus Foundation (TH-14-028), and the Undergraduate Research Opportunity Program of the University of Colorado Denver. We thank Prof. E. Tajkhorshid for the geometries from MM simulations.

Treatables Treat Dispenser

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Many of the disabled, particularly quadriplegic patients, do not have the ability to train and solidify the behavior of their service animal or just provide a reward for its help and dedication. Our project allows both the severely disabled confined to a wheelchair and their caretakers to both deliver a treat and also proved positive reinforcement to a service dog or family pet. The dispenser is designed to be attached beneath a wheelchair arm, but may be attached elsewhere if necessary. An ultrasonic range sensor is attached to one side of the head array, or wherever is convenient for the user. A tilt of the head or designated gesture will trigger the sensor and a treat is dispensed to the service animal. The triggering of the sensor is accompanied by a sound to alert the user that the sensor has been triggered. A button on the side of the dispenser allows others besides the disabled person to administer treats. The case holding the treats is easily refillable and made of clear durable plastic so users can easily see when the treat supply is running low. The project has both monetary, practical, and bonding value. Initial training of a service animal with a disabled person is costly, and the forming of a bond between the animal and human is essential but difficult to form if the person is severely hindered in interacting with the animal. This device allows both the quadriplegic to reinforce the training of the service animal, provide additional training, and make the necessary bond with their dedicated companion.

Dopamine Activity in the Nucleus Accumbens and Dorsal Striatum During Running

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Mentor: Dr. Benjamin Greenwood, DC - College of Liberal Arts and Sciences and Dr. Erik Oleson, DC – College of Liberal Arts and Sciences

Despite the clear health benefits of physical activity, the participation in exercise by the general public is in constant decline. Identifying factors contributing to motivation to participate in exercise could have dramatic effects on quality of life. The neurotransmitter dopamine has been shown to play a crucial role in movement, reinforcement, and goal-directed behavior. There is a general assumption that physical activity increases dopamine activity in target brain areas that promote motivation and movement, however the effect of voluntary exercise on dopamine activity has never been fully investigated. The goal of this research project is to analyze dopamine activity in rats during voluntary wheel running using fast-scan cyclic voltammetry which allows assessment of high-frequency dopamine release in discrete brain regions. Dopamine release was measured in real time before, during, and after exercise in the nucleus accumbens and dorsal striatum of rats. Preliminary data indicate that dopamine activity in the nucleus accumbens predicts a change in exercise behavioral state, while dopamine activity in the dorsal striatum increases during exercise. These data represent the first characterization of real-time dopamine activity during exercise, and could provide novel insight into the role of dopamine in guiding behavior.

Creating Safe Spaces: The Street Art and Activism of Swoon

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Mentor: Dr. Maria Elena Buszek,
DC - College of Arts and Media

The object of my research was to uncover the correlation between artmaking and psychological healing. Through my research I have found direct relationships relating to the therapeutic practice of a creative outlet, and the role this outlet plays in self-repair and self-restoration. The act of making can be instrumental in mental health and wellness, and the end product often reflects this. I focus in particular on street artist Caledonia Curry, also known as Swoon, as I have studied the evolution of her practice from printmaking to shelter building. Curry grew up in a family where addiction and mental health issues plagued both of her parents, and members of her extended family. Swoon acknowledges that at an early age she turned to art as a coping mechanism. The process of Swoon's work documents the act of art as catharsis, and her career can be mapped out in a productive and positive form of therapy in regard to the notion of addressing and healing past trauma. I will produce a poster as a visual document to track examples of her work.

The Memory Palace

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Mentor: Ms. Melissa Furness,
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This work is a contemporary artist's rendition of a "cabinet of curiosity". Also known as wonder-rooms and memory palaces, these cabinets were encyclopedic collections of objects that were first popularized in Renaissance Europe, before the formation of natural history museums. They served as mnemonic techniques and miniature memory theaters to be pulled out as entertainment, becoming like the imaginary edifices that allowed the ancient Greeks to carry entire speeches, taxonomies and epics in their heads. We live in an image and text saturated world. We record the inane minutia of our lives with the reverence once reserved for gods. What is worth remembering and how to go about it is no longer a primary concern, as it was before the advent of the printed word or, more dramatically, the internet. We have lost the physicality of memory and the visceral nature of the human experience. Through this work, I look to bring together this tradition of objects as narrative vessels with our understanding of contemporary social media. I am a cartographer; I map my memories by collecting objects and images that resonate with my imagined internal landscape. In my creative work, I am recording my own mythopoeia- the systems of thought and beliefs that have informed my life. I am mining my subconscious and translating it into tangible form through assemblages and installation. I use these personal symbols to access universal ideas about beauty, loss, imagination, power, femininity, decay, nature and fertility.

The Lakewood Gulch: A Waterway in Peril

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Mentor: Mr. Drew Bixby,
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The Lakewood Gulch is an artery that flows in the South Platte River basin. Significantly smaller than the heavily utilized Clear Creek, the Lakewood Gulch bubbles from the water table beneath the base of North Green Mountain, gathers water from other gulches and the run-off from nearby neighborhoods, and flows into the South Platte River. Even though it is a naturally flowing stream, the Lakewood Gulch has been converted into a floodway to prevent property damage to the encroaching housing developments. In addition to pollution from storm drainage, trash from camping and surrounding residences and natural erosion have added to its destruction. This is a journalistic project that, through my field observations, photography, and research, tells the story of a waterway in peril.

Activation of the Nigrostriatal Dopamine Pathway Strengthens Fear Extinction

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Esteban Loetz.
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Mentor: Dr. Benjamin Greenwood,
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Extinction of aversive memories is critical for the treatment of anxiety disorders, but extinction memories are fragile and depend on the context in which they were learned. Novel means to strengthen fear extinction and reduce the return of fear in contexts outside of the extinction context are needed. Prior work suggests that dopamine (DA) can strengthen fear extinction learning, but the specific DA circuits involved are unknown. We used viral-mediated transfer to express a designer receptor exclusively activated by a designer drug (DREADD) into DA neurons of the substantia nigra compacta, a midbrain region containing DA projections to the dorsal striatum, to begin to investigate whether activation of the nigrostriatal DA pathway can facilitate fear extinction and reduce the return of fear. Male wild type or TH-Cre rats received injections of a CRE-recombinase-dependent DREADD bilaterally into the substantia nigra pars compacta. After 3 weeks to allow for viral gene expression, rats were exposed to auditory fear conditioning. The next 2 days, rats received either vehicle or the designer drug CNO (1 mg/kg i.p.) 30 minutes before exposure to auditory fear extinction. The next day rats were placed drug-free into either the familiar extinction context or a novel context and exposed to the auditory stimulus. Results indicate that activation of nigrostriatal DA neurons with DREADD can enhance fear extinction in such a way as to reduce the return of fear in novel contexts. These data suggest that the nigrostriatal DA pathway is a novel target for the augmentation of fear extinction.

Lipid Coated Gold Nanoparticles For Ultra-Sensitive Label Free Quantitation of Protein Adsorption Kinetics

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Mentor: Dr. Scott Reed,
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Synaptotagmin (syt) family proteins are involved in exocytosis, a process in certain cells that allows the release of neurotransmitters and/or hormones such as insulin. Syt proteins are part of the biological machinery that promotes the fusion of secretory vesicles with the cell's membrane, the final step in exocytosis. Here, we investigate the syt7 C2A domain, a part of the syt7 protein that is responsible for docking and inserting into the membrane. In order to study the curvature dependence of its membrane binding, we use three different sized lipid-coated spherical gold nanoparticles (LCAuNP). LCAuNPs allow for ultra-sensitive, label-free detection of protein adsorption. The LCAuNPs were constructed from the ground up through a multistage process. Octahedral gold nanoparticles were synthesized and transformed into spherical gold nanoparticles. The hybrid-membrane was constructed upon the spherical nanoparticles with the addition of synthetic lipid vesicles. Propane thiol adhered the hybrid-membrane to the surface of the nanoparticles and the LCAuNP solution was purified with centrifugation. Syt adsorption studies were accomplished by monitoring small changes in the wavelengths of light that the nanoparticles interact with. The LCAuNPs limit of detection was found to be 9 nM, and the three sizes were able to show size-dependent slow adsorption kinetics that have not previously been observed.

Using CLARITY to Visualize Neuronal Networks in 3D

Olivia Hart,
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Mentor: Dr. Douglas Shepherd,
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CLARITY is a histological technique used to label and image 3D sections of intact brain tissue at high resolution. This is done by replacing the opaque biological scaffolding, lipids, with a chemical matrix, polymerized acrylamide hydrogel mesh. While maintaining the fine structure of macromolecules in tissue (nucleic acids, proteins), the removal of lipids replaced by the hydrogel matrix results in tissue becoming more porous and permeable to antibody labeling. In addition, the removal of opaque lipids improves the transparency of the tissue, which allows us to image larger tissues sections. Typically with confocal or other microscopy techniques, samples are sliced in very thin sections (microns). However, the combination clearing the tissue and using light-sheet microscopy allows us to image tissues at greater depths (z >2mm). With light sheet microscopy, we have the potential to visualize, quantify, and trace networks of cells on a global scale, which provides insight on the intermolecular interactions and cell signaling pathways within tissue. Specifically, the research that I am participating in is looking at the molecular effects of addiction specific to cannabinoids. Using CLARITY and light sheet microscopy, we havequalitatively visualized regional densities of the precursor molecule for dopamine, one of the primary neurotransmitters implicated in the addiction pathway, in a specific area of the brain called the ventral tegmental area (VTA). Our goal is to be able to qualitatively and quantitatively identify changes in the network of dopaminergic neurons in the VTA in response to cannabinoid use using a rat model.

Binding of Granuphilin C2A Domain to Membrane by Molecular Dynamic Simulations

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Mentor: Dr. Hai Lin,
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Granuphilin is a membrane binding protein found in insulin secreting pancreatic ß-cells, where it assists in docking vesicles to the plasma membrane prior to exocytosis.1 Investigating the process by which granuphilin assists in the exocytosis of insulin can lead to the development of therapeutic compounds to aid in insulin secretion for diabetes. Previous studies have shown that the granuphilin C2A domain binds with a micromolar affinity to lipid membranes containing phosphatidylinositol 4,5-bisphosphate (PI(4,5)P2) and to its soluble analog inositol triphosphate (IP3); however, the domain binds much stronger, with a nanomolar affinity, to lipid membranes containing both PI(4,5)P2 and negativity charged lipids such as palmitoyl-oleoyl phosphatidylserine (POPS).2,3 We hypothesize that the increased affinity arises from concerted binding at multiple sites on the granuphilin C2A domain. Through docking calculations of IP3 to the C2A domain, we identify the principle binding site for the PI(4,5)P2 head group on the granuphilin C2A domain. By employing molecular dynamic simulations of the C2A domain in the presence of membrane models, we show that multiple sites on the C2A domain bind concertedly at the surface of the lipid membrane. The results of our computational analysis are in line with the experimental findings. [1] Torii, S. et al. Mol Cell Biol. 2002, 22, 5518–5526. [2] Wan, C. et al. Chem Phys Lipids. 2015, 186, 61-67. [3] Lyakhova, T.A. et al. Chem Phys Lipids. 2014, 182, 29–37.

Student Access to Space

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Other collaborators: Devon DeJohn, Pre-Engineering, Community College of Denver; John Celoria, Computer Science, Metropolitan State University

Mentor: Dr. L. Rafael Sanchez,
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This research focuses on the study of the critical components suitable for sending payloads into space. This project follows strict guidelines that are given by the Colorado Space Grant Consortium and NASA. Through these agencies, our team has been able to design, manufacture and test a prototype sent on a sub-orbital mission carried by a Terrier-Improved Orion rocket. This is an interdisciplinary effort that encompasses students from the institutions at the Auraria Campus. Our payload design was selected after numerous design reviews and a rigorous analysis of feasibility by the agencies above. In our second phase, we aim to design a prototype reaching a higher sub-orbit, carried by a Terrier-Improved Malamute rocket. The purpose of this payload is to test our ability to determine the rockets attitude, track a specific star and by utilizing post process spectral analysis confirm our data, and capture stereoscopic video of the space environment. The benefits of this research are: 1.) Designing and developing key technical information on the constraints due to the harsh environment at launching, orbit, and re-entry; 2.) To study new approaches to guidance and positioning resulting in economical payload alternatives; 3.) To test research at orbital conditions of interest to the medical, pharmaceutical, environmental, and engineering fields; 4). Provide significant worldwide exposure to UCDenver and the Auraria Campus. Specific examples include: 1.) testing how pharmaceutical compounds interact in zero gravity; 2.) analyzing the effects of space on biological compounds 3.) testing the composition of the upper levels of atmosphere.

Investigating the Role of HOXB13 in Prostate Cancer

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Mentor: Dr. William B. Isaacs,
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Prostate cancer (PCa) is one of the most common adult malignancies with nearly one in six men diagnosed in their lifetimes. The androgen receptor (AR) is a ligand-regulated transcription factor that plays a critical role in male reproductive function and development and maintenance of the prostate gland. The AR signaling pathway is linked to progression of PCa. Identifying coregulatory proteins that influence ARsignaling is critical to understand prostate carcinogenesis. Homebox 13 (HOXB13) is able to regulate AR biology by activating or repressing transcription of AR target genes, serving as a critical regulator of the cellular response to androgens. The mechanism by which HOXB13 regulates AR remains unknown. The main goal of this study was to test the following hypotheses: (1) HOXB13 has a specific direct, binding interaction to AR and (2) HOXB13 regulates genes in PCa pathways. The overall objective was to define the role of HOXB13 in normal/malignant prostate biology. Through site-directed mutagenesis and co-immunopreciptation, we observed the HOXB13 sites of interaction for AR are not in the MEIS-interacting domains and homeodomain of HOXB13, but rather might be in the amino terminus outside the MEIS-interacting domains. Through RNA-seq data and qRT-PCR, we observed that HOXB13 significantly up-regulates PAK6, which is involved in MAPK signaling cascades implicated in PCa. Through the Western Blotting, we confirmed HOXB13 expression is maintained in PCa cell line and patient tissue, indicating its significance in PCa biology.

In Vivo Optogenetic Manipulation of Dopamine Neurons in a Novel Behavioral Economics Based Food Task

Dominic Isaacs, Bioengineering,
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Dylan Rakowski, Biology,
DC - College of Liberal Arts and Sciences

Mentor: Dr. Erik Oleson,
DC - College of Liberal Arts and Sciences

Dopamine is a neurotransmitter that is typically associated with rewarding stimuli. Recent data suggests that dopamine signaling within a brain structure called the nucleus accumbens (Nac) is involved with encoding the value of certain stimuli presented to an animal, and motivating them to pursue a reward based on a presented cue. While an animal is in pursuit of a reward it is common for associations to be made with a neutral stimulus and a reward, and then for predictions to be made about the reward upon presentation of the same stimulus in the future. In this experiment two novel food-seeking behavioral tasks were created which were independently modified to examine the change in dopamine signaling in the Nac as it pertains to reward evaluation and prediction. Within the behavioral task, experimental group animals had the dopamine brain circuits which project to the Nac activated to causally probe their role in reward seeking and predicting. To achieve this, light sensitive protein was inserted into rats brains, selectively expressing in dopamine neurons. Light was then focused on the areas which project dopamine pathways to the Nac.Control groups received the same stimulation, however are genetically incapable of expressing the proteins for optical activation and therefore no optical stimulation is achieved within the group. During the task, cue evoked dopamine and reward evoked dopamine were measured and quantified within both groups, and our data suggest that differences in signaling correspond to changes in the behavior of the tested animals, most notably their motivation to pursue a reward, or give up on reward seeking.

Effects of Social Interaction on Glutamate Release in mPFC

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Raleigh Jonscher, Biology,
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Esteban Lopez,
DC – College of Liberal Arts and Sciences

Mentor: Dr. Sondra Bland,
DC - College of Liberal Arts and Sciences

Social interaction during the critical period of adolescence is an important component of the development of social skills. Previous work has shown that rodent models of adolescent social isolation result in inappropriate social behavior and increased aggression, as well as reduced activation of the medial prefrontal cortex (mPFC) during social interaction. Here, we sought to assess levels of glutamate, the primary excitatory neurotransmitter, in the mPFC of male rats that were either exposed to adolescent social isolation or group housing and then exposed to either a single trial or 3 trials of social interaction with a novel rat. Adolescent rats were isolated or housed in groups of 3 for 3 weeks. Surgery was performed to implant a guide cannula in the mPFC of each rat, and rats were allowed to recover for 1 week in the same housing conditions. Microdialysis was performed after the recovery period. Microdialysis probes were inserted into the cannula and rats were placed in the microdialysis apparatus; after a 4 hr equilibration period sampling began. Three baseline samples were collected, and during the fourth sampling period a stimulus rat was placed in the apparatus for 10 minutes. Four additional samples were collected. Samples were assessed using HPLC. Small but nonsignificant increases in glutamate were observed during the social interaction sampling period, and no group differences were observed. Glutamate in the mPFC may not play an important role in social behavior.

Bottom-feeders and Vacuous Units – an Exploration of the Dehumanizing Effect of Narcissism in Media Culture

Julie Jablonski, Fine Arts, Painting and Drawing,
DC - College of Arts and Media

Mentor: Ms. Lanny Frances DeVuono,
DC - College of Arts and Media

Cockroach-esque vacuum cleaners, an old school dance beat, and pitiful celebrities. This playful multi-media installation explores the very serious theme of narcissism as manifested in media culture. Three figures are portrayed: Nancy Grace as the self-righteous carnivore, Justin Bieber as the inane megalomaniac, and Jared Fogel (of Subway sandwich “fame”) as the gluttonous monster. The work comments on the dehumanizing effect of fame via elitism and callous indifference. This piece describes the internal experience of the power-whoring media figure desperate for an audience (or victim). It also addresses the external experience of the viewer. By choosing to consume these figures (i.e. watch their show, listen to their music, voraciously digest the details of their heinous scandal), the viewer thus validates their absurd and distasteful behavior. The end result is a normalization of apathy, harm, selfishness, and banality. The ridiculousness of such celebrity personalities and their antics is nothing short of theater. As such, this installation is presented as a theatrical piece. With portraits of the three “stars” as a backdrop, robotic Rumba vacuum cleaners (metaphors for these figures as vampiric cockroaches) are called to “the dance floor” and perform a dance number to a song from the Broadway musical Hair. Silly, yes. But deadly serious.

Analyzing the Quality of Interaction Between a Mother and Infant During Feeding

Meredith Jameson, Nursing,
AMC - College of Nursing

Mentor: Dr. Madalynn Neu,
AMC - College of Nursing

The primary goal of this quantitative descriptive study is to compare two clinical assessment tools, the Nursing Child Assessment Feeding Scale and the Mother-Infant/Toddler Feeding Scale in analysis of the quality of interaction between a mother and her infant during feeding. Background. There is a great deal of communication, both verbal and nonverbal, that passes between a mother and her infant during every feeding. Such interaction might be of high quality and positive in nature or it might reveal some dysfunction in the mother or infant. In a previous study, mothers and infants with a diagnosis of gastroesophageal reflux disease (GERD) were videotaped while feeding. Interactions were scored using the NCAFS. This study is a secondary evaluation of these same videotapes using the MITFS tool seeking to compare and contrast the NCAFS and the MITFS together and separately. Hypothetically, the MITFS scores will add additional criteria to the NCAFS scores regarding the quality and nature of the mother/infant dynamic, providing more detailed information than the NCAFS scores alone. Methods. Videotapes of 22 mother-infant dyads will be assessed. The original study sample was recruited from pediatric care providers. For this current study, a trained clinician blind to the original NCAFS scores viewed and scored the videotapes using the MITFS. Results. Data analysis results will be complete by the end of January 2016.

The Developmental Effects of Early Life Stress on Prosocial Behaviors in Adulthood

Robert Jirsaraie, Psychology,
DC - College of Liberal Arts and Sciences

Mentor: Dr. David Albeck,
DC - College of Liberal Arts and Sciences

In biological terms, stress is commonly known as the “flight or fight response,” and people tend to have a negative connotation with stress. Some recent research has discovered that stress can promote prosocial behaviors. (Buchanan & Preston, 2014) Prosocial behavior can be defined as voluntarily benefiting another at one’s own personal expense and contributes to communities being sociable and civil. Much of the previous research has not accounted for individual differences of reactivity to stress. Developmental psychologists have identified that children who experience early life stress (ELS) are more hypersensitive to stress as they develop into adulthood by having more glucocorticoids. My research seeks to understand if these individuals that are more prone to stress will behave more altruistically than individuals who have experienced less ELS. Participants will complete a standardized self-report survey called the early life stress survey. Observational measures will be used to assess participants prosocial behavior by having them witness someone online being stolen from and then be given the opportunity to donate money to the victim afterwards. During this scenario psychological measures will be taken with an EEG cap to access which areas of the brain are more active during decision making. We expect to see more activity in the areas of the brain associated with emotional regulation for participants with high ELS scores as well as increased willingness to donate money to the virtual victim. This research will help us understand the lasting social impact of ELS.

An Experimental Murine Model of Schistosoma Mansoni Pulmonary Hypertension

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Other collaborators: Rahul Kumar, Claudia Mickael,
AMC - School of Medicine

Mentor: Dr. Brian Graham,
AMC - School of Medicine

Pulmonary hypertension (PH) is a condition of increased pressure in the pulmonary vascular system, causing increased afterload on the right ventricle and resulting in right heart failure. Among its causes, schistosomiasis, a snail borne parasitic disease, is likely one of the most common causes of PH. Schistosomiasis affects 200–300 million people worldwide. The most common parasite species to infect humans is Schistosoma mansoni, which is endemic in more than 50 countries including Brazil and Africa. Unfortunately, schistosomiasis remains massively undertreated relative to the disease burden, leading to its classification as one of the 6 "neglected" tropical diseases. Our lab has developed a highly reproducible mouse model to study Schistosoma mansoni-induced PH, recapitulating several key pathological characteristics observed in individuals who died of the disease. Therefore, our model can be used to help understand the key molecular pathways involved in the pathophysiology of the Schistosoma-induced PH. Recently, using this model, our lab has dissected out key biological pathways and cytokines e.g., interleukin (IL)-4, IL-13, IL-6 and transforming growth factor (TGF)-ß1 having causal role in promoting severe lung remodeling. Of interest, blockade of these molecules using pharmacological inhibitors, genetic deficiency or neutralizing antibodies show protection in this preclinical model. Overall, understanding the mechanisms linking the host immune response and pulmonary vascular disease using our murine model may underscore potential therapeutic targets in the clinical treatment of Schistosoma-induced PH.

The Role of Preconceptional Lipid-Based Nutrient Supplementation on Levels of Circulating Branched Chain Amino Acids in Guatemalan Women who are Overweight or Obese at 12 Weeks Gestation

Mattie Kerns, Biology,
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Mentor: Dr. Sarah Borengasser,
AMC - School of Medicine

Childhood obesity is a global health concern as estimates project 60 million preschool- aged children worldwide will be overweight or obese (OW/OB) by 2020. Recent reports suggest that low- and middle-income countries are suffering from a "double burden" of undernutrition (growth stunting) and overnutrition (obesity). Developmental Origins of Health and Disease (DOHaD) has demonstrated that in utero exposure to maternal under- or overnutrition contributes to detrimental growth and metabolic outcomes in early postnatal life and into adulthood. Elevated branched chain amino acids (BCAAs: Valine, Leucine, and Isoleucine) are well-established biomarkers of insulin resistance. The objective of this pilot study was to examine if levels of circulating BCAAs in pregnant women (12 wk gestation) can serve as biomarkers for in utero exposure to insulin resistance and test whether a lipid nutrient supplement (LNS) can improve maternal metabolic status in Guatemalan women experiencing both stunted growth and obesity. Using an ongoing RCT called Women First, we studied women with normal weight (NW) or OW/OB body mass indices. Women were divided into two arms: those who received LNS > 3 mos prior to conception (+LNS) and continued throughout pregnancy, or no LNS (-LNS) (n = 9-10 women per group). BCAAs were elevated in -LNS OW/OB as compared to –LNS NW ($p = 0.001$). Moreover, OW/OB +LNS had reduced BCAAs as compared to –LNS OW/OB ($p = 0.007$), suggesting LNS may improve metabolic status in OW/OB mothers and reduce detrimental fetal exposures. This pilot study suggests that LNS may impact maternal metabolic health.

Youth Development through College Connections

Katherine Ketcham, Biology,
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Brigitte Nguyen, Public Health,
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Vishruti Patel, Biology,
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Daniel Bor, Biology,
DC - College of Liberal Arts and Sciences

Mentor: Ms. Trishia Vasquez,
DC - College of Liberal Arts and Sciences

Sun Valley Youth Center and the Bridge Project are Denver organizations that benefit low income children. We educated elementary and middle school students weekly about healthy lifestyles, such as exercise, being drug and alcohol free and healthy food, at these organizations. We also gave a tour of the University of Colorado Denver downtown campus to expose the youth to higher education options. These continuing projects offer insight into the social economic and cultural aspects of the population.

Very-short Antennas via Ionized Plasmas for Efficient Radiation (VAIPER)

Rashad Kingsley-Shadi, Electrical Engineering,
DC - College of Engineering and Applied Science

Mentor: Dr. Mark Golkowski,
DC - College of Engineering and Applied Science

The Very-short Antennas via Ionized Plasmas for Efficient Radiation (VAIPER) Antenna is a novel idea to use plasma physics to improve the efficiency of a wire antenna. Dipole antennas have a poor radiation efficiency when the antenna is short compared to a wavelength. Using plasma discharges to create a dynamic conductor, the power efficiency can be improved dramatically. This is a joint project with Georgia Tech. Our team at University of Colorado Denver is using VSIM software to model the plasma physics inside the antenna, and guide the approach for the construction of the Vaiper Antenna. Georgia Tech will build the Vaiper Antenna and use the information from the UCD team to guide their approach to achieve the desired parameters inside the Antenna. If the antenna operates under the correct conditions, all the power given to the antenna will be transmitted with improved efficiency.

How to Engage Elementary Students When Reading

Anastasia Lawrence, Elementary Education,
DC - School of Education and Human Development

Mentor: Ms. Lisa Silverstein,
DC - School of Education and Human Development

Literacy is an important skill that every child needs to have to be a successful adult. However, not every child is engaged when it is time to read. This exhibit displays ideas, strategies and techniques to use in order to help teachers, parents, volunteers and others engage elementary-aged students when reading. With research composed from the Boys & Girls Club and Montview Math and Health Sciences Elementary, I have found ways to engage students in both an academic and non-academic setting. In the Fall semester I was a volunteer at the Boys & Girls Club. The “Club” is a community-based center for youth ages 6-18. This is a non-academic setting although they have time to do their homework and read. As a volunteer I would often help the children read. It was a struggle to engage students to sit down and read after they just came from school. The techniques I found though the documentation has helped many children become avid readers and find reading more enjoyable. These techniques were as simple as having them pick their own book, having them point to familiar words as you read and also letting them turn the page. These specific techniques let the children feel as they were in charge of what was going to happen next. This engaged the children quickly. As an intern at Montview Elementary this Spring, I plan on continuing to find new engaging ways to help students read in an academic setting.

BEEP: Beep Effect Echo Positioning, An Acoustic Indoor Positioning System

Bonnie Levitt, Electrical Engineering,
DC - College of Engineering and Applied Science

Xin Li, Electrical Engineering,
DC - College of Engineering and Applied Science

Brandon Wesseln, Electrical Engineering,
DC - College of Engineering and Applied Science

Mentor: Mr. Brian Atkinson,
DC - College of Engineering and Applied Science

In indoor situations, GPS is often inaccurate and unreliable. As a result, indoor positioning systems have become a growing area of research. An indoor positioning system is used to locate objects or people inside a building using RF, Wi-Fi triangulation, acoustic signals, or other sensory information. Several commercial systems are already on the market, but many of these systems require a physical infrastructure that is a barrier to entry for most consumers. To solve this problem, we developed a software solution for an indoor positioning system called BEEP: Beep Effect Echo Positioning, which leverages the acoustic properties of a room. Oursoftware can identify the location of a user at a room-specific level. By playing a deterministic pseudorandom white noise-like signal into a room, this sound echoes off of the surfaces in a room, which creates reverberated versions of the original signal. Both the original and reverberated signals are simultaneously recorded by a laptop microphone, and these signals are processed by our software. Characteristic features of the room, such as room volume and material absorption properties, are extracted by our software, which then can be used to build a unique acoustic fingerprint of the room. This software is a proof of concept that will eventually lead to the development of an indoor navigation mobile app. Our ultimate goal is to make BEEP an automated, user-friendly app that will crowdsource indoor room location data from users.

UCD Ethics Bowl: The Process

Seth Lewis, Economics,
DC - College of Liberal Arts and Sciences

Joey Chase, Philosophy,
DC - College of Liberal Arts and Sciences

Nicole Padreddii, Philosophy/English,
DC - College of Liberal Arts and Sciences

Mentor: Dr. Candice Shelby,
DC - College of Liberal Arts and Sciences

This is a panel discussion focused on how the UCD Ethics Bowl team Works. We will discuss the preparation processes for regional and national competitions, respectively, highlighting the lifelong educational benefits that result from this type of teaching and learning. We will also discuss the further opportunities that participating on the Ethics Bowl team provides.

How Do We Create Shame-resilient Students?

Jennifer Lindquist, Elementary Education,
DC - School of Education and Human Development

Mentor: Ms. Lisa Silverstein,
DC - School of Education and Human Development

Children absorb their identities in part through what is said to and about them by the adults in their lives. Teachers in particular have the potential to shape the inner voices of their students with the words they chose to speak aloud to them. As explored by researcher Brene Brown in her book, Daring Greatly, when we use shame based discipline we can establish or fuel a child's internal criticism of themselves. This is done through labeling statements such as, "You're messy" (or bad, lazy, etc). Instead it is more beneficial if we share our concerns and give criticism without labeling the student as being a certain way, focusing more on constructive criticism with appropriate wording such as "You made a messy choice." Approaching our students from a place of understanding using a heart-centered approach will help to build a positive inner monologue for students. As a future teacher I am interested in employing an understanding and heart-centered approach with my students to build a classroom culture that encourages sharing, reflection, understanding and growth. During the fall semester my inquiry focused on strictness and behavior management which evolved into my current line of questioning. This semester I will observe and document teacher and student interactions (as well as my own interactions with students) in order to better understand and expand on my knowledge of what it takes to instill students with positive inner voices, allowing them to develop shame-resistance, work through challenges and develop a growth (creator) mindset.

Exercise Increases mTOR Signaling in Brain Areas Involved in Cognition and Emotion

Brian Lloyd, Biology,
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Holly Hake, Psychology,
DC - College of Liberal Arts and Sciences

Jennifer Burns, Psychology,
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Esteban Loetz, Psychology,
DC - College of Liberal Arts and Sciences

Jonathan Herrera, Integrative Physiolgy,
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Parsa R. Ghasem, Department of Integrative Physiology, CU Boulder

Monika Fleshner, Department of Integrative Physiology, CU Boulder

Other collaborators: Dr. Sondra T. Bland,
DC – College of Liberal Arts and Sciences

Mentor: Dr. Benjamin Greenwood,
DC - College of Liberal Arts and Sciences

Exercise can enhance learning and memory and produce resistance against stress-related psychiatric disorders such as depression and anxiety. In rats, these beneficial effects of exercise occur regardless of exercise controllability: both voluntary and forced wheel running produce stress-protective effects. The molecular mechanisms underlying these beneficial effects of exercise remain unknown. The mammalian target of rapamycin (mTOR) is a translation regulator important for cell growth, proliferation, and survival. mTOR has been implicated in enhancing learning and memory as well as antidepressant effects. The effects of exercise on mTOR signaling, however, remain unknown. The goal of the present study was to test the hypothesis that exercise, regardless of controllability, increases levels of phosphorylated mTOR (p-mTOR) in brain regions important for learning and antidepressant responses. Rats were exposed to 6 weeks of either sedentary (locked wheel), voluntary, or forced wheel running conditions. At 6 weeks, rats were sacrificed during peak running and levels of p-mTOR were measured using immunohistochemistry. Compared to locked-wheel controls, both voluntary and forced wheel running increased the number of neurons expressing p-mTOR in the prefrontal cortex and hippocampus. However, only voluntary running increased the number of p-mTOR positive neurons in the nucleus accumbens and amygdala. p-mTOR positive glia were increased after both voluntary and forced exercise compared to locked wheel controls. Data from the dorsal striatum are still being analyzed. Results suggest that mTOR signaling is sensitive to exercise. Increases in mTOR signaling could contribute to the beneficial effects of exercise on cognition and mental health.

Make Love, Not War: 1960's Sex, Politics, and Art in Eros and Avant-Garde Magazines

Jen Logan, Fine Arts, Art History,
DC - College of Arts and Media

Mentor: Dr. Maria Buszek,
DC - College of Arts and Media

My research involves an examination of two complete sets of counter-cultural periodicals that were published in the 1960's, Eros and Avant-Garde. Eros was an oversized magazine featuring classical art and literature that supported the idea that eroticism had always existed and that well-read and mature adults should not be censored. The publisher and editor, Ralph Ginzburg, took chances like printing suppressed writings such as Fanny Hill when other publications were being taken to trial on obscenity charges for similar action. Ironically, Ginzburg was tried and convicted during what became a famous court case on obscenity charges stemming from the way he promoted Eros. In the middle of the Civil Rights Movement, when laws to end segregation were just being passed, Eros published pictorials on inter-racial love. Ginzburg's next magazine, Avant-Garde became a forum for discussing freedom of speech, the Vietnam War, and the period's counterculture. Censorship and race relations were serious topics in articles balanced by irreverent erotic stories, contemporary art, and calls for submission for readers' sexual fantasies. Due to high legal fees, Avant-Garde folded after issue 14. Shoshana Ginzburg, widow of Ralph and only surviving senior member of the editorial staff, gave me new insights into the behind the scenes workings of both publications. My multi-media exhibit will showcase my full collection of Eros and Avant-Garde magazines. I will highlight artwork within the magazines on a poster display and play the original record advertised for sale in the magazines.

Effects of Social Isolation on Aggressive Behaviors in Stalk-eyed Flies

Abigail Luman, Biology,
DC - College of Liberal Arts and Sciences

Aiko Materkowski, Biology,
DC - College of Liberal Arts and Sciences

Mentor: Dr. John Swallow,
DC - College of Liberal Arts and Sciences

Aggression is a vital behavior in many animal species as a means of obtaining resources, mating, and overall survival. Therefore, the presence of aggressive behaviors in a species can also be an indicator of evolutionary fitness. Stalk-eyed flies, Teleopsis dalmanni, have elongated eyestalks that protrude laterally out of their heads with eye bulbs residing on each end. Males and females of this species and other related species in the Diopsidae family are often sexually dimorphic – meaning that males and females are morphologically distinct. As stalk-eyed flies exhibit aggressive behavior in competition over access to food and mates, they are a useful model species for studying aggressive behaviors in invertebrates. This study examines the effects that social isolation has on aggressive behavior in stalk-eyed flies. Social isolation implies the removal of a sexually mature fly from a normal population cage into separate housing for the period of 7 days. We hypothesized that socially isolated stalk-eyed flies would exhibit an increased quantity and intensity of aggressive behaviors. This was tested by pairing a size-matched isolate with a control fly in a partitioned fighting coliseum. After a period of 24 hours, the flies were provided with corn medium to encourage fighting and the number and intensity of each behavior was recorded and analyzed. Preliminary data suggests a trend toward isolates exhibiting a larger number high intensity aggressive behaviors and overall wins. We will discuss the results in the context of a larger sample of fights.

Postpartum Depression and the Perception of Violent Images

Helen Mamo, Psychology,
DC - College of Liberal Arts and Sciences

Mentor: Dr. David Albeck,
DC - College of Liberal Arts and Sciences

Oxytocin, a naturally produced hormone, is important in many human behaviors. Although many people think of oxytocin as the “love hormone”, research suggests that it may have implications in depression. Because we are subjected to an abundance of violent imagery in our everyday lives, I want to understand how depression affects the way we perceive these images, and if that relationship is mediated by different oxytocin gene subtypes. Research has shown that people suffering from depression pay more attention to negative stimuli but it is unclear whether paying attention to negative cues could cause depression or if it is a result of being depressed. To assess this relationship, I would like to study a group of women suffering from postpartum depression. Because the cause of these women’s depression is known, I can focus on the pure relationship between depression and attention to negative stimuli. For this study, I will gather two groups: one group of women with postpartum depression and a control group. Both groups will view positive, neutral and negative imagery while their brain activity is measured using an electroencephalogram (EEG) machine. I hypothesize that women with postpartum depression will show greater brain activity to negative images. I also predict that the level of reactivity will be mediated by each individual’s oxytocin subtype. Specifically, because research has shown that G subtypes are more prone to depression and depressed individuals show greater reactivity to negative stimuli, I predict that women with G subtypes will show greater reactivity to negative images.

Cultural Service Learning Abroad: Building Education in Nicaragua

Junmilano Manurung, Architecture,
DC - College of Architecture and Planning

Morgan Bishop, John Rodezno, Kendal Rice, Sokol Binakaj, Nick Hopkins, Nick Brewka, Ben Elmer, Joey Luna, Joseph Urban, Carlos Gomez, Erik Maza, Ian Staples, Andrew Rick, Dillon Brandt, Michael Hammond,
DC - College of Architecture and Planning

Mentor: Ms. Jo VandenBurg,
DC - College of Architecture and Planning

During the Fall 2015 semester, sixteen undergraduate students from College of Architecture and Planning participated in a two-week learning abroad excursion to the Central American country of Nicaragua. Before traveling, the students took part in a multi-disciplinary prerequisite course offered by the University of Colorado Denver that covered the cultural, historical, and topical events of Nicaragua. While abroad, students immersed themselves in Nicaraguan culture and day-to-day life. The primary scope-of-work consisted of completing the overall design and reconstruction of an existing preschool in the rural community of Jalapa, Nicaragua. In addition to other work, students were responsible for the design and build of replacing the roof and framework, adding decorative security screens to the window openings, enclosing the perimeter of the site with chain-link fencing, and building an adequate footbridge connecting roadside to site. Each work day involved active participation on the construction site and close interaction with the local populace. With the organized help of the local community, the students faced construction obstacles head on. The students integrated into the design-build experience in the Nicaraguan landscape. Whether it was demolishing deteriorating wooden columns to replace with concrete ones or welding while relying on unreliable electrical wiring, the prospect of renovating this preschool for a highly appreciative community became a tangible vision.

Proton Transfer via Grotthuss Shuttling Mechanism through Carbon Nanotube

Danielle Miller, Chemistry,
DC - College of Liberal Arts and Sciences

Mentor: Dr. Hai Lin,
DC - College of Liberal Arts and Sciences

In many biological and chemical systems, protons have been observed transfer through nonpolar pores via water wires. These water wires have been conventionally assumed to form through ordinary diffusion, however recent dynamics simulations [1] based on reactive force fields suggest that a hydrated, excess proton can cause hydration of a hydrophobic pore by “actively shooting” water molecules into the pore, creating a water wire for the eventual proton transfer. This implies that perhaps an existing water wire is not necessary for successful proton transfer through a hydrophobic space. To verify these conclusions, we are currently carrying out combined quantum-mechanical/molecular-mechanical simulations of an excess proton in water passing through a hydrophobic cavity modelled by a carbon nanotube which has been tuned to increase its hydrophobicity. The potential of mean force of the proton translation as well as the water occupancy of the nanotube during translocation will be compared to the results from literature in order to explore the role of hydrated protons in the formation of water wires.

Involvement of Striatal Dopamine 1 Receptor Signaling in Fear Extinction Augmented by DREADD-induced Dopamine

Megan Miner, Psychology, Biology,
DC - College of Liberal Arts and Sciences

Courtney Bouchet, Biology,
DC - College of Liberal Arts and Sciences

Brian Lloyd, Biology,
DC - College of Liberal Arts and Sciences

Holly Hake, Psychology,
DC - College of Liberal Arts and Sciences

Esteban Loetz,
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Toni Nicastro, Biology,
DC - College of Liberal Arts and Sciences

Nathan Gray, Psychology,
DC - College of Liberal Arts and Sciences

Mentor: Dr. Ben Greenwood,
DC - College of Liberal Arts and Sciences

Identification of novel means to strengthen extinction of aversive memories could increase the efficacy of behavioral therapies for anxiety disorders. We observed that activation of the nigrostriatal dopamine (DA) pathway, which consists of DA neurons that project from the substantia nigra to the dorsal striatum (DS), with designer receptors exclusively activated by designer drugs (DREADDs), enhances fear extinction learning. DREADD-induced DA efflux would be expected to increase low-affinity D1 receptor signaling in the DS, but this has yet to be verified. Using double fluorescent in situ hybridization, we quantified the proportion of D1 mRNA-expressing neurons in the DS that co-labeled for cfos mRNA, a marker of neural activity, during fear extinction in the presence or absence of DREADD-induced DA augmentation. We found that fear extinction learning increased neural activation of D1-expressing neurons, suggesting that D1 receptors in the DS are recruited during fear extinction. Moreover, DREADD also increased activity of DS D1-expressing neurons, indicating that D1 receptors in the DS are a target of DREADD-inducedaugmentation of the nigrostriatal DA pathway. These results suggest that DS D1 receptors could be involved in fear extinction, and are consistent with the involvement of D1 receptor signaling in the mechanisms by which DREADD-augmentation of nigrostriatal DA enhances fear extinction.

Bioremediation of Mining-impacted Soils Through the Restoration of Bacterial Communities Enhancing Revegetation

Nancy Moreno Huizar, Biology/Public Health,
DC - College of Liberal Arts and Sciences

Mentor: Dr. Timberley Roane,
DC - College of Liberal Arts and Sciences

Bioremediation is the use of organisms to reduce or eliminate the toxicity of contaminants in the environment. The bioremediation of microbially deficient mining-impacted soils can involve restoration of bacterial communities through the addition of microorganisms from unimpacted soils. Soil-borne bacteria are able to detoxify metals through the production of exopolymers, siderophores, biosurfactants, metallothioneins, metal efflux systems, and metal methylation. Introduction of metal detoxification can increase opportunities for plant growth and plant-based stabilization of metal-impacted soils. The overall goal of this project is to enhance the ability of mining-impacted soils to support plant vegetation. By doing so, this will reduce the spread of toxic metals through erosion and weathering. The specific objectives are to assess the bacterial community composition differences among varying ratios of mining-impacted soils mixed with unimpacted soils, and to assess which ratios result in increased plant biomass and growth. To address these objectives, plant-based greenhouse studies, along with genetic-based bacterial identification methods, will be conducted. The anticipated results are increased plant productivity in ratios of increased unimpacted soil due to the introduced bacterial diversity.

Respiratory Mucous and its Relationship with Pulmonary Diseases

Melody Morshed, Biology,
DC - College of Liberal Arts and Sciences

Mentor: Dr. Christopher Evans,
AMC - School of Medicine

Research focusing on the relationship between mucus and pulmonary diseases is one of the prime components of the work done in the laboratory of Dr. Christopher Evans at Anschutz Medical Campus, Pulmonary Department. One such pulmonary disease that is of concern in the lab is asthma. This chronic condition affects over 25 million American adults and children with health care costs of $62 billion. A physiological attribute of asthma is mucous metaplasia and mucus hypersecretion. The secretion and dysregulated expression of a major mucin macromolecule in airway mucus, MUC5AC, has been linked to fatal asthma incidences. Another major mucin, MUC5B has been found in Dr. Evan's lab to be linked with beneficial roles in homeostasis and response to infection. Currently, in Dr. Evans' lab, research is involving the investigation of the relationship between MUC5AC and MUC5B. This includes focusing on their interaction with leukocytes and structural cells in the lungs to regulate tissue inflammation, injury, and repair. As an intern in Dr. Evans' lab, aside from general lab maintenance duties, I am held responsible for exposing mice to an agent inducing an inflammatory response resembling asthma, performing surgeries consisting of bronchoalveolar lavages, and collecting quantitative data of the induced inflammation.

Health and Educational Disparities

William Mundo, Ethnic Studies/Public Health,
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Racial disparities affect health and educational life-course outcomes in multiple ways. Demographic changes anticipated over the next decade magnify the importance of addressing racial disparities in health care and education. The field of cultural competence is one strategy that attempts to address these disparities. Ethnic Studies Puksta Fellows developed internship projects that focused on sociocultural barriers to health care and education, the level of health care and educational systems at which a given barriers occur, and cultural competence efforts that can address these barriers. Sociocultural barriers were identified at the organizational (leadership/workforce), structural (processes of care and education), and clinical (provider-patient and educator-student encounter) levels. A framework of cultural competence interventions---including minority recruitment into the professions, language and culturally appropriate health and educational materials, and provider education on cross-cultural issues.

Self-Reported Opioid and Marijuana Use and Pain in the Year Following Legalization in New Patients to Surgery

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We have previously shown that opioid use increases following bariatric surgery, especially following R&Y gastric bypass and in those chronically using opioids prior to surgery. The reason for this is not known but could be related to preoperative pain. The effect of bariatric surgery on marijuana (MJA) use is not known. Medical MJA has been available in Colorado for over a decade, although recreational (REC) MJA use has been legal in only the last year. In order to begin to understand the effect of MJA in the bariatric surgery population, we sought to evaluate the change in MJA use and reason, changes in opioid use, and changes in pain in new patients coming to an obesity clinic between summer 2014 and summer 2015. Our hypothesis was that there will be a higher proportion of patients using over the counter MJA in June 2015 than August 2014.

Firing on All Levels: the Pink Slip Web Series

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Over a two-semester combined effort of UCD Film and Television students and faculty a fully conceived web series is created and distributed. The 2014 series was initially conceived by Natalie Villa and the 2014 Writing Episodic Television course. It was then fully produced in the Spring of 2015 Producing Episodic TV course. The resulting anthology series -- Pink Slip --tells the diverse stories of employees' just moments before and just after they get fired. From heartbreaking tragedy to lighthearted comedy, Pink Slip highlights some of the best and exciting new work from film and television students at the College of Arts and Media. The seven fully produced episodes traveled from creative conception to full creation. Each episode demonstrates an individual voice that shines through and illuminates the human condition.

Master Fit

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Fitting experimental data to a mathematical model is an important component of many scientific analyses. This task is commonly accomplished using the methods of statistical regression. Performing nonlinear regression typically requires some familiarity with abstract computer code written in a statistical programming language such as R. The goal of this project is make a researcher's job easier by creating an app to perform nonlinear regression. The app was created using the Shiny framework that is tightly integrated with R. We designed a gui that the experimenter can use to upload their data. The app performs nonlinear regression on the data, and displays the fitted values of the model parameters. We customized the app to fit data generated in a series of behavioral neuroscience experiments that model the effects of varying cost on the consumption of a substance.

Effects of Internet Peer Support Groups on Individuals with Borderline Personality Disorder

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The internet has become a daily influence in many lives; however, influences regarding its use in emotionally vulnerable populations such as those with Borderline Personality Disorder (BPD) have yet to be studied. Individuals with BPD present a mixture of emotional lability, intervals of depression, and difficulty with impulse control, all of which increase the risk of suicide attempts and gestures (DSM-5, 2012). One study suggests the internet may have either positive or negative impacts on the stability of those with BPD (Chapman & Gratz, 2013). Our research will involve creating and administering a survey to measure any relationship between online peer support forum use and coping with symptoms of BPD. It is our hypothesis that the use of online support forums will positively correlate with coping ability. We will distribute a survey in 5 on-line peer support groups for those diagnosed with BPD to assess any relationship between how they use these groups and their general coping abilities. The information gathered will assist in possible development and utilization of peer support forums as accompaniment to treatments; especially benefitting socially impoverished individuals with easier, cheaper, 24-hour access to assistance.

Memes and Natural Selection

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Memes! We see them every time we open Facebook. But what many people don't realize is that, according to the original definition of "meme," everything you own is a meme, and every learned behavior is a meme. Richard Dawkins originally coined the term "meme" in 1976, in order to facilitate using evolutionary models from biology to describe cultural phenomena. David Hull defended this by arguing that, similar to how paleontologists and linguists independently invented cladograms, it is possible that there are other abstract evolutionary models applicable to a variety of domains. Memetics is such an attempt, aimed at explaining changes of distributions of cultural features in terms of natural selection. Using the same operational criteria which helped end the "units of selection debate" in biology, this presentation will review different kinds of cultural units and determine whether or not they are viable candidates for being considered as cases of evolution by natural selection. As in the biological domain, whether the answer is "yes," "no," or "borderline" depends on the specific conditions. Thus, memetics is a viable research program, insofar as it provides us with testable hypotheses, but it also has its limits. Just as gene drift and flow can also drive biological evolution, other mechanisms besides natural selection are needed to explain cultural evolution. Nonetheless, memetics has tremendous positive value for increasing interdisciplinary cooperation, as we collapse specialized vocabularies and models into a more unified theory.

Cultural and Linguistic Pedegogies

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There is an endless body of research that deeply supports multicultural and multilingual education in schools. By incorporating multiple languages in pedagogical approaches, teachers simultaneously validate marginalized cultures and embed equitable education and social structures within society. If multiple languages are used in pedagogical methods, monolingual English speakers benefit by exposure while their multilingual counterparts benefit from a curriculum that is culturally relevant. This inquiry seeks to examine the effectiveness and viability of multicultural and multilingual education through the use of advanced pedagogies and technology by constructing culturally relevant lessons for students to invest in their education and form solid identities. After conducting several observations with field notes, as well as interviews with teachers and students, my brief experience in a secondary classroom reinforces the forward thinking pedagogies that I have outlined and practiced. In situations where multilingual learners were given an opportunity to learn in Spanish, as well as English, and provided historical narratives relevant to their culture, the students perform better than their monolingual English-speaking counterparts. English-speaking students became inspired by the multicultural and multilingual lessons and became more interested in the lived experience of their peers. In addition, by utilizing multilingual and multicultural pedagogies thus creating an awareness of identity, marginalized Student of Color discovered a meaningful way to invest in a system that has largely discounted their contributions and place. Scholars have all but exhausted the inquiry and conundrum that I have examined, which is an instrumental challenge that faces American society today.

The Nature of Drug Use as Constructed in the Rhetoric of Music Festivals

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Mentor: Dr. Sonja Foss,
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My research is an analysis of the depiction of drug use in the rhetoric of music festivals. Specifically, I analyze two documentary films from the Woodstock music festival and two from the Electric Daisy Carnival to discover the nature of drug use and how drugs function at such festivals. Woven into the tapestry that is a music festival are the threads of a distinctive and inclusive youth culture which flourishes in the advancement of community-building and self-transformation through personal and spiritual growth. Participants speak of the essential importance of the atmosphere and the environment, in which the music is only one key ingredient. My analysis suggests that the construction of drug use in the films focuses on the mental and physical effects of psychedelic drug use, sensory stimulation as augmentation of the high, the functions of being high, the benefits of recreational drug use, the disadvantages of recreational drug use, and harm-reduction strategies and practices to maintain safe levels of use. Current models and methods of treatment used at rehabilitation centers for recovery from chemical dependency have a high rate of relapse. Current models and methods of treatment used at rehabilitation centers for recovery from chemical dependency have a high rate of relapse among clients after they are released from the treatment program. I argue that music festivals and how they are depicted to the larger culture may constitute a cultural influence that could be used to address drug use and addiction more effectively than some current approaches.

A Synthesis of Complex Dynamic Systems and Extended Mind Theory

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Mentor: Dr. Candice Shelby,
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This essay will discuss how language and gesturing play a role in the extended mind coupling process under the supposition that consciousness is an emergent property of the interactions between the mind, body, and environment. Extended Mind Theory states that the objects and beings we interact with are actively part of the cognition process. This dynamic relationship becomes more complex when we take into account how gesturing plays a role in how we perceive and express the cognition of our spatial awareness. When we view the complex dynamic relationship between mind, body, and environment coupled with a mind that pushes cognition into the world we see that an intricate chain links our consciousness's as a whole instead of consciousness being individuated.

Developmental Programming of Pulmonary Vascular Dysfunction by Perinatal Hypoxia

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Environmental exposures during perinatal life profoundly affect physiological function and disease susceptibility throughout the lifespan by altering the developmental trajectory of several organ systems. The respiratory system appears to be particularly vulnerable to such perinatal exposures given that developmental processes essential for efficient pulmonary gas transfer extend well into postnatal life. For example, perinatal hypoxia (PHX), or impaired oxygenation during perinatal life, impairs alveolarization, and affects functional and structural characteristics of the pulmonary circulation. Moreover, recent human studies demonstrate that PHX raises the risk of pulmonary vascular dysfunction in young males residing at high altitude; one limitation of this work was the reliance on retrospective review of medical records to assess PHX because prospective studies, spanning from the time of birth to young adulthood, were logistically not possible. We therefore developed an experimental murine model in which the degree and timing of environmental hypoxia could be strictly controlled to directly test the hypothesis that PHX increases susceptibility to pulmonary vascular dysfunction under conditions of chronic hypoxia during early adulthood. Using hypobaric and hyperbaric chambers to simulate high (5000 m) and low altitude (0 m) exposures, respectively, our studies demonstrate that PHX induces pulmonary vascular dysfunction that persists into adulthood, and that such effects are sex dependent. Further, our findings indicate that PHX modifies gene expression patterns in the fetal and adult lung, and thereby highlights biological pathways potentially involved in the effect of PHX to alter pulmonary function.

Influence of Living Situations on Amount of Support Received for Active Duty Army Soldiers Related to PTSD

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Mentor: Dr. Elizabeth Allen,
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Studies have indicated the more support an individual receives after a traumatic event, the fewer PTSD symptoms they develop. Active duty Army soldiers who live on base may have greater access to resources and support compared to those living off base. For the current study, we hypothesized that soldiers living on base would have lower levels of PTSD, and that this association would be at least partially attributable to greater levels of the types of support relevant to on base living. To test this hypothesis, we utilized self-report data from 399 active duty married soldiers, where 148 currently lived on base, and 251 lived off base. Support measures included perceptions of support from the American public and quality of Army specific support such as Post Family Support Services, support from other military families, chaplains, other soldiers, etc. Consistent with prior research, the level of PTSD was significantly lower when perceptions of a range of types of support were higher. However, there were no significant differences in level of PTSD for soldiers living on or off base; moreover, most of the measured aspects of support did not differ for those living on or off base. The exception was that there was a difference in level of perceived support from the American public for those living on or off base; however, it was opposite to the direction predicted: Army servicemen who lived off base felt a greater sense of support from the American public than Army servicemen who lived on base.

Longitudinal Assessment Viability of Online Peer Support Groups as an Ancillary Treatment for Borderline Personality Disorder

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Mentor: Dr. Lindsey Hamilton,
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Borderline personality disorder (BPD) is a major mental disorder affecting millions of Americans, with up to 9% of diagnosed individuals eventually committing suicide. BPD is also characterized by other forms of self harm, a failure to regulate moods, disturbed personal relationships, and extreme black and white thinking (NIMH, 2016). The best primary treatments for this disorder are Dialectical Behavioral Therapy and Schema Centered Therapy, but these treatments alone remain limited in their ability to control BPD symptoms. Fortunately, emerging research has demonstrated that participation in peer support groups represents an important ancillary treatment, resulting in significantly improved long term outcomes for BPD patients when paired with a primary therapy like DBT of SCT (Gillard et al., 2015). However, attending such groups is often impossible or impractical for many BPD patients either because they are simply unavailable in their area or due to conflicting schedules. Our research examines whether the benefits of these traditional peer support groups can be mirrored by online groups that eliminate many of these barriers. We will distribute surveys to individuals as they join several online peer support groups, and follow up 3 months later, measuring coping strategies, prevalence and severity of suicidal ideation, and subjective experiences in these groups. Online peer support group experiences will then be compared to the experiences of individuals in traditional support groups. The ultimate goal of this research being to establish whether online support groups might offer a much needed alternative to traditional peer support groups for BPD patents.

In Vivo Optogenentic Manipulation of Mesolimbic Dopamine During an Economic Based Shock-avoidance Task

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The mesolimbic dopamine system has historically been implicated in motivational processing under appetitive contexts. Previous research has established that transient accumbal dopamine release events time-locked to reward predicting cues and reward presentation scale in response to reward magnitude and are thought to direct reward seeking behavior. Less, however, is known regarding the role dopamine plays in an aversive context. Previous work by Dr. Oleson utilizing fast-scan cyclic voltammetry (FSCV) demonstrated that dopamine release occurs at the predictive cue and response outcome during a signaled operant shock-avoidance task—similarly to the augmentation observed in appetitive conditioning. Here we sought to expand upon these findings to assess the causal role dopamine plays in avoidance behavior utilizing in vivo FSCV, optogenetics, and anxiolytic pharmacology during a novel economic-based shock-avoidance task. In congruence with previous appetitive research, we observed a scaling of cue and response-evoked dopamine concentration as function of response cost. To test causality we used optogenetics to augment dopamine release at either cue onset or during successful avoidance. Our preliminary results suggest that augmenting release at cue onset reduces the price animals will pay to avoid footshock; whereas augmenting release after successful avoidance increases the price animals will pay to avoid footshock. Administration of benzodiazepines demonstrated improved avoidance in the low-dose range, but a decrease in avoidance occurred with increasing dosage. Together these findings suggest that transient accumbal dopamine release events play an integral role in the assessment of aversive stimuli and play a causal role in the motivation to avoid them.

Mesenchymal Stem Cells of Infants Born to Mothers with Obesity may Provide Clues to Future Obesity Risk

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Infants born to mothers with obesity have an increased likelihood of becoming obese later in life. We have previously shown that mesenchymal stem cells (MSCs) of infants born to mothers with obesity show a greater affinity for adipogenesis than MSCs of infants born to normal weight mothers. The mechanism by which this occurs is not yet understood, though our preliminary data suggest differences in lipid accumulation and fatty acid oxidation. MSCs were cultured from the umbilical cords of infants born to normal weight mothers (prepregnancy [pp] BMI 21.1 ± 0.3 kg/m2; n=15; NW-MSCs) or mothers with obesity (ppBMI 34.6 ± 1.0 kg/m2; n=14; Ob-MSCs). Our preliminary data show DNA hypermethylation of genes related to fatty acid oxidation in Ob-MSCs compared to NW-MSCs. These differences were observed for several subunits of the AMP-activated protein kinase (AMPK) protein, a major regulator of fatty acid oxidation. AMPK is a heterotrimeric complex, composed of a catalytic a subunit and regulatory ß and ? subunits. Each of these subunits have multiple isoforms, the a and ß subunits have two isoforms and the ? subunit has three isoforms. Based on differences in DNA methylation, we hypothesized that AMPK subunit content would be lower in Ob-MSCs. The protein and gene expression of each isoform of each subunit was measured in the MSCs to determine any differences between the Ob-MSCs and the NW-MSCs. Results from these experiments may give insight as to why infants born to mothers with obesity are at a higher risk for obesity themselves.

Peroxisome Proliferator-activated Receptor Gamma (PPARG) and its Effects on Altitude-associated Fetal Growth Restriction and/or Placental Vascularization

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The chronic hypoxia of high altitude impairs maternal vascular adaptation to pregnancy and reduces fetal growth. Peroxisome proliferator-activated receptor gamma (PPARG), a member of the nuclear receptor family, plays an important role in metabolic and vascular adaptations required for successful pregnancy outcome. In humans residing at high altitude gene expression patterns are consistent with the downregulation of the PPARG pathway during pregnancy at compared to low altitude,
and are accompanied by reduced birth weight and head circumference. Our current objective is to determine whether treatment with a PPARG agonist (pioglitazone [PIO]) during pregnancy can prevent altitude-associated fetal growth restriction and/or if it affects placental vascularization in a murine model. The experimental group consists of treatment of C57/BL6 mice with PIO in their food and the control group consists of a control diet from the time of mating until tissues are harvested at Day 17.5 of gestation. Half of the animals are exposed to hypoxia using hypobaric chambers, and half are kept under normoxic, sea level conditions. On Day 17.5 we harvest the fetuses and the placentas and measure fetal growth, fetal weight, placental weight, and placental vascularity. We also collect tissues to test the effectiveness of the PIO treatment to modify PPARG protein levels. PCR genotyping is used to determine offspring sex and western blots will be used to determine levels of candidate proteins in placental tissue and maternal uterine artery vessels.

New Tool Reveals Site-Specific Differences in the Size of Osteocyte Lacunae

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New Tool Reveals Site-Specific Differences in the Size of Osteocyte Lacunae Rauff A1, Heveran CM2, Ferguson VL2, Carpenter RD3 1Department of Bioegineering, University of Colorado Denver; 2Department of Mechanical Engineering, University of Colorado Boulder; 3Department of Mechanical Engineering, University of Colorado Denver Osteocytes, or bone maintenance cells, reside within mineralized bone tissue in voids called lacunae. The osteocyte network responds to mechanical stimuli and actively directs the remodeling of bone structure. Because lacunae comprise an abundant component of bone microstructure, they may play significant roles in both mechano-sensation and the mechanical integrity of bone. The purpose of this study was to quantify three dimensional characteristics of lacunae. Samples were acquired from bones of humans, mice, and cows. The samples were stained, embedded, and polished in preparation for microscopy. A confocal microscope was used to acquire 3D “stacks” of 2D images. The images were reconstructed into 3D objects and processed using new software developed as part of the study. The new software was used to measure lacunar volume, density, directionality, radius, and anisotropy. One novel finding of the study was a site-specific difference in lacunar size: lacunar volumes in the femur ($n = 48$) and tibia ($n = 86$) of mice were 410 ± 90 and 296 ± 126, respectively ($p<0.001$). This larger size was also reflected in the lacunar surface area, which was 366 ± 55 in the femur and 268 ± 80 in the tibia ($p<0.001$). These site-specific differences in lacunar morphology could reflect differences in the mechanical function of the two bones. However, further study is needed to address this question. Additionally, the software developed in this study can be used to investigate changes in lacunar morphology that may occur due to obesity, diabetes, chronic kidney disease, and exposure to microgravity.

ER Stress in Down Syndrome: A Novel Mechanism for Dysfunction and Vulnerability

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Down syndrome (DS) is the most common genetic cause of cognitive impairment in the US, and is caused by the presence of a third copy of chromosome 21. This triplication results in a variable phenotype with several comorbidities, like dementia and Alzheimer's disease (AD). Recent literature in AD is exploring the scenario that ER stress might be a mechanism that promotes AD pathology; however, there is no former research concerning ER stress in the DS population. Therefore, we hypothesized that the presence of an extra chromosome might increase the translational burden, resulting in increased endoplasmic reticulum stress in DS individuals. Our data show increased expression of common ER stress proteins (XBP1s, ATF6) at basal levels, in cells derived from DS patients. XBP1s and ATF6 levels were significantly increased in both whole cell lysates and nuclear samples, confirming the presence of increased ER stress. However, IRE1a phosphorylation was not different between control and DS cells, indicating that XBP1s overexpression might be due to increased presence of ATF6. We also investigated viability after maneb exposure, a fungicide that causes neurodegeneration, to see if the DS cell lines are more prone to cell death due to the aforementioned ER stress condition. Cell death (LDH) and cell viability (MTS) assay results show decreased viability in the DS group after exposure. These results lend credence to our hypothesis, that DS cells are more vulnerable to toxicant exposure compared to the control group, and provide an avenue for pharmacological intervention.

Effects of the Female Rat estrous Cycle on Drug Seeking Behavior

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The estrous cycle consists of physiological changes that occur in most mammalian females after puberty. Both the estrous and menstrual cycles are regulated by the hypothalamus of the brain and involve the secretion of hormones from the pituitary gland, with the distinction being that the estrous cycle does not involve the shedding of the endometrium through menstruation. As they share many physiological underpinnings, investigating how the estrous cycle alters neurophysiology, neuropharmacology and behavior will be critical in developing tailored psychiatric interventions for female patients in the future. The estrous cycle can be divided into four stages; each phase is characterized by the secretion or regression of gonadal hormones. These endogenous chemicals play a role in behavioral modifications in rats; however, little research has been performed to understand the consequences and the mechanisms of these adaptations. One such application of this research is in drug addiction. Human and animal research suggests that females may have a higher biological propensity for cocaine abuse than males. Research has also suggested that during the estrus phase compared to non-estrous phases, cocaine's anxiogenic properties have a decreased impact on the female rat's motivation to seek cocaine. This is just one example of how hormonal stages may alter neuropharmacology and the expression of psychiatric disease. While it is understood that there are differences between estrus and non-estrous rats, the mechanism and extent of these differences is unknown. It is important for the scientific community to investigate neuroscientific distinctions during the phases of the estrus cycle.

Hyperoxia Tolerant Rat Resists Obesity – Is An Anti-Inflammatory Pathway Responsible?

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Purpose of Study: While studying the effects of continuously breathing pure oxygen (hyperoxia) on acute respiratory distress syndrome ("ARDS") in Sprague-Dawley rats, a single control rat unexpectedly survived while all (>1000) control rats died after ~66 hours. By breeding this unusual hyperoxia tolerant rat with control rats, and then breeding the tolerant offspring, a new strain of rats that survive indefinitely in hyperoxia was created. Tolerant rats also develop less lung inflammation and oxidative stress after hyperoxia. Because of emerging interest in inflammation, oxidative stress, and heme oxygenase-1 (HO-1)—a multidimensional anti-inflammatory antioxidant in ARDS and obesity—we evaluated weight gain and HO-1 expression in tolerant rats. Methods Used: Rats were fed a standard diet ad libitum and weighed. Lavage neutrophils and protein and nitrotyrosine staining were measured in lungs after hyperoxia for ~52 hours. Alveolar macrophages, bone marrow mononuclear cells, and visceral fat were analyzed for HO-1 (ELISA). Conclusions: A contribution of systemically and naturally increased HO-1 expression in tolerant rats is suggested. Because HO-1 inducers (such as glutamine) are currently available for human consumption, investigating their role in ARDS and obesity may determine therapeutic uses for ARDS and obesity in the future.

The Role of Skin Microbiota in Lipid Production and Skin Disease

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Bacteria are known to be a vital part of human health, and in illuminating their role in maintaining health, their spatial organization and metabolic contributions to different organ and tissue systems is increasingly being recognized. Much of what is known about the human skin microbiome is limited to diseased skin, which often shows a lipid imbalance: either too dry or too oily. There is little information available that addresses the role of microorganisms in a healthy skin environment; in particular the connection between skin microorganisms and skin lipid content. The objectives of this research are to identify the bacteria, one of the most prevalent types of skin-associated microorganisms, associated with different layers of the skin, and to link the presence of skin lipids with the bacterial distribution. To accomplish the objectives, a tape-stripping method used in forensics has been modified for the collection of skin bacteria and lipids. A combination of bacterial genetic sequencing techniques along with chemical lipid analyses will elucidate the relationship between skin microorganisms and skin lipids.

3,4-Methylenedioxymethamphetamine (MDMA, ecstasy) Reduces Fear in an Animal Model of Post-traumatic Stress Disorder

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Traumatic memories are at the heart of post-traumatic stress disorder (PTSD). Therapeutic strategies for PTSD thus focus on inhibiting fear memories, but these strategies have poor long-term efficacy. Psychotherapy paired with MDMA has shown promise in reducing symptoms of PTSD, but the means by which MDMA reduces fear is unknown. MDMA administered during psychotherapy could either enhance fear extinction (learning that trauma cues no longer predict threat) or impair fear memory reconsolidation (process of strengthening fear memories after recall). The goal of these experiments is to determine the effects of MDMA on fear extinction and reconsolidation in a rodent model of PTSD. Adult, male rats were exposed to a traumatic event which results in strong fear memories. To determine the effect of MDMA on extinction, rats were given saline or MDMA (1, 2, or 3 mg/kg; i.p.) the next day, immediately prior to fear extinction learning. To determine the effect of MDMA on fear memory reconsolidation, rats were briefly re-exposed to the trauma context in order to reactivate the fear memory. Saline or MDMA (3 mg/kg) was administered immediately after fear memory recall, during the fear memory reconsolidation phase. Strength of the fear memory was tested 1 or 7 days later. MDMA (3 mg/kg) enhanced short-term fear extinction memory, but only when memory was tested in the extinction context. MDMA interfered with fear memory reconsolidation. Data suggest that extinction or reconsolidation could be targets of MDMA-paired psychotherapy, and reveal potential limitations of the clinical value of MDMA.

The Effects of TNFa on Gap Junctions in Lung Epithelial Cells exposed to Polycyclic Aromatic Hydrocarbons

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We study low molecular weight polycyclic aromatic hydrocarbons (LMW PAHs) abundant in second-hand smoke, which is often linked to pulmonary disease. We previously demonstrated that LMW PAHs, 1-methylanthracene (1-MeA) and fluoranthene (Flthn), inhibit gap junctions, decrease connexin 43 (Cx43) expression, activate MAP kinases, and induce inflammatory mediators, such as tumor necrosis factor alpha (TNF). Gap junctional intercellular communication (GJIC) is involved in lung tissue homeostasis and GJIC inhibition could potentiate pre-existing disease states. In this study, we hypothesized that TNF inhibits GJIC alone and that a LMW PAH mixture (1-MeA and Flthn) exacerbates this response. We used MTS assays for cytotoxicity, scalpel-loaded dye transfer assays to measure GJIC, connexin (Cx)43 immunoblots, and TNF antibody neutralization in a mouse alveolar type II pneumocyte cell line (C10 cells) in the absence or presence of the PAH mixture at two time points. Cytotoxicity was not observed with any treatment up to 48h. After 4h, TNF inhibited GJIC significantly at all doses (0.1-20 ng/ml) compared to control and at 24h the inhibition was further enhanced. After 24h we observed a significant GJIC reduction with TNF and PAH mixture exposure when compared to single compound treatment. Cx43 immunoblots and TNF neutralization both corresponded to the GJIC findings. These results support a role of TNF on lung epithelial cell GJIC dysregulation and suggest that individuals with pre-existing lung disease may be more susceptible to environmental exposures when compared to healthy controls. Future studies will validate these results using human cell lines and co-culture studies.

Analysis of In-group Bias: Understanding How Individuals Maintain In-Group Advantages Under Cognitive Stress

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John Power, Psychology,
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In-group bias is the tendency to benefit members of one's own groups over members of other groups This is where discrimination arises and The dictator game is an economic game that is designed to question how willing people are to act against their sole interest and share economic resources with a stranger. This method can be used to determine the amount of pro social behavior being displayed by the participant for members of their own group while measuring the amount of negative discrimination against an individual of a different group. Additionally, stress has been linked as a catalyst for individuals displaying discriminatory behaviors (Kenrick, Neuberg, & Cialdini, 2010). In this experiment we will use the dictator game model along with a significant stressor to determine if individuals display more intergroup conflict behavior while under cognitive stress. We will provide the participant with a series of timed math problems before having them disperse resources to the other constituent. By doing this we expect to see a decrease in altruistic behaviors when individuals are dispersing resources to other from differing ethnic backgrounds. If individuals are being given fewer economic resources based on their race, it would result in fewer opportunities for upward social mobility with individual from that racial group being discriminated against. Since the majority of hiring managers are white and under a significant amount of cognitive stress, this could prove that these individuals are more likely to hire individuals with similar racial background due to in-group bias

Acing the Headlines: How WWI Veteran Pilots used Journalism to Galvanize American Aviation from Entertainment into Function, 1910-1930

Chloe Russell, History/Ethnic Studies,
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Mentor: Dr. William Wagner,
DC - College of Liberal Arts and Sciences

This paper examines how WWI American Veteran pilots changed the discourse of journalism surrounding aviation in order to promote safety regulations, thus influencing future success for the American flight industry. The conclusions made in this paper are drawn from research conducted at the archives in the Western History Collection at the Denver Public Library, along with scholarly secondary source material. My oral presentation will discuss the research process for historical writing, and how reading sources "against the grain" – looking for tensions or unanswered questions in the primary source material – helps expand research possibilities. I will demonstrate that having a proper scale for the research topic enhances the credibility of the narrative. It is easier to accurately argue what the causes or effects of a significant event were for a grouping related by time and place. For example, my paper is able to identify how WWI American veteran pilots specifically encouraged the U.S. government to federally regulate aviation safety by educating the public on aviation, a feat which eventually benefited the flight industry by 1940. It would be impossible to argue the impact of all American pilots from 1910-1930 in just one semester. Finally, I will discuss how to properly paraphrase sources, format citations, and write a historiography.

Investigating GSK-3-Dependent mRNA Methylation

Chloe Sanders, Psychology/Economics,
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Sanju Garimella, Biology,
DC - College of Liberal Arts and Sciences

Mentor: Dr. Christopher Phiel,
DC - College of Liberal Arts and Sciences

Glycogen synthase kinase-3 (GSK-3) is a protein kinase involved in many intracellular regulatory events. A novel role for GSK-3 was recently discovered by our lab – the regulation of mRNA methylation, referred to as m6A (methylation of adenosine bases at the C6 position). The m6A modification of mRNA is believed to control the stability of mRNA, and thus the persistence of gene expression. We have found evidence that GSK-3 controls m6A levels by regulating the enzyme that demethylates mRNA, FTO. In this study, we quantify m6A mRNA levels in mouse embryonic stem cells using two different techniques. In addition, we have cloned the FTO gene into a lentiviral vector, which will permit us to overexpress FTO in a variety of cell types, including induced pluripotent stem (iPS) cells.

Student Perceptions of Learning Objectives in Their Psychology Department

Veronica Scherbak, Psychology,
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Mentor: Dr. Mitchell Handelsman,
DC - College of Liberal Arts and Sciences

What do psychology majors think about how much their psychology department values a variety of learning objectives? We are asking psychology majors about objectives that employers, the literature, and the American Psychological Association (APA) have identified as important. Employers believe that schools are not preparing graduates well enough for the job market. Empirical studies and other literature identify a variety of important skills, such as communication, critical thinking, leadership, and teamwork. The APA outlines learning objectives that it expects psychology majors to acquire which, in addition to knowledge about psychology, include many of the skills sought by employers. Despite this overlap in learning objectives, students are falling short of expectations. The skill gap may be partially due to psychology curricula failing to emphasize the importance of certain skills. If psychology departments don't expose students sufficiently or effectively to their set of goals, there may be a disconnect between what departments want students to get out of their education and what they are actually getting. If students are consistently exposed to certain learning goals in their courses and are told about them explicitly, they should believe they are important and strive to achieve them. By asking students to rate the importance of these objectives, this study will yield information about student beliefs that can be used to identify changes that could be implemented to improve students' acquisition of skills and knowledge. Psychology departments may be able to use the results (and the questionnaire) when designing and assessing their learning goals.

1700 Years of Anthropogenic Influences: An Ecosystem Study of Northern Vietnam's Van Don Island

Olga Serenchenko, Geography, Environmental Sciences,
DC - College of Liberal Arts and Sciences

Christopher Andersen, History,
DC - College of Liberal Arts and Sciences

Mentor: Dr. Christy Briles,
DC - College of Liberal Arts and Sciences

Vietnam has a long history of human occupation (>4000 years) making it a significant region for studying anthropogenic factors influencing tropical ecosystems. A sediment core from Van Don Island was analyzed using a multi-proxy approach to examine the degree to which humans impacted the landscape. Charcoal and pollen were used to reconstruct fire and vegetation, coprostanols to approximate population levels, and carbon/nitrogen ratios and loss-on-ignition data to determine wetland productivity. The data suggests three distinct zones in the record. The first zone (1750-1000 cal yr BP) indicates a small population on the island, likely practicing rice agriculture while minimally impacting the environment. The second zone (1000-450 cal yr BP) indicates a significant decrease or movement of people away from the site location and a shift away from local cultivation of rice to other uses of the island. Historical sources suggest the island was used as a port in this time period, trading goods between the capital of Northern Vietnam and other nearby Asian countries. The third zone (450 cal yr BP to present) indicates a shift back to agriculture and away from trade as population increases greatly. We assume this shift is initially due to a movement of the northern capital away from the Red River Delta and, later on, because of a change in ship size, greater regulation, and island isolation from foreigners. Future research involves analyzing a core taken in December 2015 at the Van Don port site to compare the spatial impact of trade and agriculture.

Mutant Zygote Arrest (Zar) Proteins Disrupt Embryogenesis in Xenopus Laevis

Cameron Severn, Biology,
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Mentor: Dr. Amanda Charlesworth,
DC - College of Liberal Arts and Sciences

Zygote arrest (Zar) proteins are known to play an important role in embryogenesis. However, the molecular mechanism of action of these proteins are not yet fully understood. It has been shown in KO mice that without Zar1 or Zar2 proteins, the embryo arrests at the 1 or 2-cell stage respectively. However, mouse embryos are small and difficult to use in biochemical studies. We therefore used Xenopus Laevis embryos as a model to study the molecular function of Zar proteins. Previous studies have recognized the role of Zar proteins in translational control and have identified the major functional protein domains. However, a dominant negative phenotype for Zar in X. laevis has not yet been established. Here a truncated mutant of Zar2 is constructed that contains only the C-terminal RNA binding domain. This mutant Zar2 was designed to disrupt embryogenesis in Xenopus laevis oocytes and establish a dominant negative phenotype.

Extended Weight Loss Maintenance for Individuals in a National Non-profit Weight Loss Program

Emmanuel Seyoum, Biology,
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Other collaborators: Victoria Catenacci, Anna Furniss,
AMC - School of Medicine

Mentor: Dr. Nia Mitchell,
AMC - School of Medicine

Background. Significant, long-term weight loss is defined as =5% weight loss maintained for at least one year. Many who lose weight with lifestyle intervention regain weight within one year. Objective. To examine weight change categories of weight loss program participants who achieved =5% weight loss in their first year of participation and determine the extended weight loss maintenance among these individuals for up to seven years. Study Design. Retrospective cohort study of individuals who joined Take Off Pounds Sensibly (TOPS), a national, nonprofit, peer-led weight loss program, from January 2005 to December 2010, with at least two consecutive annual renewals. Outcome measures/ statistical analyses. Cumulative annual weight change was calculated as percentage change from baseline weight at initial enrollment and placed into one of three categories: significant weight loss (SWL, weight loss =5% of baseline); weight stable (weight change of 0 to <5% of baseline); and weight gain (from baseline). Individuals in the SWL category were followed for subsequent years of enrollment to determine if they continued to maintain SWL. Starting weight and percentage change in weight were compared. Linear random effects models were used to test for significant percentage change for follow-up years. Results. Approximately 80-95% of individuals who achieved SWL from baseline and renewed their membership the following year remained in the SWL category for up to seven years. Conclusions. Some TOPS participants can maintain weight loss for extended periods of time. A randomized controlled trial should be conducted to determine efficacy and which populations it is most effective.

How Children Feel About the Community They Belong To

Desirae Souza, Elementary Education,
DC - School of Education and Human Development

Mentor: Ms. Lisa Silverstein,
DC - School of Education and Human Development

As adults, we may not consider the views that children have on the communities they belong to. My inquiry question was developed through volunteering at the Boys and Girls Club in the fall. I focused on the truth in how children feel about their community. Throughout my documentation I found three concurrent themes that the kids I had worked with brought to my attention: race, selflessness, and family. I inquired that the children were well aware of race and racial differences among their families and peers. To understand selflessness, most of the children were always trying to help their peers rather than doing what they needed to do personally. When I asked deeper questions with the kids it had become clear that this wasn't only the case at the Boys and Girls Club. Those same kids also helped at home with family members as well, which at such a young age surprised me of the tasks that they were undertaking. Another theme that was present was most of the kids I had worked with all had immediate and extended family members that attended the same school, the club, and even shared the same home. This conveyed to me that the family aspect of their community was very strong. Throughout my next field experience at Montview Elementary School I plan to inquire further how children feel about their communities.

Stop It! Individual Differences in Working Memory Capacity Predict Performance in a Stop-Signal Paradigm

Kimberly Spahr, Psychology,
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Other collaborators: A. Eve Miller, University of Utah

Mentor: Dr. Jason Watson,
DC - College of Liberal Arts and Sciences

Individual differences in working memory capacity (WMC) predict performance in a variety of opponent processing tasks (e.g., Stroop, Simon, anti-saccade), where participants must inhibit a response to fulfill task instructions. This study finds similar predictive results in the stop-signal paradigm with 75% "go" trials and 25% "no-go" trials. Participants were required to respond on "go" trials and to withhold their response on "no-go" trials when given an auditory stop signal (Verbruggen, Logan, & Stevens, 2008). Individuals with greater WMC had an elongated "point of no return," indicating they could receive a stop signal later and still successfully arrest their response, compared to those with lower WMC. Results are interpreted within a flexible, attentional control framework, where individuals with greater WMC better maintain task goals and resist interference. Initially, analysis followed an extreme individual differences approach. Currently, we are reanalyzing the continuous set of data to identify a full range of changes in inhibition flexibility as predicted by differences in WMC. We expect to find variation in WMC holds significant predictive value for inhibition control throughout the full data set.

The Image-Restoration Strategies used by the New England Patriots in dealing with Crisis Management

Andrew Sturt, Communication,
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Mentor: Dr. Sonja Foss,
DC - College of Liberal Arts and Sciences

One of the earliest instances of sport scandal was the infamous 1919 Black Sox scandal, in which players of the Chicago White Sox were found guilty of "throwing" the World Series in exchange for monetary bribes. Ethical failures in sport continue to occur, and, as a result, athletes, executives, and teams are forced to respond. Over the course of time, sport communication crisis strategies have evolved due to media coverage and the fact that organizations and athletes now have models of how to manage crisis from past scandals. When an athlete or a team breaks the rules, there are often consequences that extend far beyond the field. Because of the blurred lines between gamesmanship and cheating and the immense social impact and popularity of sport, ethical scandals are more prominent and have a much larger impact than ever before. Successfully managing these scandals is important because of the relationships that key stakeholders (fans, sponsors, leagues, exc.) have with organizations and athletes. Over the last 10 years, the NFL's New England Patriots have been involved in three major scandals: "Spygate," "Deflategate," and the Aaron Hernandez murder trial. Guided by William L. Benoit's (1995) image-restoration theory, this study is an examination of the image-restoration strategies and communication methods used during these scandals by the four major "faces" of the Patriots franchise: quarterback Tom Brady, Coach Bill Belichick, owner Robert Kraft, and the franchise itself.

The Art Market: Gender Gaps and Market Progression

Colleen Sullivan, Fine Arts, Art History,
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Mentor: Dr. Maria Elena Buszek,
DC - College of Arts and Media

The art market is a complex and large financial market that lacks regulation and completely dependent on trends and fads. Fine art is a unique commodity in that the value of its worth as a consumer good is reliant on the expansion of one's consciousness and cultural knowledge. This form of financial investment in the art market reflects the investor's cultural and educational class rather than pure wealth. Value of artwork is determined by the trends and fads of the time. Historically male artists work has sold at a greater price and more commonly than female artists. Because of the lack of defined regulation and pricing in the market as well as fads determining such pricing it becomes evident that the art market is gendered in favor of male artists. I will discuss the large gender gap that drastically separates female artists sales from male artist sales. Beginning with what caused the gender gap in the art market and leading into the progress being made in closing this gender gap as well as the amount of inequality that still exists within the present day art market.

Fashion and Feminism: How We Wear the Movement

Cassidy Tierney, Fine Arts, Art History,
DC - College of Arts and Media

Mentor: Ms. Maria Buszek,
DC - College of Arts and Media

Fashion is one of the most constant artistic forms that has proven to both transcend and transform generations. This is particularly true in relation to sociopolitical movements. Fashion and feminism might seem like an incompatible pairing; however, their relationship is one that is mutually definitive. While feminist scholars have been justifiably weary of the fashion industry, the feminist community is becoming more accepting of fashion as both creatively and politically beneficial. In the contemporary market, the fashion industry rapidly adapts to trends that are financially beneficial. More and more young people are beginning to identify as feminists, and the fashion industry has taken note. Collections by big brands have made feminism trendy by featuring collections that are meant to appeal to a new, feminist, independent generation of women. While some argue that this trend is shedding light on the feminist cause, others argue that this watered-down, mass-produced form of feminism is dangerous. Building upon my previous research on the contemporary fashion market and coming from a scholarly feminist background, I will examine whether the fashion industry's current obsession with feminism is beneficial for the cause or is simply a way to make profits for larger companies through a comprehensive oral presentation accompanied by a PowerPoint.

Investigating the Differences in Membrane Binding Cooperativity between the Tandem C2 Domains of Synaptotagmin 1 and Synaptotagmin 7

Hai Tran, Chemistry,
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Daniel Giardina, Chemistry,
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Matthew Coffman, Chemistry,
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DC - College of Liberal Arts and Sciences

Mentor: Dr. Jefferson Knight,
DC - College of Liberal Arts and Sciences

Synaptotagmin 1 (Syt1), a Ca2+ sensor involved in exocytosis in pre-synaptic neurons, contains a characteristic tandem C2 sequence (C2AB) which inserts into anionic membranes in the presence of Ca2+. Previous studies have shown that the C2AB fragment of Syt1 inserts into target membranes more deeply than either individual C2A or C2B domain, suggesting cooperative interaction between C2A and C2B in the membrane-docked state. This behavior stands in apparent contrast to that of another family member, Syt7, whose C2A and C2B domains have been shown to bind membranes independently. To compare the cooperative behaviors of the C2 domains in these two isoforms, the dissociation kinetics (off-rates) of protein-liposome complexes were measured upon addition of the Ca2+chelator EDTA using stopped-flow fluorescence spectroscopy. Using liposomes composed of a 1:1 mixture of phosphatidylcholine and phosphatidylserine (PC/PS), the Syt1 C2AB tandem domain exhibits a much slower off-rate than either of the single domains. In contrast, dissociation kinetics for Syt7 C2AB were best fit to a two-step model in which each rate constant matches those from the individual domains. This preliminary result supports the presence of interdomain interactions in the membrane-docked state of Syt1 C2AB but not Syt7 C2AB. These experiments were performed with protein domains purified using affinity chromatography with high-salt washes and verified to be >95% free of nucleic acid contaminants; ongoing work aims to assess effects of polyanions on this apparent cooperative behavior.

Home in the Heart: Champa House

Sherleen Tran, Public Health,
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Bonnie Le, Chemistry,
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Rachel Beam, Biology,
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Cailey Daniels, Biology,
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Hamzah Chahien, Biology,
DC - College of Liberal Arts and Sciences

Yazmin Castillo, Pre-Nursing,
DC - College of Liberal Arts and Sciences

Calida Lieu, Pre-Medicine,
DC - College of Liberal Arts and Sciences

Mentor: Ms. Trishia Vasquez,
DC - College of Liberal Arts and Sciences

In the Denver Metro area in 2015, over 6,100 people were without a regular dwelling. Out of the 6,100 homeless individuals, 47% of them were women and children (The Gathering Place, 2015). Many women are forced into homelessness due to domestic violence and abuse. Children, especially, suffer a great deal from being homeless. Homelessness has a devastating impact on children and youth's educational opportunities. According to a 2014 report from the Denver Coalition, children lose about half a year worth of education because their parents cannot afford to send them to school. It can be very difficult for a mother to feed and clothe her children while working and raising a family, especially if they are homeless. In Denver, homeless women and children can apply for housing at homeless shelters. The Champa House, one of such shelters, provides single mothers the opportunity to begin a new and independent life. At Champa House, they go through transitional phases that will teach them to balance their busy lives from grocery shopping on a budget to teaching them about career goals – not jobs, but careers. Knowing that these mothers work hard to raise their children, Home in the Heart was developed to support these individuals. We plan to host a game night on the Auraria Campus in order to collect toiletries, household items, and beauty products so that the women and children can still enjoy the wonders that life brings, even during hard times.

Three-Way Mirror

Joey Verbeke, Music, Recording Arts,
DC - College of Arts and Media

Mentor: Mr. Jeff Merkel,
DC - College of Arts and Media

When you think of a mirror, a reflection of what you look like at that current point in time is probably the only thing that comes to mind. This project took on the challenge of leveraging art and technology to explore the way in which one can interact within the context of a mirror. Using a two-way mirror, a computer screen behind it, face tracking technology, and mixing this all with creative code I was able to create a way in which a participant is able to interact through time with the previous person to look in the mirror. “Three-Way Mirror” is also an expression of our times, in which so much of our interaction is done through technology, and how we abstract our digital self from what’s really on the other side of the mirror.

Gang Reduction Initiative Maps

Lauren Vialpando, Criminal Justice,
DC - School of Public Affairs

Mentor: Ms. Nora Scanlon,
DC - School of Public Affairs

During my time as an intern for the Gang Reduction Initiative of Denver (GRID), I have been able to assist in a number of mapping projects. There are three different maps that set out to explain different information that helps provide a visual representation of GRID’s mission and the individuals they are dedicated in helping. The first map is the Ceasefire Project and it shows the crime density as well as specified crimes that are occurring in targeted ceasefire areas. Ceasefire is considered an area where small groups of individuals are responsible for the majority of gun and gang violence in Denver. Therefore, when there is a shooting, in addition to arresting and prosecuting those involved, the law enforcement response will focus its attention on the activities of the entire group. The second map is considered the intervention map, its purpose is to give a visual representation of GRID’s clients while illustrating the age, race, and neighborhood. The last map is resource guide for families that are of low socioeconomic status as well as families that are gang affiliated. It provides a list of different organizations and their location such as non-profits, schools, police stations, religious organizations, and gang intervention. The purpose of the resource guide is to make the resources and their information more obtainable for those who are in need. Each map gives a different representation of the amount crime, those who are involved, as well as the resources that could help prevent it.

Music in the Classroom

Elysia Vigil, Elementary Education,
DC - School of Education and Human Development

Mentor: Ms. Kobi Nelson,
DC - School of Education and Human Development

In my classroom that I have been working in, we sing a song to help with the identification of letters and sounds of the letters. I noticed they didn't understand that these strange lines made letters and the letters made sounds and when put together, these letters and sounds made words. I made a video of the sounds and letters with individual pictures. We have been showing the video to the students and the results have been astronomical! They were paying attention to the video and singing along. This song helped tremendously in their writing. While writing they are working on writing down the beginning sounds of the words they want and some of them are even sounding out the whole word to the best of their ability. All but two of my students can identify all of the letters and the sound that goes with the letter.

Low Molecular Weight Polycyclic Aromatic Hydrocarbon Mixture effects on NALP3 Inflammasome

Ka-Na Xiong, Biology,
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Mentor: Dr. Alison Bauer,
AMC - Colorado School of Public Health

In the environment, secondhand, and thirdhand smoke, Polycyclic Aromatic Hydrocarbons (PAH) are present. PAHs can be divided into high molecular weight (HMW) PAHs which are considered carcinogenic and low molecule weight (LMW) PAHs that are considered non-genotoxic, yet far more abundant. Little is known about the LMW PAH inflammatory effects in lungs, specifically their effects on the inflammasomes, however previous studies showed that these PAHs can induce several cytokines. Environmental toxicants (eg. silica, asbestos) can lead to oxidative stress that in turn activates complex mechanisms, such as NOD-Like receptor (NLR) signaling pathways and inflammasomes. Thus, we hypothesized that LMW PAHs induce oxidative stress activating the pyrin domain-containing protein 3 (NLRP3) inflammasome that contributes to lung inflammation. We investigated two environmentally relevant LMW PAHs singly and in binary mixtures (1-methylanthracene (1-MeA) and fluoranthrene (Flthn)) for their effects on gap junction intercellular communication (GJIC) activity using a scalpel loaded/dye transfer assay in the presence of NLRP3 inhibitors or antioxidants, as well as gene expression using RT-PCR of signaling pathways downstream of NLRP3. PAH treatment demonstrated inhibition of GJIC and this inhibition was partially reversed in the presence of a NLRP3 inhibitor called glybenclamide or an antioxidant (NAC). Caspase 1 (Casp1) and interleukin 1? (Il1?) genes were also elevated following PAH treatment, further supporting a role of the NLRP3 inflammasome in eliciting inflammation in response to these PAHs. We will investigate other potential links between the LMW PAHs, oxidative stress, and the NLRP3 inflammasome in future studies.

A Molecular Dynamics Study of the Effects of Protein Thermal Fluctuations on Electron Transfers Within the Photosynthetic Reaction Center of the Bacterium Rhodopseudomonas viridis

MacKenzie Zarecki, Biology,
DC - College of Liberal Arts and Sciences

Mentor: Dr. Hai Lin,
DC - College of Liberal Arts and Sciences

The transformation of light energy into chemical energy by the process of photosynthesis is accountable for all of life on Earth, and thus, makes our understanding of this mechanism of the utmost important. The photosynthetic reaction center is a transmembrane protein responsible for separation of charge during photosynthesis. In the bacterium Rhodopseudomonas viridis (Rps. viridis), a photon excites an electron in a chromophore dimer called the special pair (PS). The excited electron is then transferred through a bacteriochlorophyll chromophore to a bacteriopheophytin and then to a menaquinone molecule. A final electron transfer reduces a ubiquinone acceptor molecule which then diffuses away from the reaction center to another protein complex. In this study, we carry out molecular dynamics simulations to explore the change in energy of the photosynthetic reaction center in the primary electron transfer step upon photoexcitation in order to ascertain the effects of protein thermal fluctuations on electron transfer at various temperatures.

Sustainable Building- CCD Confluence Building

Maryam Amrollahi Biuki,
Civil Engineering/Construction Engineering Management,
DC - College of Engineering and Applied Science

Daniel Babyak, Civil Engineering,
DC - College of Engineering and Applied Science

Alan Pagan, Civil Engineering,
DC - College of Liberal Arts and Sciences

Aaron Brice, Civil Engineering,
DC - College of Engineering and Applied Science

Mentor: Dr. Caroline Clevenger,
DC - College of Engineering and Applied Science

This is a video we made for "Sustainable Construction" Course, Focusing on one of Sustainable buildings on Campus: CCD Confluence Building. Youtube Link: https://www.youtube.com/watch?v=IGjCYr-PYF8

Larger Brain Structure and Less Anxiety in Hyperoxia Tolerant Rats: A Possible New Model for Investigating Post Traumatic Stress Disorder (PTSD)

Kaily Baer, Medicine,
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Other collaborators: Paul Wilson, Dr. Nicolas Busquet, Dr. Michael Mesches, Kendra Huber, MR/CT RT, Dr. Natalie Serkova, Dr. Alan S. Newman, Qianbin He

Dr. Ana Fernandez-Bustamante,
AMC – School of Medicine

Mentor: Dr. John E. Repine,
AMC - School of Medicine

Purpose of Study Anxiety related to various factors, most notably Post-Traumatic Stress Disorder (PTSD), is a medical problem that disrupts daily life. For unknown reasons, after trauma, only certain individuals develop anxiety and PTSD. Reduced brain hippocampal volume has been implicated as a possible contributor to anxiety and PTSD susceptibility but this relationship is unclear. By repeatedly breeding a single rat that unexpectedly survived breathing pure oxygen, we created a unique tolerant strain of rats that all survive indefinitely breathing pure oxygen (hyperoxia) while, in contrast, all control rats die in ~66 hours. Because hyperoxia tolerant (HT) rats also have bone marrow mononuclear cell precursors and blood monocytes that have naturally increased expression of heme oxygenase 1 (HO-1)—a multidimensional anti-inflammatory antioxidant, HT rats provide an ideal opportunity to learn about anxiety, hippocampal volume, and increased HO-1 expression. Methods Used Young (~3-6 month) control and HT Sprague-Dawley rats were tested using a battery of behavioral tests including contextual fear conditioning, zero maze testing, and open field testing. Brain volumes were measured with MRI. Conclusion We speculate that increased HO-1 expression in brain microglia cells derived from bone marrow mononuclear cells and blood monocytes reduces brain inflammation and oxidative stress and may contribute to the increased hippocampal volumes and reduced anxiety of HT rats. HT rats are therefore a new model for investigating anxiety and PTSD and conditions associated with increased brain inflammation and oxidative stress, such as Alzheimer's Disease.

Exercise and Dopamine Modulation of Fear Extinction: Utilizing Exercise and Underlying Mechanisms to Treat Anxiety Disorders

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DC - College of Liberal Arts and Sciences

Toni M. Nicastro, Integrative Biology,
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Megan A. Miner, Integrative Biology; Psychology,
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Brian A. Lloyd, Integrative Biology,
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Nathan M. Gray, Psychology,
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Esteban C. Loetz, DC - College of Liberal Arts and Sciences

Mentor: Dr. Benjamin N. Greenwood,
DC - College of Liberal Arts and Sciences

Anxiety and trauma-related disorders are prevalent and debilitating, yet treatments lack long-term efficacy. Behavioral therapies such as extinction-based exposure therapy are beneficial but highly susceptible to fear renewal— the return of fear outside of the therapy context. Exercise is emerging as a healthy, non-invasive, inexpensive means to augment fear extinction. Recent evidence from our lab supports this notion, as physical exercise immediately following fear extinction both enhanced fear extinction memory and reduced the later renewal of fear in adult, male, Long Evans rats. Exercise impacts a variety of peripheral and neurobiological systems, one being midbrain dopamine (DA) circuits. Viral-mediated transfer of a gene coding for a Designer Receptor Exclusively Activated by a Designer Drug (DREADD) allowed us to control activity of select populations of DA neurons with high specificity during fear extinction. DREADD-induced activation of midbrain DA neurons during fear extinction mimicked the effects of exercise: rats displayed enhanced fear extinction memory and reduced fear renewal. One consequence of midbrain DA neural activity is activation of DA-1 receptors (D1) in the dorsal striatum. Populations of dorsal striatum D1-expressing neurons are anatomically linked to fear circuits. Interestingly, pharmacological activation of D1 in the dorsal striatum during fear extinction blocked fear renewal but had no effect on fear extinction memory. These data suggest that activation of midbrain DA neurons is sufficient to reproduce the memory-modulating effects of exercise, and these effects are partly mediated by D1 signaling in the dorsal striatum.

Post-Traumatic Growth Using Equine-Assisted Intervention for Veterans with PTSD

Allison Boyrer, Nursing,
AMC - College of Nursing

Eleni Padden,
AMC - College of Nursing

Mentor: Dr. Cheryl A. Krause-Parello,
AMC - College of Nursing

A staggering number of veterans are exposed to traumatic events during the course of their service. Studies examining the transition of service members from the military culture into civilian society have provided vital empirical information regarding the emotional challenges associated with this significant lifestyle change, and the pressing health care needs of those who have served. Critical health issues that may occur during reintegration after trauma include depression, anxiety, substance use, and suicide. Effective interventions are urgently needed to facilitate re-adjustment and post-deployment health and well-being. There is currently a dearth of knowledge on equine assisted intervention (EAI) and its effects upon post-traumatic stress disorder (PTSD) symptomology in military veterans. Recent literature posits that post-traumatic growth (PTG) entails undergoing processes of psychological shifts in relating to the world subsequent to traumatic event(s), and contributing to a renewed appreciation for life. EAI incorporates understanding the horse and their distinct personalities, attitudes, and moods, and has strong potential to be therapeutic for veterans during the process of transitioning into a civilian society. For veterans experiencing recurring thoughts of trauma, having an animal near requires the focus to be shifted away from self and outward, towards the horse and their needs, allowing for a reorienting of prioritizations that may impact shifts in psychological outlook and ultimately promote PTG. Veterans may experience PTG by engaging in EAI—cultivating a greater appreciation for life, more intimate relationships with others, a reduction of fear, recognition of new possibilities for one's life path, and spiritual development.

Identity and Community Life in Colorado, 1890-1945

Rose Campbell, History,
DC - College of Liberal Arts and Sciences

Mara O'Keefe, History,
DC - College of Liberal Arts and Sciences

Natalie Kellett, History,
DC - College of Liberal Arts and Sciences

Taylor Warner, History,
DC - College of Liberal Arts and Sciences

Mentor: Dr. William Wagner,
DC - College of Liberal Arts and Sciences

This panel will examine the construction of social identity in various Colorado communities from the 1880s to World War II. During this transformative period, commercial and industrial development in cities like Denver, mining booms, the expansion of commercial agriculture and ranching, and a variety of other developments brought a diverse array of migrants to the state. Confronted with social fluidity and demographic change, residents of major urban centers, mining towns, and rural communities often worked to bolster their socioeconomic status by defining their own identity against one or more social "others." The three papers that comprise this panel offer new insights into this important aspect of community formation in Colorado. The first paper analyzes how "regular" physicians in Colorado used the state's first medical licensing law to marginalize homeopathic doctors and other "irregular" physicians in 1880s. The second paper uses the story of one married couple, Thomas and Emma Clark, to illuminate the emergence of a culturally distinct middle class in Aspen, Colorado, around the turn of the nineteenth century. The final paper investigates how issues of ethnic, national, and ideological identity shaped interactions between German POWs and the rural Colorado communities that housed them during World War II.

The Importance of Content and Pattern to Birds that Breed in Grassland Ecosystems

Amber Carver, Integrative & Systems Biology,
DC - College of Liberal Arts and Sciences

Mentor: Dr. Michael Wunder,
DC - College of Liberal Arts and Sciences

An emphasis on habitat state, which I refer to as content, has been suited to the single-species approach to ecology. Others have recognized the importance of habitat variability (pattern) in providing resources for whole communities. My research focus is the importance of both content and pattern in determining the distribution and survival of individual species, which then drives community stability. I study ground-nesting birds on the shortgrass steppe. In this system, content is influenced mainly by grazing and weather. Pattern is influenced by the way the distribution of grazing and weather fluctuates over space and time. As bison have been removed from the system and replaced by cattle with more fixed distribution, the magnitude of fluctuation in grazing has been dampened. Rangeland scientists are testing ways to restore pattern through a cyclic grazing regime. Their objectives include increasing the viability of declining bird species (a content-centric objective) and the stability of the community as a whole (a pattern-centric objective). However, reconciling these two objectives requires knowing how species respond to habitat patterns via distribution and reproductive output. Over the past two years, I have monitored 561 nests and studied how the outcome of these nesting efforts is influenced by system content and pattern. Preliminary results suggest vegetation affects species in different ways, but its effect can be overruled by weather, which may have a more uniform impact on the community. Moving forward, I will study the unfolding effects of grazing-driven pattern, investigating how the community responds to an engineered system.

Groundwater Modeling For Alluvial Aquifer Storage and Recovery

Cibi Vishnu Chinnasamy, Civil Engineering,
DC - College of Engineering and Applied Science

William C. McIntyre, Civil Engineering,
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Mentor: Dr. David C. Mays,
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The implications of climate change in the western United States are causing water managers to reassess water storage. In Colorado, the era of large above-ground dams and reservoirs is probably over, due to environmental and endangered species concerns. A recent study estimated about 12 cubic kilometers (10 million acre-feet) of storage is possible in the South Platte River Basin alluvium of northeast Colorado. This presentation provides a brief overview of alluvial aquifer storage and recovery on the South Platte River downstream of Denver, Colorado, and provides a groundwater model highlighting the feasibility of alluvial aquifer storage and recovery in our semiarid climate where water administration is based on the doctrine of prior appropriation. Computer software from the U.S. Geological Survey, MODFLOW, is used to simulate various characteristics of the system. Preliminary MODFLOW simulations of clogging, soil matrix stability, consolidation, and aquifer recharge times indicate the feasibility of implementing this aquifer storage and recovery system with a storage capacity of 120,000 cubic meters (100 acre-feet). The aquifer can be filled in 5 to 13 days depending on the degree of clogging, and overall soil consolidation predicted is approximately 40 mm, assuming the soil matrix is elastic. Results demonstrate that alluvial aquifer storage and recovery facilities are a feasible option to meet rising water demands of Colorado, prevent loss of water due to evaporation, reduce the effect of climate change on water resources, and promote water security projects in semiarid climatic regions.

A Computational Study of CtBP1-peptide Complex

Nara Chon, Chemistry,
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Eun-bie Shin, Biology,
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Mentor: Dr. Hai Lin,
DC - College of Liberal Arts and Sciences

The human C-terminal binding protein 1 (CtBP1) is a NAD(H)-dependent transcriptional co-repressor. It regulates cell cycle by binding a Pro-X-Asp-Leu-Ser (PXDLS) motif in the sequence-specific DNA-binding proteins, where X is an arbitrary but usually hydrophobic residue. The overexpression of CtBP1 causes disruption to cellular signal for apoptosis leading to uncontrolled cellular growth, or cancer. [1,2] The goal of this study is to use computer modeling to identify and optimize peptides as CtBP1 inhibitors; the inhibitors may help to restore the programmed cell death caused by CtBP1 overexpression. In particular, we performed atomistic molecular dynamics (MD) simulations, and Poisson-Boltzmann and Generalized Born surface area calculations (PBSA/GBSA) for a series of peptides that contain the PXDLS sequence. [1] Molly, D. P. et al. J. Biol. Chem. 1998, 33, 20867-20876. [2] Nardini, M. S. et al. EMBO J. 2003, 22, 3122-3130. Acknowledgments: This work is supported by University of Colorado Denver Office of Research Services and Dreyfus Foundation (TH-14-028), and uses computational resources of XSEDE (140070) and NERSC (m2495).

Lightning, Magnetospheric Ducts, and Whistlers

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Mentor: Dr. Mark Golkowski,
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Lightning can be described as a giant electrostatic discharge of electricity during an electrical storm. Lightning strokes emit a broadband pulse of radio waves with frequency range from 0 Hz to over 100 kHz. A fraction of the energy from the lightning discharge (very low frequency (3 kHz to 30 kHz)) gets injected into the Magnetosphere (magnetosphere is that area of space, around a planet, that is controlled by the planet's magnetic field). Generally, waves in the magnetosphere follow complex trajectory. Field aligned density irregularities known as "Ducts" serve as guiding structures which maintain the direction of the wave along magnetic field. Ducted waves arrive normal to ionospheric boundary and we receive these trapped waves as a whistler wave. A whistler is a VLF electromagnetic wave that originates from a lightning strike which propagates into the earth's magnetosphere and follows a field line to the opposite hemisphere of the earth. It undergoes dispersion of several kHz due to the slower velocity of the lower frequencies through the plasma environments of the ionosphere and magnetosphere. Thus they are perceived as a descending tone which can last for a few seconds. The purpose of this work is to analyze dispersion of whistler waves both theoretically and experimentally. To achieve this goal we used advanced equipment (VLF receiver antenna, low-noise amplifier, GPS synchronizer) to receive VLF signals from lightning discharges. We then used a whistler analysis software in order to analyze observed whistlers and determine their L-parameter and equatorial electron density. Analyzing whistler waves will lead to an improved understanding of the nature and properties of the magnetosphere and near-earth plasma. Early works regarding whistler-mode wave propagation was focused on ducted wave propagation, more recent works are more biased toward non-ducted (oblique) wave propagation. Our dispersion analysis of whistler waves shows that the ducted wave propagation better explains the ground-based observations in the conjugate hemisphere.

A Pharmacist-Physician Collaboration to Optimize Benzodiazepine Use for Anxiety and Sleep Symptom Control in Primary Care

Zeta Chow, Medicine,
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Mentor: Dr. Katy Trinkley,
AMC - School of Pharmacy

Introduction: Benzodiazepines are prescribed inappropriately in up to 40% of outpatients. The purpose of this study is to describe a collaborative team-based care model in which clinical pharmacists work with primary care physicians (PCPs) to improve the safe use of benzodiazepines. Methods: A collaborative model of care including clinical pharmacists was implemented to improve safe use of benzodiazepines for anxiety and sleep disorders within a primary care clinic. Adult patients were eligible if they received care from the academic primary care clinic, were prescribed a benzodiazepine chronically, and they were not pregnant or managed by psychiatry. Outcomes included: baseline PCP confidence and knowledge of appropriate benzodiazepine use assessed by an electronic survey, patient symptom severity, and medication changes. Results: Twenty-five PCPs responded to the survey. PCPs reported greater confidence in diagnosing and treating generalized anxiety and panic disorder than sleep or seizure disorders and had variable knowledge of appropriate benzodiazepine prescribing. Twenty-nine patients had at least one visit with 39 total patient visits. In these visits, 59% resulted in the addition or optimization of a non-benzodiazepine medication and 46% resulted in discontinuation or optimization of a benzodiazepine. Generalized anxiety symptom severity scores significantly improved (-2.0; 95% CI: -3.57, -0.43). Conclusions: Collaborative team-based models that include clinical pharmacists in primary care can assist in optimizing high-risk benzodiazepine use. While these findings suggest improvements in safe medication use and symptoms, additional studies are needed to confirm these preliminary results.

An Exploration of Social Media, Protests, and Police-Community Relations

Nancy Contreras, Criminal Justice,
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Mentor: Dr. Mary Dodge,
DC - School of Public Affairs

Few studies have explored the goals and means of recent protests that are calling attention to police misconduct in marginalized communities. This research explores activists' use of social media to organize protests. The study gathers information regarding activists' use of Facebook and Twitter, and how the dynamics of this social movement are constructed as affecting community relations with police. Data collection was conducted through non-participant observation of protest events and semi-structured, in-depth interviews with activists. The findings are essential in establishing a rich narrative of how perceived and real injustice can be challenged through the perspectives of diverse community members.

Src Tyrosine Kinase Activation in Xenopus laevis Fertilization

Elana Costanza, Biology,
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Mentor: Dr. Brad Stith,
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My work uses Xenopus fertilization as a model system to examine the regulation of Src tyrosine kinase by lipid phosphatidic acid (PA). Src and PA are both important in cancer (PA and Src are elevated in tumor cells), metastasis, autophagy associated diseases (Parkinson's, Crohn's diseases), Alzheimer's disease and strokes. We have shown that PA mass increases during Xenopus fertilization and that this lipid binds and activates Src. It is suggested that PA activates Src by reducing one or two intramolecular interactions that keep Src in a compact, inactive conformation. One interaction involves weak bonding between phosphorylated tyrosine 527 near the C-terminus of Src and the SH2 domain of Src, and a second is between the SH3 domain to the proline rich area of the linker region. Src activation normally involves dephosphorylation of tyrosine 527, which breaks the interaction with the SH2 domain, and blocks the SH3 interaction with the linker region by activating agents with multiple prolines. When these two interactions are broken, Src autophosphorylates tyrosine 416 to remove the activation loop from the active site, thus activating it. Using phosphospecific western blotting, my work studies the phosphorylation of tyrosine 527 during fertilization and after PA addition to determine the mechanism of Src activation. Furthermore, when Src is no longer needed, it is believed that an increase in the phosphorylation of Serine 75 results in a repulsion of negatively-charged lipids so that Src is lost from the membrane. This loss occurs during fertilization and is believed to cause Src inactivation.

Reshaping the Underutilized

Brian Dickson, Landscape Architecture,
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Mentor: Mr. Jody Beck,
DC - College of Architecture and Planning

Urban sprawl presents interesting opportunities for activating urban landscape, particularly in areas defined as first ring suburbs. These suburbs were originally located at the perimeter of their respective metropolitan environments. They have however morphed over time into unique spaces deeply embedded in the dense urban fabric. Their position between the city core and outer ring suburbs offers opportunities to connect many vital components of the greater urban environment. In addition, within these first ring suburbs, many blocks and corridors exist as secondary or forgotten spaces such as alleyways, old primary thoroughfares or even open spaces connecting various strips of land. This research will identify the potential connections of open space in these areas and develop potential strategies that can connect and bring neighborhoods of a city together and create opportunities for significant expansion of social capital. The first stage of this research is documentation of open spaces within Congress Park, the Highlands, and Platte Park which have been selected as representative of the first ring suburbs in the Denver metropolitan area. These spaces will be analyzed relative to potential revitalization strategies which focus not only on use by neighboring residents but also on their capacity to create links throughout the urban tissue of the metropolitan area. The revitalization strategies will be organized relative to a typology of open spaces; alley, pocket and coves. The systematic development of these spaces is proposed to lead to new alternatives in everything from to increased social capital, opportunities for increased way-finding, and new connections between. The newly established spaces could not just create new green space but create distinct links between shared elements of a neighborhood and greater community as a whole.

Health Disparities, Health Equity, and Cultural Competency Webinar Module for Health Professional Students

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Mentor: Dr. Dominic Martinez,
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Minority populations have poorer overall health than other U.S. residents which is attributed to lack of access to quality healthcare. This is why it is increasingly important for future healthcare providers to have a basic knowledge of health disparities, health equity, and cultural competency. Despite the interest some students expressed in better understanding these topics, little time was available to further them during medical school. Thus, students and faculty hypothesized that a curriculum designed to introduce these topics before involvement in regular medical school curriculum could help them be more aware of issues involving health equity. The central issue we will address with this research project is to determine the level of understanding students have of health disparities research prior to initiating their clinical training. To assess and increase their knowledge we have developed a module composed of three units offered to students prior to their arrival on campus. The module, created through the PowerPoint based program Adobe Presenter, offers three units designed to introduce students to terminology and issues surrounding health disparities. Using Adobe Presenter we were able to transform ordinary presentations into an interactive Adobe Flash multimedia experience. Our module incorporates captivating narratives demonstrating the importance of these topics, Interactive Webinar Module (IWM) to simulate guest speakers, and quiz questions dispersed throughout to keep students engaged. The module is composed of three thematic subunits including an introduction to health disparities research and equity, introduction to the concept of cultural competency, and actual stories of individuals dealing with health disparities.

Parallel Adaptive Partitioning Algorithms for Multiscale Molecular Dynamics Simulations

Adam Duster, Chemistry,
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Mentor: Dr. Hai Lin,
DC - College of Liberal Arts and Sciences

Multiscale modeling based on the combined quantum-mechanics/molecular-mechanics (QM/MM) methodology describes a system of interest with high accuracy at the QM level of theory, embedded in an environment treated with the computationally efficient MM level of theory. The adaptive partitioning (AP) schemes improve upon conventional QM/MM methodology by reclassifying atoms on-the-fly as QM or MM, allowing a QM subsystem to dynamically change its composition and location throughout a simulation. To accomplish this, a buffer zone is inserted between the QM and MM subsystems in order to provide a smooth transition for atoms exchanging between the QM and MM subsystems. At each step of the simulation, the AP schemes express the potential of the system in a many-body expansion manner, which requires a maximum of 2n QM/MM calculations for the n molecules in the buffer zone. By exploiting the fact that these configurations may be calculated independently, the AP schemes can be parallelized with a maximum 2n theoretical speedup. This work reports the parallel implementation of the AP algorithms using the OpenMP protocol in the molecular dynamics package QMMM.

Previously Undiagnosed Cardiomyopathy Discovered Under General Anesthesia in a Patient with Trisomy 9 Mosaicism: A Case Report

Lauren Eagelston, Medicine,
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Mentor: Dr. Richard Ing,
AMC - School of Medicine

Trisomy 9, a condition in which cells have three copies of the ninth chromosome instead of two, is are rare chromosomal disorder that is not compatible with life. Current literature does describe a small group of living patients that have trisomy 9 mosaicism, a condition in which some cells have three copies of the ninth chromosome and some have two. Mosaic trisomy 9 is associated with cognitive disability, cardiac anomalies, skeletal malformation, and distinct facies, among other common characteristics. Despite the varied presentations of this condition, a case of cardiomyopathy has yet to be described in patients with trisomy 9 mosaicism. Here, we report a case of undiagnosed cardiomyopathy in a patient with mosaic trisomy 9 that was elucidated during general anesthesia.

Musicians without Borders in Palestine

Heath Ellis, Political Science,
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Mentor: Dr. Betcy Jose,
DC - College of Liberal Arts and Sciences

Musicians without Borders (MwB) aims to heal trauma and connect people in conflict or post-conflict zones through music. Among a host of other programs worldwide, MwB partners with a local organization based in Bethlehem called the Sounds of Palestine. Sounds of Palestine runs several music programs in the refugee camps in and around Bethlehem which teach music and support musical activities for refugee and disadvantaged youth. These activities are designed to foster psychosocial healing and community building and to promote conflict resolution in the midst of the ongoing tensions between Israel and Palestine. To this end, I will be participating in a two week cross-cultural program with the Sounds of Palestine which runs from March 18th until April 4th. I will be collaborating with the organization on programming for the two weeks and will serve as a teaching assistant while simultaneously conducting observational research. The data collected from this trip will be included in a Master's Project for the Political Science Department. Specifically this research project examines the decision making processes and the potential for transferability of international non-governmental organizations using music as the primary vehicle for psychological and social healing as well as community building and conflict resolution.

Regulation of m6A through Gsk-3

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Mentor: Dr. Christopher Phiel,
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Glycogen Synthase Kinase 3 (Gsk-3) is a critical serine/threonine kinase known to regulate a diverse array of cellular functions including gene expression, cell differentiation, and cellular proliferation. It is composed of two isoforms, Gsk-3a and Gsk-3ß, and is almost exclusively a negative regulator through phosphorylation of target substrates. Two key pathways known to be affected by Gsk-3 activity are the insulin and Wnt pathways. Both pathways are constitutively active in Gsk-3a-/-; Gsk-3ß-/- embryonic stem cells (ESCs). These mouse ESCs deficient in Gsk-3 have been shown to remain in a pluripotent state capable of indefinite self-renewal, even in the absence of leukemia inhibitory factor (LIF). N6-methyladenosine (m6A) is the methylation of adenosine at the carbon-6 position, and is the most abundant internal mRNA modification. Although it was discovered more than forty years ago, very little is know about the function and regulation of this modification. Both an RNA methyltransferase, Mettl3, and an RNA demethylase, FTO, have been discovered recently, showing that the m6A modification is reversible. It was also revealed that cells lacking Mettl3 remain in a highly pluripotent state and are unable to undergo differentiation. The phenotypic similarities between Gsk-3a/Gsk-3ß double knockout (DKO) ESCs and Mettl3-/- ESCs, led us to hypothesize that Gsk-3 may play a role in the regulation of m6A. The importance of m6A on regulating pluripotency in ESCs.

Domains of Care Coordination Across Stakeholder Perspectives: A Realist Synthesis

Nora Flucke, Nursing,
AMC - College of Nursing

Mentor: Dr. Angela Richard,
AMC - College of Nursing

Confusion remains about the meaning of care coordination five years after enactment of the Affordable Care Act, in which Congress authorized provisions for care coordination but did not provide a definition. Lack of agreement across stakeholder groups has delayed the development of metrics and incentives to drive value-based care coordination in the intent of health reform. Purpose: The purpose of the study was to improve conceptual clarity of care coordination by identifying shared care coordination domains and associated provider roles, both essential to the delivery of team-based chronic care. Method: This study was designed, conducted, and reported according to RAMESES (Realist And Metanarrative Evidence Syntheses: Evolving Standards) criteria. The scope of the synthesis spanned all levels of involvement, from national expert panels from multiple professional disciplines to direct-care providers, including professionals who cannot currently bill for care coordination services. Findings: Eleven domains of care coordination were abstracted. When plotted onto a matrix against provider roles a grid pattern emerged. The grid allowed for recognition of duplication and gaps in the provision of comprehensive care coordination services according to the involvement of different service providers. Conclusion: This realist synthesis enhanced the conceptual understanding of care coordination by identifying shared domains of care coordination and their relation to the roles and scopes of contributing participants. The subsequently developed tool has utility for optimizing workforce resources and furthering incentives for value-based care coordination.

Elucidating the Impact of Heavy Metals on the Taxonomic Diversity and Functional Activity of Microbial Communities within the Chattanooga Fen

Kelsey Foster, Biology, DC - College of Liberal Arts and Sciences

Mentor: Dr. Timberley Roane, DC - College of Liberal Arts and Sciences

Fens are marshy wetlands with an accumulation of partially decomposed organic matter. The Chattanooga Fen, located in southwestern Colorado in the San Juan National Forest, is anthropogenically and endogenously impacted by metals, which are toxic to cells at elevated concentrations. The anthropogenic source of metals comes from water which has flown over or through sulfur-bearing minerals exposed to air via mining practices at the Gold Finch Mine located just above the fen. The result of this is known as acid mine drainage (AMD), which is rich in heavy metals and has a net acidity which further dissolves other metals. Natural metal impact is a result of acid rock drainage (ARD) which forms from the natural oxidation of sulfur-bearing minerals. The sediments at the Chattanooga Fen have become the final repository for these metals. This study aims to elucidate the impact of metals in shaping the taxonomic and functional diversity of the microbial communities within the uncharacterized Fen. This will be accomplished through the use of Illumina high-throughput sequencing of extracted 16s rDNA from sediment samples. The samples will be collected utilizing coring at the outflow of the Gold Finch mine, along the AMD effluent, and from naturally metal impacted sediments which are unimpacted by AMD. RNA will also be extracted from these samples, and expression of carbon and nitrogen fixation, sulfate reduction, and polyphosphate metabolism genes will be quantified. The understanding of how metals impact the diversity and functional potential of microorganisms will be essential in influencing future management decisions.

The Cultural Foundations of Industrial Change in America, 1870-1945

Kayla Gabehart, History,
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Leslie Krupa, History,
DC - College of Liberal Arts and Sciences

Chloe Russell, History,
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Sarah Sifton, History,
DC - College of Liberal Arts and Sciences

Mentor: Dr. William Wagner,
DC - College of Liberal Arts and Sciences

This panel explores the cultural and ideological components of industrial change in nineteenth- and early twentieth-century America. In examining milestones in American industrialization, such as the completion of the first transcontinental railroads and the rise of commercial aviation, historians tend to emphasize the social, economic, political, and military imperatives that drove industrial and technological innovation. Such narratives often overlook the important role of cultural factors, including definitions of manhood, ideas about nature, and myths of national progress, in shaping industrial development. This panel sheds new light on cultural currents that influenced the development of three industries: architectural design, railroad construction, and aviation. The first paper investigates how transcendentalist thought, and particularly the ideas of English art critic John Ruskin, influenced the designs of Philadelphia architect Frank Furness in the late nineteenth century. The second paper explores how surveyors employed on the transcontinental railroads both invoked and contributed to popular mythology about the American West as they documented their experiences in diaries, letters, and autobiographies. The final paper analyzes how World War I veteran pilots used flying exhibitions and promotional writing to stoke popular interest in aviation and transform piloting from a form of showmanship to a formal profession.

Lived Experience of Students of Color in Counselor Education

Marina Garcia, Counseling,
DC - School of Education and Human Development

Mentor: Dr. Carlos Hipolito-Delgado,
DC - School of Education and Human Development

There is limited research on the recruitment and retention of students of color in graduate education. However, the existing research has expressed, along with the challenge of recruiting an ethnically diverse student body, the evident need to create an inclusive academic environment (Pooke, 2007). Further, ethnic diversity in graduate studies is related to increased cultural competence and improved academic outcomes. Given these benefits and the need for more diversity in graduate education, the purposes of this presentation are to discuss findings of an illustrative case study on the factors that impact the recruitment and retention of students of color in a Counselor Education graduate program. Eight graduate counseling students from CU Denver were interviewed regarding their experiences in their graduate program. These graduate students described how a desire to diversify the counseling profession served as an impetus to apply to graduate school and persist towards graduation. Further, these participants noted the need for graduate programs to demonstrate commitment to diversity going beyond representational diversity and to active mentorship, exploration of differences, and critical conversations in the classroom. Based on this findings, participants will learn strategies to create an inclusive and culturally supportive environment for recruiting and retaining ethnically diverse graduate students.

Very Low Frequency ElEctromagnetic Observations: Challenges and Opportunities

Ryan Gillespie, Electrical Engineering,
DC - College of Engineering and Applied Science

Mentor: Mr. Mark Golkowski,
DC - College of Engineering and Applied Science

A rich variety of phenomena can be observed at high latitudes near the north and south poles since this is where the Earth's magnetic field is almost vertical and connects the atmosphere to locations in space tens of thousands of kilometers away. Some of the observed processes are related to the Aurora Borealis (Northern Lights), while others are important for modern communication technologies. In order to make observations of these waves, special hardware is needed and an appropriate site must be found. The site needs to be remote in order to avoid interference from the electrical power grid. Here we present the custom hardware and discuss our deployment of the hardware in the remote communities in Alaska. In seeking to combine research and education, we have performed several outreach activities with local schools that hosts our receiver equipment. The goal of the outreach efforts are to help the students understand the scientific instrument at their school and also be exposed to STEM disciplines and future career paths.

Low Cost Prototyping Approaches to Stimulate Education and Engineering Research

Ao Guan, Mechanical Engineering,
DC - College of Engineering and Applied Science

Mentor: Dr. Sanchez Vega Luis,
DC - College of Engineering and Applied Science

This study addresses innovative approaches to research and education based on low cost prototyping techniques. The objectives of this work are: (1) to test and develop functional, desktop prototyping techniques at a cost low enough for a student to use as personal desktop items; (2) To design a learning environment based on software and hardware prototyping techniques, aimed at providing more realistic and complete research and educational experiences. The innovative qualities of a student can be enhanced by adopting routines on which the generation of conceptual ideas and proof of concept are constantly cycled in a time efficient manner. These approaches show the often multidisciplinary components of even the simplest projects. Proof of feasibility typically involves the integration of Math and Science, as well as key aspects of design and manufacturing. Examples are provided to shows that the elements necessary to this process can be adapted to the student's education and resources.

Historic Colorado Avalanches and Climate Change

Zara Hickman, Environmental Science,
DC – College of Liberal Arts and Sciences

Mentor: Dr. Christy Briles,
DC - College of Liberal Arts and Sciences

Snow-avalanche disturbance events are common at high elevations and pose threats to winter sport enthusiasts, tourism, and transportation. In the United States alone, 28 people are killed on average from avalanches each year (CAIC 2015). Where snow avalanches have occurred against anthropogenic boundaries, records exist (Atkins 2006). Remote areas where most avalanches occur lack historic infrastructure to record activity. Lake sediments are an archive for avalanche events in mountainous environments. Lakes have long life spans with records that go back millennia, continuously record events, and record events happening throughout the watershed of the lake. The avalanches deposit allochthonous course-grained (>1mm in diameter) inorganic sediment and plant remains that are significantly different from year-to-year production of organic fine-grained autochthonous sediments (Vasskog et al 2011). Lake sediments with layers of “unconsolidated” material are not studied as the material disrupts the gradual sedimentation rate. The “disturbed” sediment also requires detailed inspection to determine the extent of the event in the sediment record. There is an opportunity to explore lakes as natural archives of avalanches events. To date Norway has reconstructed avalanches using lake sediments (Vasskog et al 2011) With the increasing impacts of climate change to mountainous regions, there is a pressing need to understanding about how climate and climate fluctuations impact the frequency of avalanches. This project looks to reconstruct the last four millennia of avalanche activity in Colorado using high elevation lake sediments. We will also compare the reconstruction with existing local paleoclimate data to determine what conditions give rise to more frequent and/or extensive avalanches.

Youth Community Health Awareness Project

Torbjorg Holtestaul, Medicine,
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Janine Hoerauf, Medicine,
AMC - School of Medicine

Alida Ovrutsky, Medicine,
AMC - School of Medicine

Jess Coulter, Medicine,
AMC - School of Medicine

Mentor: Dr. Jamaluddin Moloo,
AMC - School of Medicine

Since 1997, 3,380 refugees from Burma have fled violence and persecution in their homeland to settle in Colorado, where they must adjust to a foreign culture and a complex healthcare system. This community based participatory research (CBPR) project is a sustainable partnership with a group of local refugee youth from Burma researching personal and community health. Medical students, community leaders, and an advisory board of youth from Burma met once a month and collectively decided to target alcohol use literacy and possible interventions. The project began in January 2014 and is an ongoing effort with the ultimate goal of developing and evaluating an alcohol health literacy intervention specifically for the refugee community from Burma. At this time, we are in the midst of key informant interviews and survey development to formally assess alcohol use and education in this specific community. Longitudinal goals include developing mentorship relationships between refugee youth and medical students, bolstering the relationship between CU School of Medicine and the surrounding community, and improving communication and understanding between refugee communities and the healthcare system.

Properties of Electromagnetic Waves from the near-Earth Space Environment

Poorya Hosseini, Electrical Engineering,
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Mentor: Dr. Mark Golkowski,
DC - College of Engineering and Applied Science

The near-Earth space environment contains billions of dollars of spacecraft assets that are important for modern communications. This environment also contains highly energetic particles and many different types of electromagnetic waves. The particlesform what are known as the radiation belts. The Earth's radiation belts are extremely variable and pose a significant hazard to satellites and astronauts in the near-Earth space environment. The dynamics of these energetic particles are believed to be controlled in large part by two separate but related classes of naturally occurring plasma waves: extremely low frequency/very low frequency (ELF/VLF) chorus and hiss. The source mechanism and properties of whistler mode chorus are still subjects of active research. Moreover, the origin of plasmaspheric hiss, the electromagnetic emission believed to be responsible for the gap between the inner and outer radiation belts, has been debated for over four decades. Although these waves can be observed in situ on spacecraft, ground-based observing stations can provide orders of magnitude higher data volumes and decades long data coverage essential for certain long-term and statistical studies of wave properties. My project involves the theoretical and numerical analysis of ground observations of hiss and chorus observations from different stations in Alaska. The main impact of my work will be to further understanding of chorus and hiss generation, propagation, and their impact on the Earth's radiation belts. This will allow for improved forecasting of space weather which affects a large class of technological systems.

Dances for Solidarity-Denver: Letter Writing, Solitary Confinement & Dance

Patrycja Humienik, Communication,
DC - College of Liberal Arts and Sciences

Adam Lauver, Communication,
College of Media, Communication and Information,
CU-Boulder

Mentor: Dr. Stephen J. Hartnett,
DC - College of Liberal Arts and Sciences

In this interactive performance, Dances for Solidarity-Denver organizer Patrycja Humienik, along with DFS member and second-year doctoral student at CU-Boulder, Adam Lauver, invite participants to dance in solidarity with incarcerated people in solitary confinement. The dance, based on a movement list out of the New York Dances for Solidarity (DFS) initiative, has expanded, and continues to grow, in collaboration between Denver members and incarcerated pen pals. DFS shares dance through letter writing to question the limits/possibilities of the arts: is it possible to use the postal service to create a dance with people in solitary confinement? How do people in solitary respond to the invitation to dance with us? Can we use letter writing to communicate nonverbal experience? Excerpts from ongoing dialogues will also be available to begin to answer, and to further complicate, these questions.

North Denver Change

Daniel Hutchinson, Humanities,
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Cody Peterson,
Applied Geography and Geospatial Sciences,
DC - College of Liberal Arts and Sciences

Mentor: Dr. Jordan Hill,
DC - College of Liberal Arts and Sciences

The City of Denver is undergoing a period of dramatic urban change and redevelopment. All too often, detailed information regarding current and future projects are not readily available to the general public or provided in a form that is accessible to low income and primarily Spanish speaking communities. The “North Denver Change” Project has set out to create a nonpartisan website to inform interested members of the public about the immediate and long-term changes taking place in North Denver. In particular, this resource focuses on projects included under the umbrella of the “North Denver Cornerstone Collaborative,” as well as changes to the neighborhoods of Globeville, Elyria-Swansea, Cole, Northeast Park Hill, Five Points, the RiNo district. It also includes other nearby areas that will be impacted by the numerous public and private development projects in this part of the city, especially the National Western Complex development and the widening of Interstate 70. This website is intended to consolidate and centralize informational resources pertaining to the numerous projects currently underway or planned in this part of Denver, and to present that information in a format that will be understandable and accessible to members of the diverse populations within these communities. It is our belief that concise and transparent information will foster a better informed public, help inform more vibrant and constructive dialogue, and provide a resource for those concerned with the potential health, environmental, and economic impacts of the changes in North Denver.

Experimental Study for Microwave-Induced Thermoacoustic Tomography

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Mohand Alzuhiri, Electrical Engineering,
DC - College of Engineering and Applied Science

Mentor: Dr. Mark Golkowski,
DC - College of Engineering and Applied Science

Microwave-Induced Thermoacoustic Tomography (MI-TAT) is a noninvasive hybrid modality which improves contrast by using thermoelastic wave generation induced by microwave absorption. Ultrasonography is widely used in medical practice as a low-cost alternative and supplement to magnetic resonance imaging (MRI). Although ultrasonography has relatively high image resolution (depending on the ultrasonic wavelength at diagnostic frequencies), it suffers from low image contrast of soft tissues. In this work samples are irradiated with sub-microsecond electromagnetic pulses inducing acoustic waves in the sample that are then detected with an unfocused transducer. The advantage of this hybrid modality is the ability to take advantage of the microwave absorption coefficients which provide high contrast in tissue samples. This in combination with the superior spatial resolution of ultrasound waves is important to providing a low-cost alternative to MRI and early breast cancer detection methods and for nondestructive testing (NDT) applications.

Education for Refugee Boys and Girls in Jordan and Lebanon: An Opportunity for Implementing Alternative Education Methods Hungry Scholar Project

Colleen Jennings, Political Science,
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Yasmin Wasalaam, Political Science,
DC - College of Liberal Arts and Sciences

Mentor: Dr. Bassem Hassan,
DC - College of Liberal Arts and Sciences

A review of the literature combined with case studies reveal that there is a severe lack of education resources available for refugee girls and boys in Jordan and Lebanon due to the escalating refugee crisis. While an influx of sufficient financial aid could possibly remedy the situation, the challenge of more than doubling an entire school system within an effective time frame is clearly impossible, particularly since refugee children are already a year or more behind in school. Additionally, countries like Jordan and Lebanon do not want to develop an infrastructure that would encourage long-term residency of refugees. Refugee students kept in a status of potential mobility, therefore, need educational resources that are inexpensive, easy to access, and can travel with them. The internet and mobile devices are the tools that can provide that kind of access and affordability, creating an opportunity for people of good will and expertise to support refugee students with their internet and educational needs. The Hungry Scholar website and phone application will connect mentors from the West with Syrian and Iraqi refugee students in Jordan and Lebanon, where research shows readiness for increased internet, tablet, phone, and application usage, as well as an eagerness among families to promote their children's education. Building a transnational network of scholars that connects the West with the Middle East potentially provides a path to long-term international security, as well as greater local and long-term security for refugee girls and boys.

Understanding Patient Experience and Culturally Proficient Care from the Perspective of African American Patients in Denver

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Other collaborators: Cerise Hunt, MSW, Interim Director, Dr. Virginia Visconti, Community Practice Specialist, Center for Public Health Practice,
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Mentor: Dr. Beth McManus,
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African Americans have higher rates of morbidity and mortality than other races and ethnicities, after controlling for access to quality healthcare. Lack of culturally proficient care by clinicians and healthcare clinics hinders effective healthcare delivery. This paper discusses the use of focus groups to understand patients' experiences and perceptions of healthcare providers' cultural proficiency. African Americans who receive healthcare from three different primary care clinics in the Denver Metropolitan area were recruited for participation in one of three focus groups. A total of 28 patients across all clinics participated in one of the three focus groups. The focus group discussion was facilitated using a semi-structured protocol. All focus groups were recorded and transcribed verbatim. Framework analysis was used to code and analyze the data to identify convergent themes. The emerging themes revealed that system and individual level interactions affect patient experience and the quality of culturally proficient care. At the system level, patient experience depends on the structural setting within which healthcare providers operate—the clinics' environment, time-allotted for an office visit, and follow-up care. At the individual level, patients experience is affected by the quality of the patient-doctor interaction—the level of engagement, cultural awareness, cultural skills and the cultural sensitivity doctors perceive to possess. Regular diversity and inclusion training can support the enrichment of healthcare staff and doctors' cultural proficiency. Integrating culturally proficient care appropriate to patients' cultural background is imperative in improving patient satisfaction, clinical health outcomes, and long terms health improvements among African Americans.

Influence of Chronic Exposure to an SSRI on Stalk Eyed Fly (Teleopsis dalmanni) Locomotion, Brain Monoamines, and Morphology

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Andrew Bubak, Neuroscience,
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Mentor: Dr. John Swallow,
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Fluoxetine, used as an antidepressant and anti-anxiety drug and branded as Prozac, Sarafem, and Rapiflux, is a common pharmaceutical contaminant in waterways. In this study the stalk eyed fly (Teleopsis dalmanni) was used to explore the possible impacts on insect behavior and morphology by chronic exposure to fluoxetine. Fluoxetine is a selective serotonin reuptake inhibitor (SSRI) which increases the serotonin available to bind postsynaptic cells. Serotonin is a conserved biogenic monoamine found primarily in the central nervous system and enteric nervous system in both invertebrates and vertebrates. Serotonin influences such diverse processes as cognitive function, locomotion, and appetite. During the T. dalmanni larval stage, nutrient intake contributes to ultimate adult size. Adult males have significantly longer eyestalks than females, and males with greater eye-spans succeed more often in aggressive conflicts over resources. Serotonin mediates larval locomotion and light response in other dipterans, and brain serotonin levels play an important role in determining T. dalmanni contest outcomes. This study examined the influence of fluoxetine on T. dalmanni larvae and adults across behavioral and morphological measures. Larvae experienced chronic oral dosing of 0.2 mg/g fluoxetine or received control food lacking any drug. Third instar larvae locomotion and phototaxis were quantified. Adult eye-span, body length and locomotion were measured. Results suggest that fluoxetine influences the development and behavior of T. dalmanni. These will be discussed in the context of the serotonergic system and the presence of pharmaceuticals in the environment.

Marijuana: How Effective are Oral Fluid Devices in Detecting the Presence of THC in Impaired Drivers?

Daniella Johner, Criminal Justice,
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Mentor: Dr. Mary Dodge,
DC - School of Public Affairs

As the first state to legalize recreational marijuana, Colorado has faced many challenging issues. The collateral consequences of high rates of marijuana use have resulted in related research, especially for law enforcement. This research examines statewide data that explores driving while under the influence, roadside testing, and impairment citations. The paper explores the piloting of five oral fluid testing devices. Additionally, citations for impairment by drug type and circumstances surrounding
the traffic stops (proactive and reactive) show evolving trends in driving under the influence of marijuana. Finally, new methods of training officers demonstrate the need for additional drug recognition experts.

Assessing Acid Mine Drainage Pollution Severity with Bacterial Community Composition

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DC - College of Liberal Arts and Sciences

Mentor: Dr. Timberley Roane,
DC - College of Liberal Arts and Sciences

Acid Mine Drainage (AMD) is a form of water pollution caused by mining activities and is characterized by high metal concentrations and acidity. In recent years, AMD has been seen in headline news, including the Gold King Mine Spill of 2015; but, AMD impacts waterways every day. Colorado has a rich history of mining which effects over 2,600 km of rivers with AMD. Currently there are no consistently available biological indicators of the presence of AMD and its associated toxicity, complicating environmental risk assessment efforts. The purpose of this study is to determine if specific bacterial communities can be linked to AMD impacts and indicate the degree of contamination. The bacterial communities can then be used as bioindicators of AMD pollution severity. This type of bacterial profiling will assist agencies and organizations in prioritizing sites for mitigation. For this study, soil samples were collected in 2014 from AMD sites throughout the Colorado Mineral Belt. Bacteria within the soil samples were identified through a method called Illumina high throughput 16s rDNA sequencing. The resulting bacterial community of each site is currently being analyzed and compared using statistical software systems, QIMME and R, to find correlations between bacterial communities and metal contamination. Results from our previous work have shown that bacterial community composition may be linked to specific chemical properties associated with AMD. Continued analysis of 2014 samples is shedding light on the temporal stability of this relationship.

Climate Change: Bias within the Peer-review Process

Alexander Kaufman, Environmental Science,
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Mentor: Dr. Bryan Wee,
DC - College of Liberal Arts and Sciences

The scientific process is based upon the premise of objectivity. The scientific method and peer-review journal process are created to ensure these principles are upheld. Issues arise when the trends within the scientific community appear to have systematic biases against certain factors. We are aiming to assess the peer-review process of 30 journals related to climate change and determine if any trends or patterns of bias appear. We are hypothesizing that we will see a bias against non-english speaking authors and a disproportionate representation from Northern hemisphere authors. The study will focus on 2010-2015 publications from the top, middle, and bottom journals (10 each) related to climate change. The ranking will be established by examining the impact factor, a proxy used for journal importance and credibility. The last name of the author will be used to identify native language, or, if ambiguous, we will examine university affiliation to determine native language. The journals selected will be asked to report the amount of article submissions per year to establish baseline information and to compare trends over time. GIS will be utilized to visualize the relationships between publications and first authors. Spatial statistics and linear regression will be used to further analyze the data. The results will be drafted into an article that we will submit to an open-source journal. If time permits, we would like to examine these other factors: gender, university rank, number of authors, and results. This study will help illustrate the shortcoming of the scientific peer-review process.

How to Engage Elementary Students When Reading

Anastasia Lawrence, Elementary Education,
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Mentor: Ms. Lisa Silverstein,
DC - School of Education and Human Development

Literacy is an important skill that every child needs to have to be a successful adult. However, not every child is engaged when it is time to read. This exhibit displays ideas, strategies and techniques to use in order to help teachers, parents, volunteers and others engage elementary-aged students when reading. With research composed from the Boys & Girls Club and Montview Math and Health Sciences Elementary, I have found ways to engage students in both an academic and non-academic setting. In the Fall semester I was a volunteer at the Boys & Girls Club. The “Club” is a community-based center for youth ages 6-18. This is a non-academic setting although they have time to do their homework and read. As a volunteer I would often help the children read. It was a struggle to engage students to sit down and read after they just came from school. The techniques I found though the documentation has helped many children become avid readers and find reading more enjoyable. These techniques were as simple as having them pick their own book, having them point to familiar words as you read and also letting them turn the page. These specific techniques let the children feel as they were in charge of what was going to happen next. This engaged the children quickly. As an intern at Montview Elementary this Spring, I plan on continuing to find new engaging ways to help students read in an academic setting.

Students' Conceptions and Understanding of Biodiversity in Grades 5-12

Paul Le, Integrative and Systems Biology,
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Mentor: Dr. Laurel Hartley,
DC - College of Liberal Arts and Sciences

Biodiversity is a complex term that can describe the variation we see in organisms, communities, and ecosystems. Biodiversity is important in understanding ecosystem structure and process, especially in light of contemporary issues such as degradation, climate change, and pollution. Therefore, it is vital to educate our students on biodiversity in the hopes of creating well-informed citizens who see value in natural areas and conservation. Recognition of biodiversity is believed to be a precursor to understanding more sophisticated ecological topics, but data on US student recognition of biodiversity is sparse. Through assessments given after a biodiversity module, we investigated A) the total number, specificity, and diversity of organisms that students and teachers could name, and B) the types of information students used to group organisms. We found that the majority of organisms named by students were vertebrate macro-organisms, and the majority of organisms named by teachers were vertebrate macro-organisms and plants. Compared to middle and high school students, teachers named a higher total number and diversity of organisms and named more organisms in specific taxonomic categories. The types of information students invoked to group organisms together varied by question context. However, information related to evolutionary relationships among organisms was used less than information related to form/outward traits, habitat, function (e.g decomposer), and taxa (e.g. fungi, plant). Overall, we found that students could name a variation of organisms, but had an easier time naming vertebrate macro-organisms when compared to plants, which emphasizes a need to focus on plants during learning experiences.

Influence of Elevation and Latitude on Flowering Phenology and Reproductive Isolation in Physocarpus Monogynus (Torr.) J.M.Coult. and P. opulifolius (L.) Maxim. (Rosaceae): A Course-based Research Experience

Marian Lea, Biology,
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Mentor: Dr. Leo Bruederle,
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Flowering phenology is the progression of a plant's reproductive cycle through time. Differences in flowering time can function as a barrier to gene flow among similar species when they lack geographic barriers. Physocarpus monogynus and P. opulifolius are closely related species of shrubs that co-occurr in the Black Hills of South Dakota and along the Front Range of Colorado. The objective of my research was to determine whether flowering time differs between P. monogynus and P. opulifolius, taking into account elevation and latitude, thereby preventing hybridization. Herbarium (museum) specimens of P. monogynus (176 total) and P. opulifolius (19 total) were obtained from the Rocky Mountain Herbarium at the University of Wyoming. Flower phenology of each individual specimen was ranked as follows: 1=flower buds, 2=½buds ½open, 3=open flowers, 4=½open ½fruits, 5=fruits. The strength of linear models was assessed using Akaike's Information Criterion. F-statistics and p-values were obtained from an ANOVA. Parameter estimates and 95% confidence intervals were calculated for day, elevation, latitude, and species. The strongest model for determining flowering phenology used "day of the year" and "elevation" (AIC weight 0.46), and the addition of "species" decreased the model strength. The estimate and 95% confidence interval for species broadly encompassed zero; no difference in flowering time between species was supported (p=0.94). Phenology does not differ according to species; thus, where the two species co-occur, there is no temporal barrier to gene flow between these species. As such, it is likely they can freely hybridize, thereby obscuring species limits in the West.

Solar Flare-Induced Changes to the Ionosphere and the Effects on VLF Wave Propagation

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Mentor: Dr. Mark Golkowski,
DC - College of Engineering and Applied Science

In the last layer of atmosphere, ions that move freely are under constant attack from the sun. This layer, the ionosphere, and the earth's surface act as good conductors at very low frequencies (VLF, <30kHz), propagating waves and relaying information over very long distances. However, the periodic radiation from solar flares alters the ionosphere and thus affects the propagation of the VLF waves. Our goal is to study the response of the propagating VLF wave form in order to be able to predict it's reaction due to the solar event. We do this by fitting existing solar flare data with its VLF responses. Another major property of the ionosphere's conductive behavior is the sustained global waves that come together to create a pattern known as the Schumann Resonances. Studying the perturbations of the Schumann Resonances, we use curve fitting techniques in the hopes to gain insight into the dynamic capability of the ionosphere and the responses of the waves it reflects. Submarines have the difficult task of being able to communicate through the large amounts of salt water between them and the surface. However, surfacing to send or receive a message is deeply impractical and subjects them to attacks. Luckily, these low frequencies are able to penetrate to the operational depths of a submarine, making them ideal for communications. The ultimate goal is to have the real-time capability to monitor VLF transmissions used in submarine communications, even when experiencing solar activity that modifies the VLF wave forms.

Gap Junction Remodeling in Hypertensive Right Ventricles: Dynamic Expressional and Organizational Changes Associated with Severity of Pulmonary Hypertension

Ozus Lohani, Bioengineering,
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Mentor: Dr. Michael E. Yeager,
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Intro: Pulmonary hypertension (PH), a disorder of multiple etiologies and one without a definite cure is characterized by reduced right ventricular (RV) function. Individuals that are diagnosed with pericardial effusion (PE) associated with PH have a survival rate of 0% at 5 years. We are investigating the integrity of cell-cell junctional proteins in the context of disturbed transcellular water flux in cardiomyocytes. As humans who are diagnosed with PH arrive to the poor prognosis through multifarious causes, we are compelled to study PH across multiple preclinical models in order to fully understand the multifaceted and the dynamic progression of the disorder. Hypothesis: We hypothesized that connexin-43 (Cx43), gap junction protein abundant in the myocardium is mislocalized. Additionally, contractile protein alpha-actinin expression would be decreased in the RV of hypertensive hearts. We believe that this leads to increased lymphedema in the RV and promotion of vascular leak. Methods: We studied rats in two models of RV failure PH: monocrotaline (MCT) and Sugen5416-hypoxia (SuHx) in comparison to normoxic rats (controls). Both diseased models have evidence of edematous ventricles and PE. Confocal microscopy and western blots were performed to assess localization and expression, respectively, of the proteins. Conclusion: Altered subcellular localization of Cx43, decreased expressions, and smaller plaque sizes in the end-stage PH with RV failure correlate with accumulation of interstitial fluid, as seen in previously studied diseased LV with PE. Such aberrations in gap junction localization, expression, size and their relationship to water accumulation raise the possibility that unique cell-cell connections could be novel attractive therapeutic targets for PH.

Hemodynamic Changes During Induction of Anesthesia: A New Noninvasive Computational Method vs. Traditional Vital Signs

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Induction, or the initiation, of general anesthesia often causes low blood pressure due to a decrease in tone of peripheral blood vessels and redistribution of blood volume peripherally to the limbs instead of centrally to major organs. Particularly in children, changes in vital signs such as low blood pressure or high heart rate are late indicators of this redistribution and are often unreliable. Previous studies have shown that photoplethysmogram waveforms shown by a pulse ox device change significantly with volume loss. An algorithm, using machine learning and feature extraction, was created called the CRI, or Compensatory Reserve Index. This functions as a continuous, non-invasive measure of central volume loss, and is displayed on a scale of 1 (normovolemia) to 0 (hemodynamic decompensation). In this study, we used healthy children undergoing elective dental restoration, cardiac catheterization and cardiac electrophysiological studies under general anesthesia between 1 and 18 years of age. A pulse oximeter sensor connected to our custom device was placed on the patient's finger for the duration of the procedure. We found that vital signs such as heart rate, blood pressure and mean arterial pressure as well as CRI significantly change during induction of anesthesia. A significant change in CRI was noted in 92% of patients, with changes in any vital sign not exceeding 49% of patients. It seems that CRI is a more reliable monitoring device than traditional vital signs in detecting hemodynamic changes during induction of anesthesia.

Effects of Experiential and Place-based Education on University Students' Climate Change Understanding, Beliefs, and Behavior

Katrina Marzetta, Licensure - Science Biology,
DC - School of Education and Human Development

Mentor: Dr. Alan Davis,
DC - School of Education and Human Development

Science holds a uniquely powerful place in our society as it opens doors to high-paying professions as well as demystifies environmental issues that impact everyday life like air/water quality standards and population density (Barton, 2008). Understanding science that impacts our present and future, like the science of climate change, is imperative for making critical life choices. Climate change is a difficult subject to teach because it requires complex scientific understandings and is tied to personal beliefs (Spence, Poortinga & Pidgeon, 2012). It is important to teach students not only the science of climate change, but also impact their personal beliefs to produce behavior that will mitigate climate change. In my study I examined the impact of Experiential/Place-based Education on college students' climate change understanding, beliefs, and behavior. Experiential and Place-based Education both teach through actions directly tied to students' understandings and beliefs through experience. In my study students were instructed about climate change utilizing these methods at Five Fridges Farm in Wheat Ridge, Colorado. Results indicated radically positive changes in student beliefs and behaviors surrounding climate change due to the Experiential and Place-based Education that took place.

Psoas Muscle Area and Muscle Fat Infiltration Before and After Antiretroviral Therapy Initiation in HIV Infection

Fadzai Masawi, Modern Human Anatomy,
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Mentor: Dr. Kristine Erlandson,
AMC - School of Medicine

Physical function impairment and metabolic dysfunction occur commonly among HIV-infected compared to HIV-uninfected adults. Antiretroviral therapy (ART) initiation is associated with gain in both total body fat and lean body mass among HIV-infected adults, but little is known about the effects of ART and weight gain on the quality of the muscle (i.e., fat infiltration). We hypothesized that antiretroviral therapy (ART) initiation would be associated with greater fatty infiltration (lower attenuation by Hounsfield units, HU) after 96 weeks of therapy, in HIV+ patients and thus may be a mechanism underlying physical function impairment and metabolic dysfunction. L4-L5 single-slice CT scans at baseline and week 96 among HIV-infected participants initiating ART were analyzed for psoas muscle attenuation ; Differences in CT density (by HU) between adipose tissue and muscle estimated the amount of fat present in muscle, with lower HU indicating fat and higher HU indicating muscle. Regression models used to determine associations between baseline psoas measures and covariates of interest. Our results showed older age, female sex, and Hispanic ethnicity, but not HIV disease severity (CD4 count), to be significant predictors of psoas muscle area and density prior to ART initiation. Although not statistically significant, ART initiation was associated with a trend towards increased psoas muscle mass. Greater fatty infiltration among whites with ART suggests that this population may be at increased risk of metabolic and physical function impairment compared to blacks. Physical function measures in future research could confirm these findings.

Ploidy Determination in Eutrema edwardsii R. Br. (Brassicaceae) using Museum Quality Herbarium Tissue

Jared Mastin, Biology,
DC - College of Liberal Arts and Sciences

Mentor: Dr. Leo P Bruederle,
DC - College of Liberal Arts and Sciences

North American Eutrema (Brassicaceae) consists of two species. Eutrema penlandii is a federally listed species endemic to the Mosquito Range in Colorado, while Eutrema edwardsii occurs in the Northern Hemisphere from Siberia to Svalbard, Norway in arctic and alpine wetlands. As part of a larger project addressing the systematics of this species complex, allozyme analysis revealed that E. edwardsii is of allopolyploid origin based on fixed-heterozygosity in five populations. Flow cytometry was then used to assess ploidy in populations of both species across their range using silica-dried tissue. Whereas our results reveal E. penlandii to be exclusively diploid in five populations, E. edwardsii is both tetraploid and hexaploid in seven populations. Previous chromosome counts indicate E. edwardsii occurs as an octaploid, as well. Here, I describe a technique adapted from Roberts (2007) using museum-quality herbarium tissue to assess ploidy. Although the ability to use herbarium tissue for flow cytometry is surprising due to the degradation of nuclei over time, distinct size differences of nuclei among ploidies suggests that ploidy can be determined from “less-than-ideal” samples. Preliminary data suggest that tissue as old as 35 years may be suitable for these purposes. This research demonstrates the utility of herbarium tissue for ploidy determination. Using herbarium tissue for ploidy determination will allow researchers to survey large collections without the need for field collecting. The next step will be documenting ploidy using herbarium tissue collected from across the range of these species and niche modeling to discover environmental correlates with respect to ploidy.

Tracing Whistler Waves in Near-Earth Space

Ashanthi Maxworth, Electrical Engineering,
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Mentor: Dr. Mark Golkowski,
DC - College of Engineering and Applied Science

Whistler waves are a type of low frequency signals in the frequency range of 1 kHz – 30 kHz that are common in the near-Earth space environment. The name “whistler” is due to the whistling sound those create when passed through a speaker. The near-Earth space environment consists of the Earth’s ionosphere and magnetosphere. Both of these regions are in a plasma state. Plasma is considered as the fourth state of matter in which particles are in an ionized state. Whistler waves belong to the most intense electromagnetic waves in the Earth’s magnetosphere. When the intense whistler waves travel through the Earth’s magnetosphere, the waves and the ionized particles in the plasma can interact with each other. This is also known as the “wave -particle interaction”. This wave-particle interaction can release energy. The energy released in this process can damage the space electronics, damage communication links such as GPS communications, change the dynamics of the earth’s radiation belts and significantly impact space weather. Therefore it is important to track the propagation of whistler waves in order to accurately predict there power-flow path and minimize their undesirable effects. Determining the power-flow path of a ray is known as try-tracing. In our work we model the propagation of whistler waves in the warm magnetospheric plasma rather than cold plasma. Since sun is heating the magnetosphere, warm plasma ray-tracing is more accurate and provides more accurate predictions even though it is more complicated. We investigate the modifications to the ray paths when the temperature is taken into consideration. This work helps scientists and researchers develop more accurate predictions of space weather.

Mirroring Communities, Building Trust: Law Enforcement Agencies’ Use of Representative Bureaucracy to Foster Social Equity

Sean McCandless, Public Affairs,
DC - School of Public Affairs

Mentor: Dr. Mary Guy,
DC - School of Public Affairs

The past year brought a spate of videos showing unwarranted law enforcement brutality, which raise concerns regarding how agencies achieve accountability for social equity, or fairness. The proposed social equity reforms meant to address these issues of brutality are numerous and range from fostering more engaged governance to mandating performance measurement. One method has been to promote representative bureaucracy, which is meant to make public agencies mirror the demographics of the communities they serve. This presentation will examine how 12 agencies in six states have attempted to create representative bureaucracy, specifically: a) why and how reforms were initiated; b) reforms’ impacts, especially on fairness; c) how success is measured; and d) future challenges. Principle data sources are interviews with police and sheriff officers, state- and local-level lawmakers, and citizen groups. Findings reveal numerous challenges to creating representative law enforcement agencies, such as difficulties with enlarging applicant pools, but also several benefits, such as culture shifts within departments and improved community relations. This presentation will be of interest to academics, students, and practitioners at UCD. First, it will detail how agencies achieve accountability for social equity and how representative bureaucracy reforms have affected community relations. Second, it will suggest ways that agencies might undertake reform. Third, the research details both a critical and timely topic, and all attendees would be able to reference these findings, for instance, in class discussions and campus activities.

The Socially Engaged Youth Voter

Kiki Miller, Communication,
DC - College of Liberal Arts and Sciences

Mentor: Dr. Jennifer Reich,
DC - College of Liberal Arts and Sciences

In 2008 U.S. Senator Barack Obama was elected president and coined “The First Internet President”. The moniker captured the Obama campaign’s ability to leverage mass emails, social networking sites, and YouTube videos to spread Obama’s message and motivate a previously marginalized group -- youth voters. The millennial generation officially outnumbers baby boomers and their choices and actions are beginning to transform the social and political landscape of the United States. Therefore, it is important to understand how millennials in the United States are organizing themselves around social and political issues and how they are constructing their identities as citizens. After a thorough review of the literature regarding the influence of social networks on the political behavior of youth voters during the 2008 and 2012 presidential elections, I conducted ethnographic research, including participant observation and face-to-face interviews, during the primary election cycle to identify trends in youth voting behavior surrounding partisan politics. I will discuss the trends presented in the literature, the emerging trends I found throughout my research, and what I hope to examine while continuing to study youth political behavior during the general election.

Efficacy of the Mucolytic P-3001 in Reducing Airway Resistance in

Leslie Morgan, Integrated Sciences,
DC - College of Liberal Arts and Sciences

Mentor: Dr. Christopher Evans,
AMC - School of Medicine

Historically, treatment regimens for asthma have focused primarily on controlling smooth muscle contraction caused by inflammation. However, recent findings suggest that the mucin protein MUC5AC is responsible for this bronchoconstriction. In order to determine the effectiveness of the mucolytic P-3001 in breaking down MUC5AC, BALB/c WT mice were challenged with allergic aspergillus extract and IV methacholine prior to administration of either P-3001 or saline. Airway resistance (RAW) measured during mechanical ventilation showed a tenfold increase for the saline-only group as opposed to the mice that received the mucolytic P-3001 who showed only a fourfold increase. In addition, the calculated PC20 values, which are a measure of airway hyperresponsiveness, were lower among the saline group than the P3001 group. A lower PC20 value correlates to a higher degree of airway hyperresponsiveness. These findings indicate that delivering the aerosolized mucolytic P-3001 to inhibit the mucin protein MUC5AC may be a novel pharmacologic approach in the treatment of asthma and other obstructive diseases.

A Survey of Youth's Perceptions of Marijuana Use in Colorado

Jessica Rosenthal, Criminal Justice,
DC - School of Public Affairs

Mentor: Dr. Mary Dodge,
DC - School of Public Affairs

In light of changes to marijuana laws and increased use by youth it is essential to develop an understanding of attitudes held by children and teens. This research is designed to explore perceptions of marijuana and their likelihood to use systems designed for student reporting. Background information on drug use among youth is presented to underscore the importance of developing an understanding of their opinions on drug use. The research focuses on youths in fourth, seventh, and tenth grade in urban and rural school districts. The survey was designed to identify the prominent themes of students' opinions about legal marijuana. The research also explores youths' opinions about their likelihood of using reporting systems and whether anonymity plays a role in their likelihood to recognize illegal practices. The presentation explores similarities and differences between the responses of students in different grades and possible implications.

Head Loss As an Explanation of the Steal Phenomenon in Microvascular Surgery

Phillip Ross, Medicine,
AMC - School of Medicine

Mentor: Dr. Frederic Deleyiannis,
AMC - School of Medicine

Vascular steal has been cited to help explain end-organ ischemia after microvascular reconstruction. Attempts to clarify a mechanism of vascular steal have been made by modeling blood circulation after a simple electrical circuit, suggesting that the free flap provides a path of least resistance for blood flow and thereby compromises endorgan perfusion. We present a case of a posterior medial thigh perforator flap for the reconstruction of a diabetic foot ulcer in a patient with a single vessel providing inflow to the foot. In the context of this case, we provide a novel explanation for the steal phenomenon using the Hagen-Poiseuille law and the property of head loss in fluid dynamics and discuss how the vessel size of the free flap may contribute to a steal phenomenon.

Grantmaking Through the Lens of the Bronfenbrenner Ecological Framework

Lisa Roy, Education, Leadership for Educational Equity,
DC - School of Education and Human Development

Mentor: Dr. Shelley Zion,
DC - School of Education and Human Development

Foundations use a myriad of grantmaking strategies to close the achievement gap. This monologue will compare three Foundation Initiatives, exploring their grantmakimg strategies through the perspective of Bronfenbrenner's ecological frame (micro-, meso-, exo-, macro-systems, and chrono-systems). The results demonstrate that focusing on a significant transition and the systems aligned with that one transition (Pre-K to Kindergarten, middle school to high school, high school to college) is critical to success in closing the achievement gap. The monologues will be from the perspective of the learners.

The Application of LWPC for Modeling SID Behavior

Sandeep Sarker, Electrical Engineering,
DC - College of Engineering and Applied Science

Mentor: Dr. Mark Golkowski,
DC - College of Engineering and Applied Science

Very low frequency (VLF) electromagnetic waves reflect from the Earth and the upper atmosphere and can therefore propagate for very long distances across the globe. Such signals are used for communications with ships and submarines. The propagation of these waves is a complicated solution involving many modes and is strongly affected by the state of the upper atmosphere known as the ionosphere. The ionosphere is composed of electrons and ions, which is also known as plasma. Plasma can be described as the fourth state of matter, which is achieved by adding additional energy to gases until electrons are freed from the molecular structure. The Long Wave Propagation Capability (LWPC) software was developed by the Space and Naval Warfare Systems Center. The purpose of this software is to calculate the amplitude and phase of VLF signals propagating in the Earth-ionosphere waveguide. In this work, the LWPC software will be analyzed as well as its capability for modeling the effect of sudden ionospheric disturbances (SIDs). SIDs occur briefly when the sun emits solar flares whose energy or temperature further ionizes the ionosphere. The effect of these solar flares lowers the reflection height and sharpness of the ionosphere's electron density profile for the brief period that the solar flare is crossing the Earth's path. Using the LWPC and previous work's modeling, this work attempts to model the behavior of the ionosphere based on the measured signals amplitude and phase changes during the SID event. The results will help to improve communications using VLF waves.

Standardized Sections, Immunohistochemistry Protocols, and Fluorescent Imaging to Distinguish the Cellular Composition of the Globus Pallidus from Surrounding Structures

Violette Simon, Modern Human Anatomy,
AMC - School of Medicine

Mentor: Dr. Diego Restrepo,
AMC - School of Medicine

Parkinson's Disease (PD) is a progressive disease characterized by a loss of dopaminergic neurons in the substantia nigra. Symptoms that patients present with include tremors, bradykinesia, and rigidity. PD symptoms are initially treated with levadopa, but patients may develop extra movements in response to levadopa, termed dyskinesia, in addition to motor fluctuations (i.e. decreased duration of efficacy following medications). At this point in the clinical course, patients are considered for deep brain stimulation (DBS) surgery, a personalized, reversible, and alternative treatment for PD motor symptoms. Identifying the optimal DBS target during surgery is not a trivial task, and being able to differentiate these targets from surrounding tissue can make DBS procedures more successful. Through standardized sections of cadaveric brains, our project consists of excising the globus pallidus (GP), using immunohistochemistry and auto-fluorescence, and observing the cellular composition of this deep brain structure. If the GP is easily differentiable from surrounding structures, then live intraoperative imaging modalities should be feasible during DBS surgeries.

Who is 5770?: The Decision to Donate

Violette Simon, Modern Human Anatomy,
AMC - School of Medicine

Mentor: Dr. Vic Spitzer,
AMC - School of Medicine

This video has been created as an educational tool for students who will be dissecting or studying cadavers. This video provides insight into what drives individuals to donate. The video includes personal interviews with Kate Serr of the Colorado State Anatomical Board, with Susan Potter who decided to become a donor, and audio and video of Vic Spitzer. The video explores factors behind Susan Potter's choice to donate and also explores ways in which students at the University of Colorado Anschutz Medical Campus pay respect to individuals who have donated their bodies to science. The video has been used as an educational tool for first year students in the Master's in Modern Human Anatomy and the Anesthesiology Assistants programs and will be used for the physical therapy, physician assistant, dental, and medical students, as well.

Risk and Protective Factors for Suicidal Adolescents

Kelsey Stappert, School Psychology,
DC - School of Education and Human Development

Mentor: Dr. Franci Crepeau-Hobson,
DC - School of Education and Human Development

Recognizing risk and protective factors for adolescent suicide attempts is an important factor for identification and suicide prevention strategies. The purpose of the study was to assess the relationship between adolescent risk factors and suicide. Nationally representative data from the 2013 Youth Risk Behavior Survey (YRBS) created by the Centers for Disease Control and Prevention (CDC) were used. The relationship of demographic characteristics, bullying, substance abuse, media exposure, and physical activity to suicide attempts was assessed. Results concluded distinguishable characteristic among demographics and suicide risk factors: gender, race/ethnicity, grade level, experience of bullying-school property and electronically, exercise-physical activity and sports participation, and media exposure-video game/ internet use. Implications for practice and future research are discussed.

Maptime: Building Bridges The Divisions

Rachel Stevenson,
Applied Geography and Geospatial Science,
DC - College of Liberal Arts and Sciences

Mentor: Dr. Rafael Moreno-Sanchez,
DC - College of Liberal Arts and Sciences

“Maptime is for people who love maps! Beginners Welcome!” Maptime is an open learning environment for all levels and degrees of knowledge, offering intentional educational support for the beginner. Maptime is simultaneously flexible and structured, creating space for mapping tutorials, workshops, ongoing projects with a shared goal, and independent/collaborative work time. Maptime Boulder was founded in Colorado in September 2014. Founded by Rachel Stevenson, Jennings Anderson and Robert Soden. Maptime has become a community of individuals who want to learn how to use public data to make maps and try to make sense of their world. In the year and half since Maptime came to Boulder, numerous workshops have been taught, on OpenStreetMap, Carto DB, QGIS and many more open source software programs. Maptime Boulder, in teaching workshops based on open source software, has extended the skill sets of anyone who attends a workshop. In 2015, with support from Dr.Moreno-Sanchez, Maptime MileHigh was started at University of Colorado Denver, In the north building. Led by Taylor Long, Maptime Milehigh has helped bring more students to Maptime, to learn and expand on their open source skills. This poster will showcase, how Maptime works and what benefits it has for students and professionals.

Novel Method of Bioremediation and Characterization of Bacterial Communities on Arsenic-impacted Museum Collections

Sladjana Subotic, Biology,
DC - College of Liberal Arts and Sciences

Mentor: Dr. Timberley Roane,
DC - College of Liberal Arts and Sciences

Metal-based preservatives, including toxic arsenic salts, were widely used prior to the 1970s for the prevention of rodent and insect damage to museum collections. While many arsenic-treated collections have been protected from deterioration, what remains unknown is whether the presence of arsenic influenced the bacterial communities found on these collections. In this study, high throughput sequencing revealed that there are diverse bacterial communities on museum collections, and that community composition seems influenced by the arsenic concentration as well as material type and storage area. Preliminary data showed that material type explained 32.5% of the variation seen among the bacterial communities while storage area (collection type) and arsenic concentration accounted for 34.10% and 20.33% percent, respectively. The use of bacteria in the removal of arsenic from these collections is also of interest. Research shows that Rhodopseudomonas palustris, a metabolically versatile proteobacterium, is able to volatilize arsenic via methylation resulting in the conversion of the metal into a gas. In preliminary laboratory studies, R. palustris tolerated concentrations of arsenic as high as 250 ppm. Additionally, R. palustris showed the ability to remove 3-4.5 ppm of arsenic from a starting concentration of 7 ppm arsenic within 14 days. In order to optimize the process of volatilization of arsenic from museum collections, the presence of in situ bacteria on the surface of collections may influence the methodology used for this technology.

Postoperative Management of the Pediatric Patient Following Upper Extremity Revascularization—a Review and Proposed Protocol

Alec Sundet, Medicine,
AMC - School of Medicine

Mentor: Dr. Rodrigo Banegas,
AMC - School of Medicine

Traumatic pediatric amputations of the hand and upper extremity can have long-term financial, psychological, developmental, and functional consequences that readily extend beyond the realm of that which is normally encountered in comparatively injured adults. These factors, along with a paucity of medical comorbidities, have guided a more liberal and aggressive approach to treating pediatric amputations in hopes of optimizing psychosocial, aesthetic, and developmental outcomes. Furthermore, advances in pharmacology and microsurgical replantation techniques have allowed what were otherwise exceedingly rare surgeries to become commonplace in hospitals all over the world. Despite these gains, vascular thrombosis remains the leading cause of failure in microvascular surgeries. A recent survey showed that 96% of reconstructive surgeons use some form of anticoagulation therapy in their treatment, but no consensus regarding pharmacologic agents, dosing, or efficacy exists. The risk of thrombosis is further complicated by the dynamic nature of vasculature in response to stressors such as sympathetic tone, decreased intravascular volume, and response to external temperature. In an attempt to improve the long-term success rates of our microvasculature surgeries, we created an inclusive protocol, outlining complete and proper management of the post-operative pediatric patient following revascularization or replantation surgery.

Developing a Protocol for Creating Anatomical Models from Photographs of Cryosectioned Cadavers: Modeling the Bifurcate Ligament and its' Attachments

Kaitlyn Todd, Modern Human Anatomy,
AMC - School of Medicine

Mentor: Dr. Victor M. Spitzer,
AMC - School of Medicine

The foot acts as a shock absorber, distributing up to one 1.5 times a person's bodyweight in order to carry the body for approximately 1,000 miles per year. Each foot is made up of 28 bones, 30 joints, and more than 100 muscles, tendons and ligaments that are responsible for locomotion, and are susceptible to injury. Avulsion fractures of the anterior calcaneal process caused by bifurcate ligament injury are commonly misdiagnosed as an ankle sprain. Understanding ligaments of the foot is essential for a correct physical diagnosis and treatment of these injuries. With an increasing amount of information to learn throughout medical school, mastering anatomical knowledge becomes more challenging as many medical students spend less time on anatomical dissection. Computer-assisted instruction has been used to supplement traditional teaching formats, and it's known to contribute to learning, result in cost savings and has a high satisfaction rate for learners compared to traditional teaching formats. The objective of this study is to create a protocol for generating computerized anatomical models from photographs of a cryosectioned cadaver to enhance anatomical education resources. The bifurcate ligament and its' attachments were chosen to develop the protocol because of the high incidence of injury misdiagnosis and ability to illustrate why visualizing the anatomy through photographic images is advantageous compared to CT scans and MR images. The protocol developed for modeling anatomical structures from photographs of cryosectioned cadavers has the potential to be expanded to include tissue properties and be applied to other regions of the body.

The Impacts of Pathogen Disturbance on the Ecosystem Function of Whitebark Pine (Pinus albicaulis) in the Southern Wind River Range

Aaron Wagner, Biology,
DC - College of Liberal Arts and Sciences

Mentor: Dr. Diana F. Tomback,
DC - College of Liberal Arts and Sciences

Harsh climactic conditions within the alpine treeline ecotone (ATE)—the transition from closed canopy forest to treeless alpine tundra—cause forests to reach their upper elevational limit. In this ecotone, pioneer conifers ameliorate microclimatic conditions in their lee, thereby facilitating leeward conifer growth. This positive feedback cycle of climate moderation and survival promotes tree recruitment, leading to the formation of tree islands. As a result of its tolerance for cold and windy sites, whitebark pine is the majority tree island initiator in many upper subalpine and ATE communities in the Rocky Mountains. However, white pine blister rust—a disease caused by the exotic fungal pathogen, Cronartium ribicola—is causing extensive mortality across whitebark pine's range. These losses are rapidly changing the composition and ecosystem function of many high elevation forests. In the first study to examine these interactions in an ATE at whitebark pine's south-easternmost range in the Rocky Mountains, we assessed community structure, whitebark pine prevalence, whitebark pine's role in facilitating tree island development, and disturbance by white pine blister rust. We found whitebark pine was the most abundant solitary tree and tree island constituent, composing an average 0. 923 (95% CI: 0.871, 0.957) and 0.878 (95% CI: 0.788, 0.941), respectively. The average species composition of tree island initiators was 0.650 (95% CI: 0.400, 0.867) whitebark pine, considerably less than its overall community abundance. The average proportion of whitebark pine infected with white pine blister rust was 0.038 (95% CI: 0.010, 0.079).

Limber Pine Metapopulation Dynamics and Clark's Nutcracker Seed Dispersal: Current Results

Tyler Williams, Biology,
DC - College of Liberal Arts and Sciences

Mentor: Dr. Diana Tomback,
DC - College of Liberal Arts and Sciences

We are studying the interactions between limber pine (Pinus flexilis) and its primary seed disperser, the Clark's nutcracker (Nucifraga columbiana), within Rocky Mountain National Park (RMNP). Limber pine stands comprise metapopulations—i.e., regional populations composed of local populations subject to colonization, extinction, and recolonization. Historically, fire and ecological succession primarily caused extinctions. Current threats for limber pine in RMNP include mountain pine beetle (Dendroctonus ponderosae) outbreaks, wildfire, and especially invading white pine blister rust (non-native pathogen Cronartium ribicola). Tree losses may result in decreased nutcracker seed dispersal, complicating metapopulation persistence. The purpose of our research is to investigate: 1) limber pine's population structure within RMNP and how its connectivity (the average number of stands linked together by seed dispersal) is affected by nutcracker home range size and seed dispersal distances; and, 2) the importance of alternative food sources in RMNP for nutcrackers. This presentation focuses on the first objective. We constructed the RMNP limber pine metapopulation from National Park Service GIS layers. Metapopulation characteristics of interest include the number and size of, and distance between, stands of the metapopulation as well as any instances of stand extinctions or recolonizations. We obtained data of nutcracker home range sizes and seed dispersal distances from studies conducted in Washington and Wyoming. To examine whether nutcracker spatial movements in RMNP were comparable, we collected supplementary data in 2015 by radio-tracking nutcrackers. Limber pine stands were 10-400 ha in area, with nearest stands usually within 3 km. Nutcracker spatial data indicate high metapopulation connectivity.

Quantum Dynamics in Photoexcitation Reactions of Photoremovable Protecting Groups

Carly Wolfbrandt, Chemistry,
DC - College of Liberal Arts and Sciences

Mentor: Dr. Haobin Wang,
DC - College of Liberal Arts and Sciences

Photoremovable protecting groups (PPGs) allow for photoexcitation of one molecular substituent, while leaving other groups inactive. PPGs have been used extensively in organic synthesis, however, the selectivity of specific protecting groups to different wavelength combinations has not been widely studied.1-2 The complicated dynamics of these multistep photo-induced reactions usually involve coupled nuclear and electronic motions, thus rendering a Born-Oppenheimer treatment invalid. Very often, the presence of strong quantum coherence in the primary ultrafast reaction steps implies that the dynamics of the system do not follow a classical dissipative mechanism. Therefore, a complete quantum mechanical description is necessary to describe the overall process. Our current research, in collaboration with Dr. Scott Reed's experimental group at the University of Colorado Denver, indicates that multiple-wavelength photo-deprotection is possible. We aim to offer a complete quantum dynamical description of the reaction mechanisms of dual-wavelength photochemical deprotection. (1) Yang, H. et al. J. Org. Chem. 2011, 76, 2040-2048. (2) Klán, P. et al. Chem. Rev. 2013, 113, 119-191.

Erythropoietin (Epo) and Soluble Epo Receptor: A role for Maternal Vascular Adaptation to High-altitude Pregnancy

Gabriel Wolfson,
Biomedical Science and Biotechnology,
AMC - Colorado School of Public Health

Mentor: Dr. Colleen Julian,
AMC - School of Medicine

Preeclampsia (PreE), a common complication of pregnancy marked by high maternal blood pressure and protein in the urine, increases the risk of fetal and/or maternal death. Notably, PreE occurs three times more often in women living at high altitude (>2500m; 8200 feet) compared to sea level. The underlying cause of PreE is not known, but it is thought that hypoxia (due to lack of oxygen content or reduced blood flow) causes abnormal levels of biological factors that influence vascular function to be released by the mother and/or her placenta. In this study, we examined whether altitude-related hypoxic stress leads to changes in maternal blood levels of two biological factors, erythropoietin (Epo) and its receptor (sEpoR). Epo is involved in the creation of new red blood cells, the regulation of vascular function and blood vessel growth; sEpoR inhibits the ability of Epo to perform these biological functions. Our data show that healthy, pregnant women living at high altitude (~3600m; ~11,800 feet) had an increase in Epo levels relative to those at sea level without any change in sEpoR; we expect that this response promotes vascular adaptation to pregnancy and enhances blood flow to the placenta and fetus. In addition, we found that women who develop PreE during their pregnancy had markedly higher levels of sEpoR without a proportional increase in Epo. We propose that this prohibits normal vascular adaptation to pregnancy, and thereby may contribute to the development of PreE.

The Taxonomy of Physocarpus (Rosaceae) on the Eastern Slope of Colorado

Moneka Worah, Environmental Science,
DC - College of Liberal Arts and Sciences

Jojo La,
DC - College of Liberal Arts and Sciences

Mentor: Dr. Leo P Bruederle,
DC - College of Liberal Arts and Sciences

Two conflicting hypotheses have arisen surrounding the status of Physocarpus (Rosaceae) in Colorado. Whereas, Weber and Wittmann (2012) have stated that both Physocarpus opulifolius and Physocarpus monogynus occur along the Front Range and that the two may co-occur and hybridize resulting in taxonomic ambiguity, Jennifer Ackerfield (pers. comm.) recognizes only P. monogynus. The objective of this study was to test these hypotheses combining fieldwork with a morphometric analysis. In order to test for statistically significant differences meriting taxonomic recognition in Front Range Physocarpus, morphological data were collected from 73 herbarium specimens and analyzed using univariate statistics. This preliminary analysis provides evidence that both species do, in fact, occur in Colorado as indicated by the number of carpels and ovary length, both of which are reliable characteristic discriminating between the two species. In order to test the hypothesis of hybridization, material was collected from Rocky Flats National Wildlife Refuge (39 samples) and Gregory Canyon, Boulder Open Space and Mountain Parks (29), where P. opulifolius and P. monogynus have been reported to co-occur. Morphological data were collected from these samples and compared to the results from the previous study. Preliminary results lend support to the hypothesis of hybridization occurring at these sites, thereby obscuring species limits. These results contribute to a better understanding of species diversity in Colorado.

Discussion of Foucault's Lectures

Svetlana Yefimenko, Humanities,
DC - College of Liberal Arts and Sciences

Megan McClure, Humanities,
DC - College of Liberal Arts and Sciences

Michael Davis, Public Administration,
DC - School of Public Affairs

Samuel Kelley, Humanities,
DC - College of Liberal Arts and Sciences

Mentor: Dr. Jordan Hill,
DC - College of Liberal Arts and Sciences

From 1971 to 1984, Michel Foucault delivered a series of lectures at the College de France. These courses were instrumental in ushering in a more accessible and nuanced version of the complexity of Foucault's thought. It is the purpose of this symposium to present the public with analyses of two of these lectures -- The Punitive Society and Psychiatric Power. One of the papers on the Punitive Society will focus on how traditional morality is appropriated, exploited, and misconstrued for the sake of elite interests, and the other will emphasize the dehumanization of delinquents and deviants. Within Psychiatric Power, one lecture will discuss Foucault's observations of assimilation and apply them to the treatment of Native Americans in the mid 19th Century, and the other paper will discuss the interaction between the concepts of medical and psychiatric powers and its impact on the theories surrounding the psychical relationship between mother and fetus and the ramifications these powers have on the mother's agency over her body. Foucault's impact on academic thought is wide-ranging and profound, and seemingly disparate disciplines can be brought together for the purpose of illuminating his core insights.

Occupying Otherspace: Re-imagining Rio De Janeiro's Olympic Tennis Center

Zachary Zemljak, Architecture,
DC - College of Architecture and Planning

Mentor: Mr. Matthew Shea,
DC - College of Architecture and Planning

"Forced evictions in Rio Favela for the 2016 Olympics triggers violent clashes." Olympic stadiums are heterotopic spaces for global competition and spectatorship, meaning that they have a specific spatial logic that is outside of the systems and networks that delineate the host locality. Because of this separation, the spaces have three typical trajectories: to fall into ruins, to be torn-down and erased, or to be appropriated with like-events. This project aims to explore an alternative trajectory, one where the Olympic tennis Center is strategically designed to be appropriated with informal housing after the event. Rio De Janeiro's favelas exist in the formal City's undesired, left-over spaces. They are tactical, accretive communities where environment determines social structure. Once it turns to "left-over space," the Tennis Center will become the determining infrastructure for the displaced people's new informal community. Along with addressing the specificities of the Olympic Games, the design attempts to alleviate and exploit certain concerns associated with the tactical growth of informal housing and their relationship with their context. Through the strategic distribution of the interconnected infrastructural systems, the growth of the housing can be predicted and seeded into a more functional, egalitarian community. The appropriate network of movement, water, sanitation, electricity, structure, and connectivity with adjacent contexts will generate a variety of unique living conditions in which unique identities can co-exist.

Live-Cell Single-Molecule Imaging Reveals Distinct Mechanisms of the Targeting Cbx-PRC1 Complexes to Chromatin

Chao Zhen, Chemistry,
DC - College of Liberal Arts and Sciences

Thao huynh, Chemistry,
DC - College of Liberal Arts and Sciences

Roubina Tatavosian, Chemistry,
DC - College of Liberal Arts and Sciences

Huy Duc, Chemistry,
DC - College of Liberal Arts and Sciences

Marko Kokotovic, Chemistry,
DC - College of Liberal Arts and Sciences

Mentor: Dr. XiaoJun Ren,
DC - College of Liberal Arts and Sciences

Polycomb group (PcG) complexes are a long-standing paradigm for studying epigenetic inheritance and play pivotal roles during development and in cancer. Thus, understanding the mechanisms underlying PcG functioning is crucial. By combining live-cell single-molecule imaging and genetic engineering, we here present a framework to investigate thermodynamics and kinetics of Cbx-PRC1, one of the PcG complexes, binding to chromatin in living embryonic stem cells. Our results provide new insights into molecular mechanisms by which Cbx-PRC1 complexes are targeted to chromatin and control the specificity of expression of PcG target genes.

Inspection, Monitoring, and Rehabilitation of 8th Avenue Viaduct, Denver, Colorado

Yang Zhou, Civil Engineering,
DC - College of Engineering and Applied Science

Mentor: Dr. Kevin Rens,
DC - College of Engineering and Applied Science

The 19-span steel twin-box girder bridge, located on 8th Avenue between Mariposa St and Vallejo St in Denver, Colorado, was constructed during 1985. This fracture critical structure lies on four horizontal curves and three vertical curves. The bearings are expansion pot bearings except those on Pier 11 which are fixed bearings. Due to the extreme daily temperature changes in Colorado, excessive transverse superstructure movement has resulted in fractures of the bearing guide bars of which some were intentionally removed. The lack of guide bars actually made the problem worse. Additionally, the transverse force introduced from the superstructure led to excessive tension cracking of the concrete pier caps. The successive pier inspections completed in 2001 and 2015 observed a significant amount of active cracks on the pier caps. Corrosion of the exposed pier reinforcement could result in compromised safety of the bridge substructure. In this study, a Finite Element model was created to simulate the complete bridge movement. It is recommended that epoxy be used to seal active cracks and post tensioned carbon fiber reinforced rods be used to strengthen the pier caps to close active cracks. Data analysis and Finite Element Analysis will be completed to come up with the rehabilitation plan of the bearing system and the expansion joints.

Predicting Non-Point Stormwater Runoff Quality for Different Land Use Classes using Geospatial and Statistical Analyses

Brik Zivkovich, Civil Engineering,
DC - College of Engineering and Applied Science

Mentor: Dr. David Mays,
DC - College of Engineering and Applied Science

Understanding and evaluating urban impacts on natural ecosystem processes has become an increasingly complex task for engineers, planners and environmental scientists. As built environments continue to grow, increased human activity and large-scale development drastically stress receiving streams and lakes resulting in the current impaired and degraded state of surface waters. In response, integrated water quality management programs have been adopted to address unregulated non-point pollution sources by stormwater treatment installations to treat stormwater runoff as close to the source as possible. Common installations such as water quality basins, rain gardens and other bioretention systems are coupled with new developments to help reduce excess sediments, nutrients, and other pollutants that are carried into stormwater systems to nearby streams and rivers. This study provides a detailed statistical and geospatial analysis process to analyze how different land uses affect urban stream systems. Using metropolitan Denver, Colorado as a case study, a parsimonious evaluation method for identifies critical non-point pollution source watersheds and associated sub-basins. The two-phase analysis led to the development of a non-point stormwater assessment matrix that can be used to aid stormwater professionals to evaluate and specify retrofits of water quality features within urban areas. The selected water quality features can be used reduce, capture and treat stormwater runoff prior to entering urban surface waters as proper treatment locationis vital for optimizing pollutant reduction while simultaneously promoting restoration of the urban hydrologic regime.

Infiltration and Clogging by Sand and Clay in a Pervious Concrete Pavement System

Patrick Coughlin, Civil Engineering,
DC - College of Engineering and Applied Science

Chelsea D. Campbell, Civil Engineering,
DC - College of Engineering and Applied Science

Mentor: Dr. David C. Mays,
DC - College of Engineering and Applied Science

From a hydrologic perspective, perhaps the greatest limitation of pervious concrete pavement is the risk of clogging, defined as a reduction in hydraulic conductivity that reduces infiltration. Accordingly, a laboratory study was performed to measure clogging by sand and clay (sodium montmorillonite) in a saturated pervious concrete pavement system, and the subsequent effect of surface cleaning by pressure washing. Methodology involved measuring the head loss between the water surface and at the boundary between the bottom of the pervious concrete sample and the top of the subgrade layer for each setup of sand and clay. Either the sand or clay was placed on top of the pervious concrete layer in increasing amounts. A constant head was maintained above the pervious concrete and clogger for each test. Both sand and clay caused measurable clogging that was not reversible by pressure washing. However, even after clogging, the infiltration rate was well above the average intensity of 6.6 cm/hr for the 100-year 1-hour design storm for Denver, Colorado. This result is encouraging, but should be interpreted with caution, because in these experiments the infiltration-limiting layer was never the pervious concrete, but rather the subgrade, which in this case was a thin layer of sand with a large hydraulic conductivity. Accordingly, this study suggests that pervious concrete may be effective for stormwater retention, when provided with an engineered drainage system, but that its performance for stormwater infiltration will be limited by the infiltration characteristics of the subgrade.

Patagonian Glacial Lake Outburst Floods (GLOFs): Utilizing Geo-Spatial Analysis to Assess Risks and Effects on Downstream Communities

Manuel Castro,
Applied Geography and Geospatial Science,
DC - College of Liberal Arts and Sciences

Mentor: Dr. Frederick Chambers,
DC - College of Liberal Arts and Sciences

The Cachet Dos Lake, Aysen region of Chilean Patagonia has endured repeated Glacier Lake Outburst Floods (GLOF) for the last eight years. These floods have occurred with little to no warning. Due to the complexity and remoteness of the area the causation of GLOFs and their potential for destruction have not been studied in depth, making it impossible to predict the occurrences. This research helps to connect the physical geography aspect of these hazards with the social geography of the affected communities. A geographic holistic perspective can bring better planning and preparation of the small settlements that depend on this area for their means of survival. Geospatial analysis techniques are used to identify the possible threat to these homesteaders, critical infrastructure, agriculture and livestock located in the Colonia and Baker Valleys. Knowledge of the topography from the source region and along these valleys can be plotted to the confluence of the Rio Colonia and Rio Baker. This enables the prediction and extent of downstream damage that may be anticipated by different water levels recorded in the Cachet Dos Lake before any GLOF occurs This initial research is to determine the potential ability of GIS modeling to lessen the severity of damage experienced by homesteads and vulnerable down valley communities by noting their structures location and elevations on an x, y, z grid. These locations and elevations will then be analyzed by modeling different overlays of expected water volumes that the lake can release in these outburst floods, with the potential flood topology and steam paths delineated. Response activity will be dictated by the expected severity of flood resulting from the GLOF event.

UNDERGRADUATE RESEARCH OPPORTUNITY PROGRAM (UROP) – 2015 RECIPENTS

The CU Denver Undergraduate Research Opportunity Program (UROP) is a competitive program designed to financially support research projects for CU Denver undergraduate students. Undergraduate research is an opportunity to extend learning outside the traditional classroom, laboratory, or studio; to utilize creativity and curiosity in the development of new knowledge, art, or innovation; to become more self-confident and independent; and to gain experience in presenting results to peers and mentors. UROP supports student projects under the broadest possible definition of "research." All declared undergraduate students, independent of college or school, are eligible for UROP research funds.

Ashley Bouck- Product Labeling and Geographic Origins of Colorado Honeys. College of Liberal Arts and Sciences

Ryan Brody - Synthesis of Hydroxyapatite Nanoparticles Surface Functionalized with PNIPAAm and Hyaluronic Acid. College of Engineering and Applied Science

Kara Brown - Art History and Practice at the Venice Biennale. College of Arts and Media

Taylor Coomer - The Pharmacotherapeutic Potential of Disruption of eCB and HCRT Neuromodulation of Dopamine Neural Activity in the Co-morbid Diagnosis of Schizophrenia and Drug-addiction. College of Liberal Arts and Sciences

Nicklaus Deevers - The Impact of Nutrient Pollution on Ammonia-Oxidizing Microbial Communities Residing in Freshwater Ecosystems. College of Liberal Arts and Sciences

Marissa DeLima - Purification and Analysis of Tozoplasma Gondii Protein Domains Involved in Membrane Fusion. College of Liberal Arts and Sciences

Brittany Frysinger, Caitlyn Scharmer, Amber Ford - A Small Puppet Theater Company for Spanish-Speaking Kids and Parents. College of Liberal Arts and Sciences

Christina Garza - Combined QM/MM Dynamics Simulations of Proton Transfer in E. coli ClC Chloride Ion Transport Protein. College of Liberal Arts and Sciences

Jack Henderson, Dante Merrill - Interplays of Membrane and Ligand Docking of Granuphilin C2A Domain: A Molecular Dynamics Study. College of Liberal Arts and Sciences

Nathanael Gray, Toni Nicastro - Activation of Nigrostriatal Dopamine Pathway to Strengthen Extinction and Reduce Fear Renewal Across Contexts. College of Liberal Arts and Sciences

Stephen Edwards - Marble, Marble XXVI Symposium: An Exploration in Stone. College of Liberal Arts and Sciences

Abigail Luman - The Effects of Social Isolation on Aggressive Behaviors and Neurochemistry in Stalk-eyed Flies. College of Liberal Arts and Sciences

Fassil Eyayou - Effects of MDMA During Fear Extinction on the Relapse of Fear. College of Liberal Arts and Sciences

Desmond Hamilton - Lipid Coated Gold Nanoparticles for Ultra-Sensitive Label Free Quantitation of Protein Adsorption Kinetics. College of Liberal Arts and Sciences

Adam Rauff - Investigating the Effects of Weight-Bearing Function on Bone Microstructure. College of Engineering and Applied Science

Chloe Sanders, Sanjana Garimella - Investigating Gsk-3-Dependent mRNA Methylation. College of Liberal Arts and Sciences

Chris Temple, Jonathan Baker, Gavin Johnson - Unlocking Brainwaves for Assistive Limb Control. College of Engineering and Applied Science

Olga Serenchenko, Christopher Andersen - Exploring Vietnamese History Through a Charcoal Lens. College of Liberal Arts and Sciences

Joseph Verbeke - Augmented Immersion - An Interactive Art Installation. College of Arts and Media

Kimberlie Grady - In Search of the Rare. College of Liberal Arts and Sciences

Hai Tran - Investigating the Kinetics of Membrane Targeting Synaptotagmin1 C2MDomains. College of Liberal Arts and Sciences

Jazmin Fontenot, Matt Ishiki, and Raleigh Jonscher - The Effect of Isolation Rearing on Glutamate in the Medial Prefrontal Cortex. College of Liberal Arts and Sciences

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