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*Gates Field House
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UNIVERSITY of
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OFFICE OF RESEARCH AND GRADUATE EDUCATION

Keynote Presenter Abstracts

Hojjat Abdollahi

**DOCTOR OF PHILOSOPHY IN ELECTRICAL & COMPUTER ENGINEERING CANDIDATE
DANIEL FELIX RITCHIE SCHOOL OF ENGINEERING AND COMPUTER SCIENCE**

A Pilot Study on Using an Intelligent Life-like Robot as a Companion for Elderly Individuals with Dementia and Depression

The use of socially assistive robots, with a focus on the socialization aspect of human-robot interaction, has become more relevant due to the increase in the number of elderly people, the decrease in the cost of technology, and recent advances in artificial intelligence. Residents of nursing homes are living longer and often experience a reduction of their cognitive abilities due to age or dementia. We conducted a pilot study to demonstrate the feasibility of using Ryan Companionbot, a perceptive and empathic conversational humanoid robot, to improve the quality of life of elderly individuals with moderate dementia and/or depression.

Ryan can interpret and respond to users' emotions, proactively engage in conversations and cognitive games, and remind users about their schedules. Six elderly individuals with moderate dementia and/or depression participated in this study. Each individual had 24/7 access to a Ryan in his/her room for a period of 4-6 weeks. The robot was customized to each subject and was programmed to provide constant companionship and mental stimulation through cognitive games and conversation. The subjects' interaction with the robot was recorded and analyzed later.

Our observations and interviews of these individuals, interviews with their caregivers and analyses of their interactions during this period revealed that they established rapport with the robot and highly valued and enjoyed having a Companionbot in their room. The robot helped them maintain their schedule, improved their mood, and increased their mental stimulation.

Elinor Brereton

**MASTER OF ARTS IN ANTHROPOLOGY CANDIDATE
ARTS, HISTORY AND SOCIAL SCIENCES DIVISION**

Psychotropic Medications and Children: Perceptions of Mental Health Professionals

This paper explores mental health professionals' perspectives on the prescription of psychotropic medications for children. It uses critical medical anthropology to examine the supremacy of biomedicine in the mental health

field and explores the extent to which this medical system is impacting the way mental illness is conceptualized and treated in children. Eight semi-structured interviews were conducted in Denver, Colorado with psychiatrists, psychologists, social workers, and a pharmaceutical board member to capture multiple perspectives from different positionalities within the field. Participants discussed factors they believe influence prescribing practices including: professional role changes, issues of access, limited evidence, cost and institutional pressures to practice within a biomedical model of care. This paper suggests that the supremacy of biomedicine has changed the conversation of mental health so drastically that psychological and social factors are no longer legitimately considered as part of mental health care, to the detriment of the children in need of services. Attempting to medicalize the human condition by restricting it to a purely biomedical model of care reduces the individual experience of health and illness and eliminates the possibility of further understanding pathology and providing appropriate and holistic care.

Melanie Byrne

**MASTER OF SCIENCE IN HEALTHCARE LEADERSHIP CANDIDATE
UNIVERSITY COLLEGE**

Distance Pathology – Bridging Gaps in Prenatal Telemedicine

Prenatal care for women during pregnancy is a proven health intervention with long term benefits for mothers and babies. With the recent focus on overcoming some of the major obstacles patients face in obtaining quality care, prenatal telemedicine programs help connect patients with providers across the United States. Prenatal medicine, however, requires extensive monitoring through lab tests or pathology. Most telemedicine programs lack a comprehensive pathology component leaving patients facing many of the same obstacles they experienced prior to telemedicine programs. To bridge this gap, this study aims to show how health systems can utilize emerging technologies for in-home lab testing, coupled with electronic documentation and transmission of results, to build a comprehensive prenatal pathology program provided at a distance. By surveying recent studies of available lab technologies, the results of this study support a proposal for a comprehensive distance pathology program that includes common prenatal tests in a format that allows patients to collect specimens in-home and have them shipped for analysis or receive results on the spot. The incorporation of electronic documentation and information transmission allows results to be transmitted efficiently allowing for quicker decision making and better quality of care.

Dave McHose

MASTER OF ARTS IN EDUCATION LEADERSHIP & POLICY STUDIES CANDIDATE MORGRIDGE COLLEGE OF EDUCATION

Impact of Differentiated Station Work on Secondary Math Instruction and Student Learning

Using math work stations to increase student engagement and academic growth can be an effective differentiated instructional strategy. This action research project explores and studies the impact of this intervention on student engagement and academic growth. The study included a treatment group of students who received the intervention and a control group of students who received regular instruction. Data was collected from three sources: pre and post-test results (quantitative data); student feedback from the treatment and control groups (qualitative data); and, feedback from passive observers (qualitative data). The results of this study found that students' engagement and academic growth increased more with the use of math work stations than with regular math instruction. These results were supported all three sources of collected data. Math work stations should be added to the body of knowledge that already exists as an effective, differentiated math instructional strategy.

Talia Thompson

DOCTOR OF PHILOSOPHY IN CHILD, FAMILY & SCHOOL PSYCHOLOGY CANDIDATE MORGRIDGE COLLEGE OF EDUCATION

Assessment with Individuals with Fragile X Syndrome: Strategies to Enhance Engagement and Decrease Hyperarousal and Anxiety

Cognitive and educational testing of individuals with fragile X syndrome (FXS) can provide crucial information for parents, researchers, and educators. Understanding the unique cognitive strengths and weaknesses of a student can inform teachers about the most useful instructional strategies for an individual. Unfortunately, psychological testing can be a stressful experience for individuals with FXS. Frequently the examination room is unfamiliar and can unintentionally cause an individual with FXS to experience hyperarousal and intense discomfort. In addition, the tasks required of the examinee can be challenging, new, and have unpredictable stop points, which can increase stress in the individual being tested.

Our team is part of a multi-site NIH grant research project validating a new cognitive battery on individuals with intellectual disability. Through extensive field research, we have developed a number of strategies to improve the experience of psychological testing for individuals with a variety of

neurodevelopmental disabilities, including FXS. This presentation will go over unique considerations when testing individuals with FXS, including a visual learning style, sensory needs, preference for routine, and issues with anxiety. We will then discuss practical strategies clinical, research, and school psychologists can use when administering psychoeducational tests to individuals with FXS. We hope you will leave this presentation with new and easy-to-use techniques that will help you to further develop your assessment skills and ultimately have a positive impact on the lives of individuals with FXS.

Natalie Trivino

MASTER OF ARTS IN GEOGRAPHY CANDIDATE NATURAL SCIENCES & MATHEMATICS DIVISION

Paleoflood Hydrology and Basin Morphometric Characteristics Related to Flooding in the Colorado Front Range

Extreme precipitation and subsequent flooding are the most prevalent and costly natural hazard globally (Baker et al., 2002). Therefore, it is necessary to better understand the physiographic characteristics associated with flooding to help prepare for flooding hazards, since these factors are the dominant controls for flood runoff (Costa, 1987). The Colorado Front Range is particularly prone to flooding hazards due to the steep, complex terrain of the mountains where water quickly spills out onto the most populated region of Colorado. This region has experienced numerous catastrophic floods such as the 2013 Front Range Floods, the Fort Collins Flood of 1997 and the Big Thompson Canyon Flood of 1976 to name a few (N.W.S., n.d.).

The objective of this study is to analyze the physiographic characteristics of several drainage basins throughout the Colorado Front Range South Platte River tributaries and determine how these characteristics relate to extreme flooding susceptibility. This was done accomplished through: 1) data collection on the prior maximum flood through a historic and paleoflood analysis; 2) a morphometric terrain analysis with ArcGIS to delineate basin characteristics such as area, shape, relief, and stream characteristics; and 3) a statistical analysis to determine which basin characteristics most relate to flooding susceptibility. Results indicate that drainage area under 2300 meters elevation, total drainage area, area of basin with slopes greater than 30 percent, basin magnitude, relief ratio, basin relief, and basin orientation are the most important characteristics driving flooding susceptibility.

Hilary Weismiller

DOCTOR OF PHILOSOPHY IN MOLECULAR & CELLULAR BIOPHYSICS CANDIDATE NATURAL SCIENCES & MATHEMATICS DIVISION

Molecular Basis for Tau Fibril Growth Barriers

Neurofibrillary tangles composed of the microtubule associated protein tau are the pathological hallmark of Alzheimer's disease (AD), progressive supranuclear palsy (PSP), and other fatal neurodegenerative disorders. Short tau fibrils are believed to spread intracerebrally by transfer between interconnected neurons. Once taken up by the cell, tau fibrils recruit soluble tau monomers onto their ends and imprint their conformation onto the recruited proteins. Based on the number of microtubule binding repeats, there are two distinct groups of tau isoforms: three-repeat (3R) tau and four-repeat (4R) tau. In AD all tau isoforms are recruited into fibrils. In PSP only 4R tau is deposited. Although it is recognized that the conformations of fibrils in PSP may be incompatible with the recruitment of 3R tau, the molecular events leading to this barrier are not understood. We hypothesized that proteolytic cleavage of 4R tau prior to fibrillization could be a contributing factor. To test this hypothesis we formed tau fibrils from an array of differently sized 4R tau fragments. We identified a broad spectrum of barriers in 4R tau truncated at the N- and C-termini. A fragment of the repeat region (amino acids 244-368) established the strongest barrier. Remarkably, single mutations in full-length tau elicited similar effects. Collectively, the findings reveal sequence-dependent variations in tau fibril structure that determine seeding barriers in 4R tau.

Poster Presenter Abstracts

Mostafa Abbasi

DOCTOR OF PHILOSOPHY IN MECHANICAL ENGINEERING CANDIDATE
DANIEL FELIX RITCHIE SCHOOL OF ENGINEERING AND COMPUTER SCIENCE

Three-dimensional Strain Mapping by Digital Image Correlation in Bioprosthetic Heart Valves: A Comparative Study of PERIMOUNT Magna, CoreValve, and SAPIEN 3

Transcatheter aortic valve replacement (TAVR) is a safe and effective treatment option for patients deemed at high and intermediate risk for surgical aortic valve replacement. Similar to surgical aortic valves (SAVs), transcatheter aortic valves (TAVs) undergo calcification and degradation over time. However, to date, there have been limited publications on the long-term durability of TAVs. To assess longevity of TAVs in comparison to SAVs, 3D deformation analysis and in-plane strain measurement of the leaflets under physiological loading condition become an inevitable part of the evaluation. The goal of this study was to perform a side-by-side comparison of leaflet strain of PERIMOUNT Magna surgical bioprosthesis, SAPIEN 3, and CoreValve using a 3D digital image correlation (DIC) system.

Abdulaziz Alanazi

DOCTOR OF PHILOSOPHY IN ELECTRICAL & COMPUTER ENGINEERING CANDIDATE
DANIEL FELIX RITCHIE SCHOOL OF ENGINEERING AND COMPUTER SCIENCE

Coordinated AC/DC Microgrid Optimal Scheduling

This research proposes a coordinated optimal scheduling model for hybrid AC/DC microgrids. The objective of the proposed model is to minimize the total microgrid operation cost when considering interactions between AC and DC sub-systems of the microgrid network. Nonlinear power flow equations for AC and DC networks have been linearized through a proposed model to enable formulating the problem by mixed integer linear programming (MILP) which expedites the solution process and ensures better solutions in terms of optimality. The proposed model is tested on the modified IEEE 33-bus test system. Numerical simulations exhibit the merits of the proposed coordinated AC/DC optimal scheduling model and further analyze its sensitivity to various decisive operational parameters.

Mohana Alanazi

**DOCTOR OF PHILOSOPHY IN ELECTRICAL & COMPUTER ENGINEERING CANDIDATE
DANIEL FELIX RITCHIE SCHOOL OF ENGINEERING AND COMPUTER SCIENCE**

Day-Ahead Solar Forecasting Based on Multi-level Solar Measurements

The growing proliferation in solar deployment, especially at distribution level, has made the case for power system operators to develop more accurate solar forecasting models. This poster proposes a solar photovoltaic (PV) generation forecasting model based on multi-level solar measurements utilizing a nonlinear autoregressive with exogenous input (NARX) model to improve the training and achieve better forecasts. The proposed model consists of four stages of data preparation, establishment of fitting model, model training, and forecasting. The model is tested under different weather conditions. Numerical simulations exhibit the acceptable performance of the model when compared to forecasting results obtained from two-level and single-level studies.

Abdullah Albaker

**DOCTOR OF PHILOSOPHY IN ELECTRICAL & COMPUTER ENGINEERING CANDIDATE
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Communicative Scheduling of Integrated Microgrids

A Provisional Microgrid (PMG) is a specific and promising type of microgrid that enhances the utilization of renewable energy resources in an efficient and cost-effective manner. The PMGs, however, must be electrically integrated to an existing microgrid, called a coupled microgrid (CMG), for islanded operation. This paper proposes a communicative optimal scheduling model in which the local power exchange between a PMG and a CMG is determined through the iterative exchange of relevant information. The final solution will ensure a reduced load curtailment in PMG and a higher economic benefit for the CMG. The proposed model is mathematically formulated using mixed-integer programming, and studied through numerical simulations to show performance and effectiveness.

Fahad Al-homayani

**DOCTOR OF PHILOSOPHY IN ELECTRICAL & COMPUTER ENGINEERING CANDIDATE
DANIEL FELIX RITCHIE SCHOOL OF ENGINEERING AND COMPUTER SCIENCE**

Improved Indoor Geomagnetic Field Fingerprinting for Smartwatch Localization Using Deep Learning

The Global Positioning System (GPS) is the most widely accepted solution for

outdoor positioning. It is fast, highly accurate, and requires no service fee. Nevertheless, as its signals try to penetrate roofs, walls and other obstacles they become severely attenuated and scattered. This has led researchers to investigate other means for indoor positioning such as WiFi and Bluetooth.; however, the infrastructure requirements and the highly instable and fluctuating nature of these signals pose significant challenges. On the other hand, a geomagnetic field is omnipresent and does not require the deployment of specialized infrastructure to be realized. Furthermore, it is stable and has unique spatial signatures. Hence, the use of geomagnetic field fingerprinting is an attractive alternative for indoor positioning. While several studies have utilized these characteristics in developing indoor positioning systems, the positioning accuracy can be improved. In this paper, we exploit the powerful properties of Convolutional Neural Networks (CNNs) by designing and developing a novel smartwatch-based, highly accurate and fast indoor geomagnetic field positioning system. The proposed system was tested on real world data in a real indoor environment composed of three corridors of different lengths and three rooms of different sizes. Experimental results show an encouraging location classification accuracy of 97.77% with a mean localization error of 13.59 cm. We further demonstrate how the Softmax Layer (SL) of the network can be exploited to further improve the localization accuracy in a user tracking scenario.

Ahmad Almadhor

**DOCTOR OF PHILOSOPHY IN ELECTRICAL & COMPUTER ENGINEERING CANDIDATE
DANIEL FELIX RITCHIE SCHOOL OF ENGINEERING AND COMPUTER SCIENCE**

PV based Resilient and Optimal Micro- Energy-grid (ROME) with Mesh Networks using Internet of Things

This paper proposes a mesh network based communication architecture that can be used to monitor and control different elements in a micro grid. A solar based, storage including, off-grid, micro grid model is designed using Matlab Simulink. Communication mechanisms between every element of the micro grid are represented and simulated in the model. Basic features of monitoring and regulating the generation and demand side of the grid are also discussed along with feedback based measures for effective performance in the micro grid.. A 48.6 kW battery connected PV system is simulated using Matlab and a partially connected mesh network is obtained through simulation using Network Simulator (NS) version 2.27. A combination of Bell-La-Padula (BLP) and Bins and Balls signature (BIBA) encryption technique is proposed to the micro grid to prevent attacks from top and bottom levels of the data flow structure. This paper concludes by proposing a simple hybrid encryption mechanism for sensors and network data access to prevent attacks and secure

the energy data. Finally, the paper also discusses a unique cloud infrastructure that can be used to store data, perform data analysis and assist in decision-making in case of extreme situations.

Mansoor Alturki

**DOCTOR OF PHILOSOPHY IN ELECTRICAL & COMPUTER ENGINEERING CANDIDATE
DANIEL FELIX RITCHIE SCHOOL OF ENGINEERING AND COMPUTER SCIENCE**

Marginal Hosting Capacity Calculation for Electric Vehicle Integration in Active Distribution Networks

Hosting capacity calculations provide significant benefits in optimizing the amount of additional generation and/or consumption to be added to a distribution grid without the need for additional investments. This paper presents an efficient mathematical model for calculating the marginal hosting capacity of distribution nodes. It can be used to identify the maximum possible change in generation/consumption of each specific node and further identify the nodes that are more impactful in using available network capacity. The model will be of specific importance in the integration of electric vehicles (EVs) to the distribution grid. The proposed model is solved in two stages based on a linear power flow model. Numerical studies are conducted on a test radial distribution network to demonstrate the effectiveness and applications of the proposed model.

Renee Bedard

**MASTER OF LIBRARY & INFORMATION SCIENCES CANDIDATE
MORGRIDGE COLLEGE OF EDUCATION**

Women's March on Denver: A Digital Collection

Our group created the digital collection titled "Women's March on Denver" to document the recent and historical Women's March that took place in downtown Denver on January 21st, 2017. The Women's March on Denver was organized in conjunction with similar marches across the country and world on the day of President Trump's inauguration to protest the current state of human rights in the United States of America. Participants used the event to broadcast their frustration with issues represented during the march. Over one hundred thousand men, women, and children participated in the local Denver chapter of this globally widespread activism. Our goals for the digital collection were to: create one of the first informative repositories for the 2017 Women's March on Denver; make the collection publicly available; increase awareness of the event; and, create an educational resource for those interested in protesting at this event specifically and as a general act of social participation. The project was

designed to develop a digital collection around a specific topic, have group members work together to compile necessary information, select images that document collection themes, and build a framework for hosting the items using the open source content managing system, Omeka. Through our research, outreach, collecting, and collaboration we have created and granted access to a digital collection on a topic of great importance that can be utilized in a variety of ways.

Rachel Bennet

DOCTOR OF PHILOSOPHY IN PHYSICS CANDIDATE DIVISION OF NATURAL SCIENCES & MATHEMATICS

Enhancement of Spin Injection in Nonlocal Spin Valves on Silicon Nitride Membranes

Nonlocal spin valves (NLSVs) are an important tool for both applied and fundamental research in nanomagnetism due to their unique ability to separate charge and spin currents.[1,2] Previous research shows that changes to the composition of the NLSV substrate can have a marked effect on the background nonlocal resistance by changing the substrate thermal conductance.[3] Our research demonstrates enhancement of non-local spin resistance by the anomalous Nernst effect (ANE).[4]

We present dramatically lowered thermal conductance in NLSVs fabricated on SiN membranes as evidenced in large background signals compared to substrate devices. We also present evidence of increased ANE due to geometric confinement of the thermal gradient. 2D finite-element analysis shows a Nernst coefficient of 0.5, nearly 4 times the literature value. This implies that our assumption of a Seebeck coefficient for permalloy of -12 microV/K at 200 K may be incorrect. Finally, we present evidence that the sign of the nonlocal spin resistance changes at higher temperatures, indicating the need for further thermal simulations.

[1] Jedema, et al. Nature 410, 345 (2001)

[2] Ji, et al, APL 88, 052509 (2006)

[3] Kasai, et al. APL 104, 162410 (2014)

[4] Hojem, et al. (in preparation)

Laura Buchanan

**DOCTOR OF PHILOSOPHY IN MOLECULAR & CELLULAR BIOPHYSICS CANDIDATE
DIVISION OF NATURAL SCIENCES & MATHEMATICS**

700 MHz Rapid Scan Imaging Spectrometer

Electron paramagnetic resonance imaging (EPRI) is similar to nuclear magnetic resonance imaging (MRI) in theory. In MRI, protons are imaged while in EPRI unpaired electrons are imaged. EPRI is capable of measuring oxygen concentration, redox and pH status in vivo.^(1,2,3) The effectiveness of radiation therapy depends on the oxygen concentration that varies within a tumor. The ability to spatially resolve oxygen concentration within a tumor can improve the effectiveness of treatment. EPR imaging is typically performed at radio frequencies between 250 MHz and 1 GHz. The selection of frequency is a tradeoff between signal to noise, which increases with increasing frequency, and depth of penetration, which decreases with increasing frequency. We built a 700 MHz system, in our lab, to image tumors in small animals.

The system incorporates an arbitrary waveform generator (AWG), a 700 MHz cross-loop resonator, a table-top air-cooled magnet, a homebuilt radio frequency bridge, and compact bipolar power supplies. We use rapid scan and stepped magnetic field gradients to collect the data. 3D printed tubes have been constructed to hold the samples. We demonstrate the imaging capabilities of the system by showing images of spin probes in 3D printed sample tubes with 2 and 3 dimensions. A description of the instrument is also provided.

1. Epel B, Kotecha M, Halpern HJ. In vivo preclinical cancer and tissue engineering applications of absolute oxygen imaging using pulse EPR q. *J Magn Reson.* 2017;280:149-157.
2. Eaton SS, Shi Y, Woodcock L, et al. Rapid-scan EPR imaging. *J Magn Reson.* 2017;280:140-148.
3. Elajaili HB, Biller JR, Tseitlin M, et al. Electron spin relaxation times and rapid scan EPR imaging of pH-sensitive amino-substituted trityl radicals. *Magn Reson Chem.* 2015;53(4):280-284.

Christine Caldera

**MASTER OF ARTS IN INTERNATIONAL HUMAN RIGHTS CANDIDATE
JOSEF KORBEL SCHOOL OF INTERNATIONAL STUDIES**

The State of El Salvador: Human Rights and Violence in the Post War Era

During the Salvadoran Civil War (1979-1992), the government of El Salvador utilized repressive tactics against the political opposition and innocent civilians

with the aim of maintaining authority within political, economic, social, and cultural spheres. With the signing of the United Nations brokered Peace Accords in 1992, El Salvador transitioned from an authoritarian regime to a consolidated democracy. Employing a mixed methods approach, supported by knowledge gained from fieldwork interviews in August 2014, this research examines how the change in regime type influenced the level of repression and respect for physical integrity rights in El Salvador. The research analyzes two conflict resolution mechanisms, the Peace Accords and Truth Commission and the implementation of elections as a common indicator of democratic practice, to understand how these mechanisms influenced the level of respect for and protection of the human rights of Salvadorans in the post war era. Despite democratic consolidation and the implementation of international peacebuilding strategies, this research determines that Salvadoran elites captured the peace process, thereby challenging the efficacy and quality of the reforms during the nascent democratic transition. Moreover, violence transformed in the post-war era as the proliferation of criminal activity from trans-national criminal organizations produced a high degree of insecurity, unprecedented homicide rates and heightened the militarization of the Salvadoran state while challenging the legitimacy and capacity of the Salvadoran government in its ability to maintain internal security. Lastly, Salvadorans reported a persistent fear regarding their personal security, reflecting similar sentiments expressed during the repressive civil war.

Menglong Cong

**DOCTOR OF PHILOSOPHY IN RESEARCH METHODS & STATISTICS CANDIDATE
MORGRIDGE COLLEGE OF EDUCATION**

A Comparative Analysis of Acculturative Stress Among Mainland Chinese and Taiwanese International Students at a Minority Serving University

To pursue higher education in the United States can be a rewarding opportunity for many Chinese/Taiwanese international students. However, many challenges including acculturative stress may hamper the students' ability to succeed in the United States. Previous literature about the factors affecting Chinese/Taiwanese international students' acculturative stress indicates mixed findings. One of the purposes of this study was to add clarity to this literature base by re-examining the impact of a range of factors noted in the literature, paying close attention to two distinct groups: students from mainland China and peers from Taiwan. Data was collected via an online survey from a predominantly minority serving institution on the West Coast of the United States. In all, 112 Chinese/Taiwanese international students completed the survey. The results indicated that age, gender, and years in the United States do not predict Chinese/Taiwanese acculturative stress. Education

level, however, was significantly related to Chinese/Taiwanese acculturative stress. Additionally, graduate Chinese/Taiwanese international students experienced significantly lower acculturative stress than undergraduates. No meaningful differences in terms of acculturative stress patterns were found between mainland Chinese and Taiwanese because of the small Taiwanese sample size.

Hannah Craven

**MASTER OF LIBRARY & INFORMATION SCIENCES CANDIDATE
MORGRIDGE COLLEGE OF EDUCATION**

Let's be Blunt: Building a Digital Exhibit about Legalization of Marijuana in Colorado

This poster shows the creation of a digital library exhibit using Omeka.net. A group of six library and information science students had ten weeks to decide on a topic, gather digital objects, and create a digital library exhibit. The group chose to create an exhibit exploring the history of the legalization of marijuana in the state of Colorado. This topic was chosen due to its direct impact and novelty to Coloradans and interest from other states. How the objects were chosen for the exhibit and how the group worked together and communicated to complete the exhibit within a ten-week period are discussed. In creating the exhibit, the students considered the intended audience and tailored the selection of materials and writing style to their imagined end users. In evaluating the practices that enabled the successful creation of a digital exhibit in a short time period, group members identified several key practices. Good communication through several channels including email and Slack contributed to good collaboration. Version control methods such as using Google Docs, as well as the decision to allocate the final editing of the report to one member ensured the integrity of the end product. Well defined roles allocated the workload evenly but were flexible enough to encourage completing tasks together. The group successfully created an exhibit with an introduction, a discussion of the history, as well as a discussion on medical marijuana and an exploration of cultural and economic impacts within the state of Colorado.

Emily Creek

**MASTER OF ARTS IN ANTHROPOLOGY CANDIDATE
DIVISION OF ARTS, HUMANITIES & SOCIAL SCIENCES**

The Global Dance Network: Reykjavík Iceland Takes on New Moves

This research is an exploration of the contemporary dance community in Reykjavík Iceland. With the goal of understanding the ways the community navigates the wider global dance network from its location in as a northern

island, I utilize concepts from the anthropology of globalization as well as dance anthropology. In order to understand the localization of dance knowledge as it is imported to Iceland I specifically employ the global cultural economy and ideas of second hand knowledge. I conducted an ethnographic study with dancers across three generations during the summer and fall 2017 Reykjavik Dance Festivals. This methodology included nine semi-structured interviews, participant observation, and analysis of visual and online materials. Through this thesis research I discuss how the isolation of Iceland, the movement of bodies and ideas, funding challenges, the climate of Iceland, and the roles of activism and collaboration contribute to the dance scene in Reykjavik. The research suggests that dance and other art communities have agency and are not as restricted by the global cultural economy as some would suggest. Thus, I propose that Icelandic artists have their own first-hand knowledge and have found ways to navigate through the global dance network that puts their city into the center of the network. The impact of this work serves to emphasize the role of art in the global cultural economy and attempts to give voice to the Icelandic dance community, a periphery community often overlooked in discussions of dance in scholarship.

Westley Cruces

DOCTOR OF PHILOSOPHY IN CHEMISTRY CANDIDATE DIVISION OF NATURAL SCIENCES & MATHEMATICS

New Reactions of Ynol Ethers and Subsequent Transformations

Ynol ethers are a unique type of alkyne due to the polarized nature of the C-C triple bond that is caused by the oxygen on one side of the alkyne which is similar to an enol ether. There are reports of ynol ethers undergoing ketene isomerization in mild reaction conditions due to a sigmatropic retro-ene reaction of β hydrogens in the system. Ynol ethers have been shown to participate in Claisen-like rearrangements. Minehan reported [3, 3]-sigmatropic Claisen-type rearrangements of allyl and benzyl ynol ethers. The substrates can rearrange at low temperatures. There is one example where rearrangement occurs at -78°C , demonstrating the reactivity of ynol ethers. Tran and Minehan were able to capture ketenes derived from ynol ethers utilizing intramolecular olefins through a [2+2] cycloaddition to generate complex fused ring systems. We aspire to synthesize ynol ethers with propargyl amines, homopropargyl amines, boronic esters, and silanols to probe the reactivity. This is accomplished by generation of an acetylide anion under basic conditions to various electrophiles. Subsequent transformations of the ynol ether generate unique structures that can be utilized for further transformations. We herein report new reactions of ynol ethers and their transformations.

Andrew Erhart

**DOCTOR OF PHILOSOPHY IN PSYCHOLOGY CANDIDATE
DIVISION OF ARTS, HUMANITIES & SOCIAL SCIENCES**

Intensity, Not Emotion: The Role of Poverty on Emotion Labeling Ability in Middle Childhood

Chronic poverty exposure in childhood is a risk factor for later psychopathology. A potential mechanism mediating the relationship between poverty exposure and psychopathology may be the impact of poverty on emotion expression recognition. Chronic poverty exposure has been shown to be related to deficits in emotion labeling ability in previous literature, but whether emotion-specific or intensity-specific deficits exist has not been demonstrated. The present study investigated the relationship between poverty exposure and emotion labeling ability in an ethnically and economically diverse sample of children (N = 45) in middle childhood. A novel experimental design measured emotion labeling ability across valences of emotion and intensities of emotion presentation. A hierarchical logistic regression found a significant interaction between the percentage of time since birth a child has lived in poverty and the intensity of the emotional stimulus in impacting correct emotion identification. Children who lived longer in poverty gained less accuracy for equivalent increases in intensity compared to children who have not lived in poverty. On average, children who chronically lived in poverty required emotional intensity set at 60% in order to reach levels of accuracy observed at 30% intensity among children who were never exposed to poverty. This finding demonstrates a relationship between chronic poverty exposure and difficulties recognizing emotional expressions, and that children who experience chronic poverty require more intense expressions to recognize emotions. This further elaborates the relationship between poverty exposure and expression recognition, informing future studies examining expression recognition as a mechanism involved in developing psychopathology.

Rozhin Eskandarpour

**DOCTOR OF PHILOSOPHY IN ELECTRICAL & COMPUTER ENGINEERING CANDIDATE
DANIEL FELIX RITCHIE SCHOOL OF ENGINEERING AND COMPUTER SCIENCE**

Predicting Power Outage Probability in Response to an Extreme Event using Twin Support Vector Machine

Extreme events, especially hurricanes, are one of the main cause of power outage in the United States, costing the nation approximately \$26 million annually. Having an accurate prediction of power system outages in response to an upcoming hurricane plays a vital role in improving power system

resilience. Since modeling and mathematical approaches may not be able to fully capture the behavior and aftermath of the events, learning from historical data can be a viable solution to model this complex system. Machine learning is an application of Artificial Intelligence (AI) that constructs algorithms that can be learned from and makes predictions on data without being explicitly programmed.

In this paper, a Twin Support Vector Machine (TWSVM) is proposed to determine the operational state of the power system components in the impacted areas. The proposed model is trained on the path and the intensity of previous hurricanes. A posterior probability sigmoid model is then trained on the obtained results to estimate the probability of the outage for each component. Finally, the obtained component outages are integrated into a load curtailment minimization model which can find an optimal power system scheduling to minimize load curtailment as a result of each outage. The simulation results on IEEE 118-bus test system illustrate the merits and the effectiveness of the proposed TWSVM classifier on improving power system resilience in response to a hurricane.

Huanghao Feng & Farzaneh Ashkari

**DOCTOR OF PHILOSOPHY IN ELECTRICAL & COMPUTER ENGINEERING CANDIDATE
DANIEL FELIX RITCHIE SCHOOL OF ENGINEERING AND COMPUTER SCIENCE**

Social, Emotion, Music, Robot and Autism

A survey of parents suggests that 1 in 45 children, ages 3 through 17, have been diagnosed with Autism Spectrum Disorder (ASD). Children with ASD experience a reduced ability to perceive crucial nonverbal communication cues such as eye gaze, gestures, and facial expressions. Studies shows that children with ASD are more interested in non-human agents such as tablets, gaming consoles and robots. These tools provide a social environment with less social anxiety and more comfort through the predictability of robots and computers.

The University of Denver Social Robotic group has focused on helping the ASD community since 2011. using various robots in research situations. Social games were developed to practice eye contact delivered by a commercial humanoid robot, NAO. Results of the game concluded that the duration of eye contact between the child and agent increased significantly, while the eye-gaze shift frequency decreased at the same time. A second humanoid robot, Zeno, has been used for two studies: 1) helping children with ASD understand emotions in combination with body language and 2) helping researchers better understand the difference of eye gaze perception between Neuron Typical Developed (TD) and ASD children.

A pilot study using Ryan (a rear-projection mask life-like robot) for autism research has demonstrated Ryan's ability for showing facial expressions with both the TD and ASD groups of children presenting similar patterns of six basic expressions made by the robot. This suggests that children with ASD may have the same mechanic for reading expressions but lack the knowledge of the meaning behind the expressions. A robot assistive music therapy game is in development with the goal of teaching children with ASD turn taking skills while playing musical instruments.

Nicole Fleck

MASTER OF ARTS IN ART HISTORY CANDIDATE DIVISION OF ARTS, HUMANITIES & SOCIAL SCIENCES

Considering the Human in Civic Burial Space: DeathLAB's Sylvan Constellation and Constellation Park

This presentation will examine Sylvan Constellation in Arnos Vale Cemetery, Bristol, England and Constellation Park suspended underneath Manhattan Bridge, New York City, New York. Both projects exist as proposals from DeathLAB-- a trans-disciplinary collective from Columbia University comprised of architects, engineers, and designers. My argument will focus on the participatory and performative aspects of these memorialization spaces, in order to integrate death, burial, and mortality in a civic space. As a result, the participant may engage in dialogue about their social and cultural perspective of death, burial, and mortality as part of the idea of civic livelihood and, potentially, in relation to their own identity.

I will critically analyze both the Bristol and New York City projects as I feel an important perspective missing from the DeathLAB collaborations is that of the art historian. This approach is also an optimal opportunity to examine the projects as case studies separate from one another and to use the common thread of participation and performance to describe a person's interface with both projects. As of now, Sylvan Constellation and Constellation Park exist as proposed projects in a digital environment. As such, I will use scholars dealing with art and spatial politics, phenomenology, embodied interaction, and participatory placemaking as means to inform this project. The scholars used to ground this presentation are: *Entangled: Technology and the Transformation of Performance* (2010) by Chris Salter, *Where the Action Is* (2001) by Paul Dourish, and *Aesthetics of Interaction in Digital Art* (2013) by Katja Kwastek.

Hosein Golshan Mojdehi

DOCTOR OF PHILOSOPHY IN ELECTRICAL & COMPUTER ENGINEERING CANDIDATE
DANIEL FELIX RITCHIE SCHOOL OF ENGINEERING AND COMPUTER SCIENCE

Studying the Effect of Subthalamic Stimulation and Dopamine-dependent Therapy on Human Behavior Analysis using LFP Signals

Current clinically available deep brain stimulation (DBS) therapies for Parkinson's disease (PD) are open-loop and unable to adapt to the ever-changing patient, medication, and disease states. A closed-loop DBS system that utilizes appropriate physiological control based on patients' predicted behavior may improve therapeutic results. In this study, we develop a behavior classification method robust to stimulation to label patient actions, even in the presence of therapy. Furthermore, we investigate the effect of medication and stimulation on the increased beta power associated with PD.

Three participants were implanted with DBS leads in the subthalamic nucleus (STN). During two data collection sessions from the implanted leads, one "on" medication and one "off" medication, the participants were cued to perform a series of 60 "button press" then "reach" actions with and without therapeutic stimulation. We transformed the bipolar re-referenced local field potentials (LFP) into their time-frequency representation and used the beta frequency range (13-30Hz) as input to a support vector machine (SVM) classifier. Additionally, we used Welch's power spectral density (PSD) estimate to evaluate the effect of the medication and stimulation on the beta power of LFPs.

We obtained a classification accuracy of 87%, 85%, and 87% for stimulation "off", "on", and "combined" data sets using a SVM classifier. An analysis of variance (ANOVA) for the PSDs of the four combinations of stimulation "on/off" and medication "on/off" show beta power is suppressed significantly when the patients take medication (p -value ≤ 0.002) or receive therapeutic stimulation (p -value ≤ 0.0003).

The results show that STN-LFPs contain useful information for human behavior recognition. The high-frequency stimulation pulse (~140 Hz) had limited impact on the classification performance. This is a precursor for designing the next generation of closed-loop DBS systems.

Rebekah Gordon

MASTER OF ARTS IN RELIGIOUS STUDIES CANDIDATE
DIVISION OF ARTS, HUMANITIES & SOCIAL SCIENCES

Western Philosophy and Religion: How Philosophy Shapes Faith

The Abrahamic faiths, Judaism, Christianity and Islam are also known as "Western religions". These Western religions have encountered and been affected by Western philosophy. My work focuses on three main "stages" of each religion: inception; the height of academic influence; and, modernity and the ways in which they respond(ed) to the Western philosophical construct of rationality. As a result, I discovered that each Western religion embraces rationality at certain points and rejects it at others. Western philosophy for Western religion has become much like the Church in American politics: theoretically divisible but practically difficult to separate.

Xuzheng Han

MASTER OF SCIENCE IN BIOENGINEERING CANDIDATE
DANIEL FELIX RITCHIE SCHOOL OF ENGINEERING AND COMPUTER SCIENCE

Loading and kinematic profiles for patellofemoral durability testing.

The goal of this study was to detect the deformation of the implanted polyethylene patella in an experimental durability test with realistic boundary conditions that would (a) display wear of the implanted patella after a series of realistic motivation and (b) capture worst case conditions for the implant.

Seven combinations of loads and kinematics were collected from eleven patients (average (μ) and $\mu \pm 2$ standard deviations (σ) of modes 1-3) performed experimentally in the VIVOTM simulator. The experimental implants are a size 6 femoral component and a 32-mm implanted patella to simulate the worst condition. Anterior/posterior and medial/lateral direction were controlled by force. Other directions were controlled by degree. Each of the profiles run ten thousand cycles to capture the deformation of the patella prosthesis without significant amounts of components. The three-dimensional geometry of each patellar prosthesis was scanned with a Wide-Area 3D Measurement System.

Two of the seven loading profiles (Mode 1: $\mu - 2\sigma$ and Mode 2: $\mu + 2\sigma$) were not run because the medial/lateral contact forces exceeded the limits of the VIVOTM simulator. The largest deformation was observed in the Mode 3: $\mu - 2\sigma$ (0.99mm). Deformation of each profile was different and adequately predicted by the models simulated in the Abaqus, although the peaks of deformation resulted in smaller magnitudes. The Pearson-Product correlation

coefficient is 0.91 between Finite Element Model and experimental results on the medial and lateral facets of the button.

Behzad Hasani

**DOCTOR OF PHILOSOPHY IN ELECTRICAL & COMPUTER ENGINEERING CANDIDATE
DANIEL FELIX RITCHIE SCHOOL OF ENGINEERING AND COMPUTER SCIENCE**

Bounded Residual Gradient Networks (BReG-Net) for Facial Affect Computing

Residual-based neural networks have shown remarkable results in various visual recognition tasks including Facial Expression Recognition (FER). Despite the tremendous efforts that have been made to improve the performance of FER systems using DNNs, existing methods are not generalizable enough for practical applications. We introduce Bounded Residual Gradient Networks (BReG-Net) for facial expression recognition in which the shortcut connection between the input and the output modules is replaced with a differentiable function with bounded gradient that prevents the network from facing the vanishing or exploding gradient problem. We show that utilizing more complex units will result in shallower networks with better performances. Further, by using a weighted loss function which gives a higher priority to less presented categories, we can achieve an overall better recognition rate. The results of our experiments show that BReG-Nets outperform state-of-the-art methods on three publicly available facial databases in the wild on both the categorical and dimensional models of affect.

Molly Haugen

**DOCTOR OF PHILOSOPHY IN CHEMISTRY CANDIDATE
DIVISION OF NATURAL SCIENCES & MATHEMATICS**

Trends From Two California Heavy-Duty Truck Fleets for Particle and Gaseous Emissions

Particulate matter (PM) and nitrogen oxide (NO_x) emissions have been subject to dramatic emission changes with new regulations promoting the use of advanced after-treatment systems, and better engine management in heavy-duty vehicles (HDVs). The University of Denver has monitored these trends with biannual studies since 2013 using the On-road Heavy-duty Monitoring System (OHMS) within California. The two sites measured are comprised of characteristically different HDV fleets. The Port of Los Angeles, CA site consists of short distance operations and requires all vehicles to be equipped with diesel particulate filters (DPFs) to reduce PM on site. The Cottonwood Weigh Station in northern California consists of a long-haul interstate fleet where general fleet turnover has introduced new technologies.

These contrasting fleets give valuable insight into how driving mode, fleet turnover and age impact HDV emissions. The average fleet age at the Port of Los Angeles continues to increase between measurement years. Significant increases were observed in the 2015 measurements and return to the 2013 average in 2017. High emitting HDVs maintain a high variability in their particle measurements; however, there were significantly fewer high emitting vehicles in 2017 than observed in 2015.

Fleet turnover at Cottonwood has continued to reduce the fleet age and average PM and NOx emissions. With the introduction of newer model year HDVs, there are significant reductions in PM and NOx emissions. Additional 2007 and older HDV's were observed with retrofit-DPFs further decreasing the fleets PM emissions. Newer technology vehicles exhibit lower NOx emissions contributing to reduced fleet means.

Wassan Hayale

**DOCTOR OF PHILOSOPHY IN ELECTRICAL & COMPUTER ENGINEERING CANDIDATE
DANIEL FELIX RITCHIE SCHOOL OF ENGINEERING AND COMPUTER SCIENCE**

Video-Based Facial Expression Recognition Using Siamese Neural Networks

Feature extraction is a critical step in developing machine learning techniques for pattern recognition. Traditionally, machine learning techniques such as Linear classifiers and Support Vector Machines have relied heavily on handcrafted features which can limit their performance. These methods are shallow in the sense that only a single linear or non-linear function is applied on the input handcrafted features to classify the patterns of interest. Deep neural networks allow composing various artificial neurons (non-linear functions), providing a powerful end to end (raw input signal to output) solution. These artificial neurons (AN) also extract multiple hierarchies (deep) of features from input signals, which improve the generalization capacity of the neural networks. Most of the work in deep learning research is focused on feedforward, convolutional or recurrent neural network architectures for solving various problems in computer vision and natural language processing (NLP). In the proposed research, we explore another deep neural architecture, called Siamese architecture, for powerful discriminative feature learning and facial expression recognition. In a Siamese network, we learn a similarity measure between input pairs by comparing features through a learned metric. An example of this learned metric is L₂ based distance which minimizes the distance between the features for identities belonging to the same class or maximizing the distance if they are different. This approach works well for verification purposes on an unseen input pair as the network is trained effectively for a verification (binary classification) task. Our motivation behind

exploring this architecture for facial expression recognition is that it reduces variations within the same class of signals (i.e. reduces intra-signal variation). When a network is tuned carefully, we can rely on powerful discriminative features to generalize the power of the network to entirely new unseen identities from unknown distributions.

Allyson Howe

**MASTER OF SOCIAL WORK CANDIDATE
GRADUATE SCHOOL OF SOCIAL WORK**

Exploring Telehealth Potential for Multisystemic Therapy Practices

Families living in rural areas often struggle to find effective services when their children have behavioral problems. One of the most effective interventions for adolescents, Multisystemic Therapy (MST), has specific treatment requirements that have been identified by some service providers as a challenge to serve rural clients. MST is an evidence-based intervention, primarily used with adolescents at risk of involvement with the juvenile justice system, utilizing an ecological systems framework. Previous research demonstrates that this service delivery model must be implemented with fidelity in order to be most effective. This study gathered perspectives from current and former MST therapists and supervisors regarding the potential for incorporating telehealth-based strategies to enhance MST service delivery for rural areas. A needs-assessment survey was developed to determine aspects of MST that could be more or less challenging to deliver via telehealth-based strategies. Participants included 38 therapists and supervisors from the United States and Europe. While not all participants indicated agreement with utilizing video-conferencing to conduct therapy, results indicate that the majority of respondents perceive benefits from telehealth tools enhancing service delivery. Results generally indicate an optimism in some version of incorporating telehealth capabilities into MST practices and the feasibility of telehealth approaches in maintaining treatment fidelity. This preliminary study indicates further research and pilot testing would be recommended to increase the reach of the program into rural areas.

Jonathan Huihui

**DOCTOR OF PHILOSOPHY IN PHYSICS CANDIDATE
DIVISION OF NATURAL SCIENCES & MATHEMATICS**

All-atom simulations reveal protein charge decoration in the folded and unfolded ensemble is key in thermophilic adaptation

Proteins from thermophilic organisms usually melt (unfold from folded) at a much higher temperature compared to their counterparts extracted from

mesophilic organisms, despite having very similar structures and sequences. This is a long standing puzzle in protein science with the key question: Is there a general principle that evolution may have used to achieve such high thermal tolerance?

The quest for a general principle has been hampered due to the limits of experimental and computational studies that focus on a few proteins. We tackle this by studying twelve pairs of homologous proteins from thermophilic and mesophilic pairs using detailed all-atom simulation methods. Our study reveals thermophilic proteins in the folded state have more favorable electrostatic interaction and, contrary to previous studies, we also find more favorable interaction in their unfolded state.

This destabilizing effect does not outweigh the favorable effect of the folded state but highlights the importance of considering the unfolded state. Although electrostatics seems to be primary driving forces behind enhanced stability, we also notice there are secondary strategies (4 out of 12) at play where charge regulation may not be possible for functional reasons.

Charlie Huntington

DOCTOR OF PHILOSOPHY IN PSYCHOLOGY CANDIDATE
DIVISION OF ARTS, HUMANITIES & SOCIAL SCIENCES

Association of Perceived Peer Sexual Norms with Adolescents' Attitudes Toward Committed Relationships

Social norms theory posits that perceptions of group normative attitudes and behaviors will influence individuals' cognitions and behavioral decision-making (Perkins & Berkowitz, 1986). Adolescents' injunctive norms (what they believe peers think) and descriptive norms (what they believe peers do) about sex influence their own sexual attitudes and behaviors (von de Bongardt et al., 2015). Such over-perceiving of sexual norms leads to more sexually permissive attitudes (Zelin et al., 2015). Although research with emerging adults suggests that sexual permissiveness is associated with valuing committed relationships less (Carroll et al., 2007; Leonhardt & Willoughby, 2018), the relationship between perceived peer sexual norms among adolescents and their attitudes toward commitment and marriage remains unexamined.

Bivariate correlation analyses were conducted on a diverse sample of Denver-area adolescents (N=572, ages 13-19) to see if perceived peer sexual norms were related to attitudes about committed relationships. As norms often differ by gender, analyses considered boys and girls separately.

Boys' estimates of what percentage of their peers approved of having sex and what percentage have had sex were both significantly negatively associated with their scores on scales measuring the importance of committed relationships and their future intentions to marry. For girls, both norms questions were negatively associated with future intentions to marry but not the importance of committed relationships. These results are the first to suggest that perceived peer sexual norms are related to relationship expectations as well as sexual attitudes and behaviors. Implications of gender differences for social norms interventions will be discussed.

Jessica King

DOCTOR OF PHILOSOPHY IN SOCIAL WORK CANDIDATE GRADUATE SCHOOL OF SOCIAL WORK

An Age Comparison of Caregiver Strain and Resources

Young adult caregivers (YACs) of older adults are an often-overlooked subset of the caregiver population, though they make up more than a quarter of all informal caregivers. Due to their stage in life, YACs (ages 21-40) are likely to face different caregiving challenges related to their economic and work status. Using the Life Course Perspective as a foundational framework, this study compared the resources and strains of YACs ($n = 12$) to those of their middle-aged (MACs; ages 41-60; $n = 34$) and older adult counterparts (OCs; ages 61 and older; $n = 49$). Data was collected from a cross-sectional online survey of caregivers recruited across one state through community agencies.

Standardized measures of caregiver strain and positive aspects of caregiving were used. Through multivariate regression analysis, findings indicated that YACs reported more financial strain than MACs and OCs, despite being more likely to be employed ($F = 5.702$, $df = 4$; $p < .001$). In surprising contrast, YACs reported greater positive feelings toward caregiving than both MACs and OCs ($F = 8.212$, $df = 4$, $p < .001$). These findings remained consistent while controlling for employment status, education, and hours per week spent caregiving changed. While YACs may find great value in caregiving, they may also be placed in more financially precarious situations. Caregiver support programs may want to expand efforts to reach YACs in the workplace, to offer social programs that offer financial reimbursement to caregivers, or to provide paid family leave that is inclusive of older adult caregiving responsibilities.

Sarah Leiser

MASTER OF ARTS IN MEDIA & PUBLIC COMMUNICATION CANDIDATE DIVISION OF ARTS, HUMANITIES & SOCIAL SCIENCES

Analyzing Stereotypes and Motivations Surrounding Sex in Teenage Television Dramas

The purpose of this study was to examine three different components of storylines based on sex in teenage television dramas. The components are: if and how sexual health is discussed, character motivations for having sex, and how male and female characters are treated differently when they have sex. Two episodes of both *The Secret Life of the American Teenager* and *Gossip Girl* were analyzed through a textual analysis. The scope of this research is only concerned with these two shows. While *The Secret Life of the American Teenager* has been called a more realistic depiction of teenage sex and *Gossip Girl* has been seen as too glamorous and unrealistic, both shows followed similar tropes and narratives regarding teenage sex. These include punishment for females who lose their virginity or being sexually active, girls as responsible for sexual health, males celebrated for losing their virginity and not facing consequences. Additionally, none of the analyzed characters had positive motivations for having sex. These messages, despite the differences in style and storylines, are negative and can be dangerous for teenagers who use media as a way to learn more about sex and the surrounding social roles. Future research should examine in detail how these messages influence teenagers' thoughts on health and social roles in sex.

Hossein Lotfi

DOCTOR OF PHILOSOPHY IN ELECTRICAL & COMPUTER ENGINEERING CANDIDATE DANIEL FELIX RITCHIE SCHOOL OF ENGINEERING AND COMPUTER SCIENCE

Co-Optimization Generation and Distribution Planning in Hybrid AC/DC Microgrids

This study proposes a model for co-optimization generation and distribution planning in hybrid AC/DC microgrids. Generally, there are two methods for optimal energy management in distribution systems: upgrading the system by installation of new lines in parallel with existing lines and installing local distributed energy resources (DERs) as a microgrid in appropriate buses. This study encompasses both methods and determines the optimal DER generation mix, size, and location as well as the candidate lines to be installed in order to satisfy the objective function. The problem is formulated by mixed integer linear programming (MILP). The numerical simulations on a modified IEEE 33-bus standard test system reveal the effectiveness of the proposed model. The results show that the simultaneous installation of DERs and parallel lines along

with existing lines would reduce the microgrid planning cost.

Mohsen Mahoor

**DOCTOR OF PHILOSOPHY IN ELECTRICAL & COMPUTER ENGINEERING CANDIDATE
DANIEL FELIX RITCHIE SCHOOL OF ENGINEERING AND COMPUTER SCIENCE**

Data Fusion and Machine Learning Integration for Transformer Loss of Life Estimation

Rapid growth of machine learning methodologies and their applications offer new opportunities for improved transformer asset management. Accordingly, power system operators are currently looking for data-driven methods to make better-informed decisions in terms of network management. In this paper, machine learning and data fusion techniques are integrated to estimate transformer loss of life. Using IEEE Std. C57.91-2011, a data synthesis process is proposed based on hourly transformer loading and ambient temperature values. This synthesized data is employed to estimate transformer loss of life by using Adaptive Network-Based Fuzzy Inference System (ANFIS) and Radial Basis Function (RBF) network, which are further fused together with the objective of improving the estimation accuracy. Among various data fusion techniques, Ordered Weighted Averaging (OWA) and sequential Kalman filter are selected to fuse the output results of the estimated ANFIS and RBF. Simulation results demonstrate the merit and the effectiveness of the proposed method.

Alireza Majzoobi

**DOCTOR OF PHILOSOPHY IN ELECTRICAL & COMPUTER ENGINEERING CANDIDATE
DANIEL FELIX RITCHIE SCHOOL OF ENGINEERING AND COMPUTER SCIENCE**

Distribution Market as a Ramping Aggregator for Grid Flexibility Support

Balancing electricity supply and demand is the most important responsibility of power system operators. The increasing penetration of renewable energy resources which produce a variable generation, however, has challenged the traditional practice in ensuring this balance. Utilizing potential flexibility of microgrids is a local and viable solution for capturing the renewable generation variability and uncertainty. The rapid deployment of microgrids, as well as other proactive customers in distribution networks, has made the case for extending the concept of Distribution Market Operator (DMO). This new entity will facilitate the management of the distributed resources and their interactions with upstream network and the wholesale market. A distribution market scheduling model is proposed in this paper. The proposed scheduling model is developed to capture and collect the ramping capability of

participating microgrids in the distribution market to offer it to the upstream network. Using the proposed model, DMOs can appear as major sources of flexibility in the system to address emerging ramping issues associated with growing proliferation of variable renewable generation. The proposed model is analyzed through numerical simulations, where it is shown that the offered ramping capability could be significant, considering the DMO would collect the ramping capability of a large number of microgrids and other proactive customers. This offering will be at the expense of a minor deviation in microgrids schedules from their optimal operating point, which would require additional discussions on proper incentive mechanisms.

Joseph McPeak

DOCTOR OF PHILOSOPHY IN CHEMISTRY CANDIDATE
DIVISION OF NATURAL SCIENCES & MATHEMATICS

Probing the mechanism of Samarium mediated organic reductions by the trapping of reaction intermediates

Authors: Joseph McPeak, Christopher Aretz, Bryan Cowen, Sandra Eaton, Gareth Eaton

Samarium(II) iodide (SmI_2) is known to reduce organic ketones by very rapid single electron processes. The resulting free radical intermediates are short-lived, which makes them difficult to study. The spin trapping technique intercepts transient intermediates and converts them to more stable molecules. These trapped species are more readily studied than the intermediates and may provide insight into the reaction process.

Molander and coworkers proposed two potential pathways by which the reduction of ketones by SmI_2 might take place [1]. Identification of the pathway requires the study of key intermediates. This work uses spin trapping to identify an intermediate that supports one of the proposed pathways.

The spin trapping molecule, 2-methyl-2-nitrosopropane (MNP) was used to trap intermediates in the reaction of the substrate 5-bromo-6-oxo-6-phenylhexyl methanesulfonate with SmI_2 . Spectra of the trapped species were acquired by Rapid Scan Electron Paramagnetic Resonance. Spectra were simulated to determine the nuclear hyperfine coupling constants that can be used to identify the molecule.

The hyperfine couplings demonstrated the presence of a proton on the carbon that is adjacent to the reactive site of the trapped molecule. The presence of a proton at this position is likely in one path proposed by Molander, and unlikely

in the other. The substrate was then modified by placing a deuteron at this position, instead of the proton, and the reaction was repeated. Predicted changes in the EPR spectra supported the proposed reduction pathway.

[1] Molander, G. A.; Hahn, G. J. *Org. Chem.* 1986, 51, 1135-1138

Philippa Meek

DOCTOR OF PHILOSOPHY IN RELIGION CANDIDATE DU-ILIFF JOINT DOCTORAL PROGRAM

I Now Pronounce You Man and Wives: Changing Attitudes to Polygamy in the United States

Attacks on polygamy began in the United States when Congress passed the Morrill Anti-Bigamy Act in 1862. Today, depending on the state in which a polygamist resides, practitioners can face felony charges and up to five years in prison. When polygamy was outlawed, it was a reaction to the growth of, and power held by, the Church of Jesus Christ of Latter-day Saints. Opponents at the time argued that the practice was immoral, and did not fit in with the Judeo-Christian view of the institution of marriage acceptable to law makers. While members of the mainstream Mormon Church discontinued the practice of plural marriage following Church president Wilford Woodruff's 1890 Manifesto, fundamentalist Mormons broke from the mainstream Church and continue to practice polygamy today.

In my poster I demonstrate how attitudes toward polygamy have changed, resulting in more people supporting the decriminalization of plural marriage. Through the use of longitudinal surveys, the documented popularity of television shows such as *Big Love* and *Sister Wives*, and evidence of increased efforts to challenge the laws surrounding the institution of marriage in US courts, such as the landmark Supreme Court ruling on *Obergefell v Hodges* that found state bans on same-sex marriage were unconstitutional, I show how the general public no longer has the same attitudes to marriage as those held in the nineteenth century, and how there is an increased support for practicing polygamists who continue to make legal arguments for the decriminalization of polygamy.

Michail Michailidis

**DOCTOR OF PHILOSOPHY IN ELECTRICAL & COMPUTER ENGINEERING CANDIDATE
DANIEL FELIX RITCHIE SCHOOL OF ENGINEERING AND COMPUTER SCIENCE**

Flight Controller Design for Unmanned Aerial Vehicles with Aerodynamic Uncertainty

Research focuses on establishing a foundational and mathematically rigorous framework for robust controller design with performance guarantees for systems with unstructured, time-varying aerodynamic uncertainties. Proof-of-concept demonstration, testing, Validation/Verification (V&V) of the proposed framework will be demonstrated on a family of NextGen unmanned fixed-wing aircraft with unstructured, time-varying aerodynamic characteristics during flight (due to morphing wings, segmented control surfaces on the wings, circulation control based wings, sudden changes in weight, etc.). For the NextGen UAVs under consideration, merits relate to the proposed hybrid control architecture consisting of an inner/outer loop structure where aerodynamic uncertainty in the model is bounded and tackled through a robust μ -synthesis controller, and performance is optimized using performance weighting functions in the plant output. In simulation, take off / circular maneuvering scenarios were considered, as well as trajectory following. Closed loop responses to reference instructions were almost ideal. There is no existing and universally accepted controller design methodology for navigation and control of NextGen unconventional aircraft, despite isolated efforts. It is envisioned that the proposed research will pave the way to develop a validated and verifiable navigation controller design methodology for such systems. For example, a morphing-based aircraft that emulates the biological structure of a bird will be able to control itself like a bird, with wings that twist, fold and transform. Changing shape during flight implies on-demand alteration of all aircraft aerodynamic characteristics.

Rode Molla

**DOCTOR OF PHILOSOPHY IN RELIGION CANDIDATE
DU-ILIFF JOINT DOCTORAL PROGRAM**

Reframing the Adwa Victory as a Decolonizing Praxis: Discourse Around Colonization in the Ethiopian Context

The 1896 Adwa victory in which Ethiopia defeated Italy is celebrated annually in Ethiopia on March 1 as a demonstration that the nation has never been colonized. Even though Ethiopians were able to defend their border, the western discourses create psychological, ideological, and imaginary colonization for Ethiopians. This paper will prove that while Ethiopians

celebrate the Adwa victory every year, they lack a discourse on colonialism which could address how the victory of Adwa and its aftermath affect them. I am employing Frantz Fanon's *Black Skin, White Masks* and Michel Foucault's *Discipline and Punish: The Birth of the Prison* to show the exterior (socio-political and cultural) and interior (personal and psychological) impact of colonization. Fanon's theory enables me to explain how the western discourses interpreted the Adwa victory and its impact on the social and political lives of Ethiopians. I employ Foucault's docile bodies theory to show how civilization and colonization work to tame and traumatize Ethiopians. This paper discovers: 1) after the Adwa victory, the Western discourse isolates and paint sEthiopian bodies white so that its superiority cannot be penetrated and defeated by black bodies; 2) the victory of Adwa or the lived realities and experiences of Ethiopians' cannot determine their identity because their bodies are not only alienated but also gendered and racialized by the power of whiteness; and, 3) despite the Adwa victory, imposed imperialist, communist, and neoliberal ideologies made Ethiopians bodies tamed and docile.

Kassandra Neiss

MASTER OF ARTS IN ANTHROPOLOGY CANDIDATE DIVISION OF ARTS, HUMANITIES & SOCIAL SCIENCES

An Ark By Any Other Name... : A case study examining how a secular nonprofit located in a repurposed church can best support adjustment strategies of immigrants and refugees in US cities

This project positions shrinking or struggling churches in US cities as opportune spaces to be repurposed as secular, shared-space community centers serving foreign-born communities. This is because religious, ethnic, and civic identities together inform the actions of foreign-born and native-born individuals in integration and adjustment processes. Globalizing city populations and urban resident moving patterns have diversified the user base of urban religious structures through either accommodating multiple congregations under one roof or including multiple nationalities within the same parish. It becomes necessary for these naturally occurring multi-ethnic spaces to change and adapt with their new user base and their diversity of backgrounds. The field site for this case study is a Lutheran church in Aurora, Colorado which was repurposed as a secular nonprofit center in 2017 and now supports adjustment processes of immigrants and refugees in Denver and Aurora. To determine the benefits and challenges of serving a diverse foreign-born population in a repurposed Christian structure, this research uses a community participatory model employing participant observation, time sampling, free listing, and rank ordered surveys. Preliminary findings suggest that repurposing this Lutheran Church as a secular community center is well-

positioned because the building maintains the same functionality as a community space offering spiritual, psychological, social, educational, and civic support. However, there are certain material, social, and symbolic aspects of Christian churches that may complicate the adaptation of the building as a diverse shared-space facility.

Thacien Ngendahimana

DOCTOR OF PHILOSOPHY IN CHEMISTRY CANDIDATE
DIVISION OF NATURAL SCIENCES & MATHEMATICS

Electron Paramagnetic Resonance of a 10B-containing Heterocyclic Radical

Synthesis of frustrated Lewis pair (FLP) molecules has recently received attention. This synthesis of metal-free hydrogenation catalysts and their reactivity with a wide variety of molecules is pushing catalytic design in a new direction. In FLPs, a Lewis acid is placed in a close proximity to a Lewis base in the center of a bulky molecule creating a sterically encumbered combination that causes covalent interaction among Lewis centers ('frustration') thereby causing catalytic cooperativity. Natural abundance boron consists of 80% ¹¹B and 20% ¹⁰B. There is very little spectroscopic information for samples with pure ¹⁰B.

A new FLP (C₆F₅)₂B(O₂C₁₄H₈) compound enriched with ¹⁰B was prepared at the University of Toronto and analyzed by electron paramagnetic resonance at the University of Denver. Continuous Wave (CW) spectra and variable temperature measurements were acquired with the Bruker EMX and Bruker E580, respectively. Properties were compared to those for the previously studied ¹¹B isotope [1].

Ten hyperfine couplings from protons, fluorine and boron nuclei were measured. The temperature dependent relaxation mechanisms (1/T_m, 1/T₁) were investigated. In this molecule the spin density on boron is small. Relaxation properties are similar for ¹⁰B and ¹¹B-containing molecules. Further characterization of the radical was done by performing specialized pulse techniques, ESEEM and HYSCORE, to identify nuclear frequencies. The hyperfine parameters that simulate the HYSCORE and ESEEM approximately match the hyperfine from CW spectra.

[1] S.S. Eaton, K. Huber, H. Elajaili, J. McPeak, G.R. Eaton, L.E. Longobardi, D.W. Stephan. Electron spin relaxation of a boron-containing heterocyclic radical J. Magn. Reson., 276 (2017), pp. 7-13

Shreya Patel

MASTER OF SCIENCE IN COMPUTER SCIENCE CANDIDATE

DANIEL FELIX RITCHIE SCHOOL OF ENGINEERING AND COMPUTER SCIENCE

Enhanced Probabilistic Record Linkage with Elliptic Curve Cryptography

A federated query portal in an electronic health record infrastructure enables large epidemiology studies by combining data from geographically dispersed medical institutions. However, an individual's health record has been found to be distributed across multiple carrier databases in local settings. Privacy regulations may prohibit a data source from revealing clear text identifiers, thereby making it non-trivial for a query aggregator to determine which records correspond to the same underlying individual. Privacy-preserving record linkage is an actively pursued research area to facilitate the linkage of database records under the constraints of regulations that do not allow linkage agents to learn sensitive identities of record owners. In an earlier work, large scale scalability has been shown to be possible using traditional cryptographic transformations such as Pohlig-Hellman ciphers, pre-computations, data parallelism, and probabilistic key reuse approaches. In this work, we seek to improve the runtime of a linkage exercise by adopting Elliptic Curve (EC) based transformations that are mostly additive and multiplicative, instead of exponentiations. The objectives of this proposal are three-fold: 1) improve the pre-computation time by EC-based keys and operations and avoid pre-computations that are unlikely to be used during the record linkage task; 2) reduce the communication overhead by providing compressed structures for data exchanges; and, 3) improve the linkage time by setting reference maps in memory/cache.

Anna Pauscher

MASTER OF LIBERAL STUDIES IN ARTS & CULTURE CANDIDATE

UNIVERSITY COLLEGE

Removing Barriers to Lifelong Music-Making

Barriers to adult participation in music groups make it more difficult for busy adults to learn and play a musical instrument. While many people engage in music education and music-making as a K-12 student, it is less common to remain engaged in the activity into adulthood. Recent scholarly and peer reviewed articles are referenced to address this topic. Barriers of group requirements, social norms, and poor facilitation are identified and discussed. Solutions from current research include addressing social and cultural issues, grouping participants according to learning needs, and facilitator training. Recommendations are made to identify and remove barriers that hinder

participation in music-making activities to be more accessible to adults.

Lindsey Ratcliff & Josh Boissevain

**JURIS DOCTOR CANDIDATE
STURM COLLEGE OF LAW**

Pro Se Litigants in Colorado Water Court

In Colorado, water is the most valuable property a person can own. One must navigate the state's water courts to protect and secure water rights—which normally involves hiring water attorneys and water engineers. Because water attorneys and engineers are expensive, many people in Colorado choose not to hire them. Instead, people may opt to represent themselves as self represented parties. The costs, complexities, and requirements of representing oneself in water court means that self represented parties are often dismissed or decide to withdraw from the proceedings, leaving them with no real means to protect their water rights. Parties might even choose to forego the water court process entirely.

Our research analyzes how unrepresented or self-represented parties participate in Colorado's water courts. Specifically, this work tries to answer qualitatively and quantitatively whether there are important access-to-justice and judicial-efficiency issues affecting the court because of self represented parties. As part of our research ,we interviewed self-represented parties, officers of the court, and attorneys from Colorado's water law community. This research also looks at the statutory and regulatory framework governing how self represented parties interact in the water court process, the ethical issues facing attorneys and court officials interacting with self-represented parties, the resources and tools currently available to address some of these issues, as well as some of the resources or legal changes needed to address these issues.

Annie Richardson

**DOCTOR OF PSYCHOLOGY IN PROFESSIONAL & CLINICAL PSYCHOLOGY CANDIDATE
GRADUATE SCHOOL OF PROFESSIONAL PSYCHOLOGY**

Preliminary Normative Data Analysis on the Denver Attention Test (DAT)

To evaluate the DAT, a brief computerized performance validity test is currently in development. The DAT was initially administered to a control group of 30 randomly selected healthy adult volunteer subjects, ages 18-65, from the general community. The subjects were first instructed to give full effort when completing the test. They were then provided with a background scenario prompting them to simulate mild cognitive impairments without

having the test detect simulation (Malingered). A second normative group of 30 subjects were provided with the same background scenario and took the test with simulated impairments (Malingered II).

The data indicated a cutoff Total Correct score of ≤ 39 (100% specificity and 88% sensitivity) and a Total Time cutoff score of ≥ 97 (100% specificity and 83% sensitivity) for negative response bias. Using a decision formula considering cutoffs for Total Correct or Total Time, the data demonstrate 98% sensitivity and 100% specificity in determining negative response bias. This decision formula accurately detected negative response bias in 59 out of 60 subjects in the normative groups.

The test accurately detected negative response bias in 98% of testing subjects in the normative sample. This preliminary analysis indicates that the DAT is an effective measure of performance validity. Additional research on clinical subjects is indicated to support diagnostic utility in psychological assessments.

Alicia Saxe & Jodie Wilson

DOCTOR OF PHILOSOPHY IN CURRICULUM & INSTRUCTION CANDIDATE MORGRIDGE COLLEGE OF EDUCATION

Complementary Social Justice Curriculum through an Aesthetic Approach to Teaching

The unique capacity of the arts to promote student and teacher commitment to the aims of social justice has both attracted and sustained a considerable amount of scholarship. A subject that remains less developed, however, is the connection between aesthetic learning experiences and the potential for the enhanced expression of a teacher's social justice beliefs within the classroom. Through an educational criticism and connoisseurship research method, this study offers an analytical look at six themes of aesthetic learning experiences and argues that their intentional infusion into teaching practice can act as a conduit for deepened identification and expression of a teacher's complementary curriculum. In addition to connecting aesthetic learning experiences and the complementary curriculum, our findings support the possibility for increased teacher satisfaction, creativity, and flow experiences. We also examine student learning outcomes, including perceptions of satisfaction, engagement, and meaning-making.

Kelsea Schoenbauer

DOCTOR OF PHILOSOPHY IN COMMUNICATION STUDIES CANDIDATE
DIVISION OF ARTS, HUMANITIES & SOCIAL SCIENCES

Where the Monster Weights: A/r/ticulations of Anorexia Nervosa and Bulimia

The spectacle that is anorexia nervosa and bulimia abounds in everyday images and narratives, as ultrathin females both captivate and revolt audiences in popular press books (e.g., *Wasted: A Memoir of Anorexia and Bulimia*; *Wintergirls*), documentary films (e.g., *Super Slim Me*; *Thin*), movies (e.g., *Starving in Suburbia*; *To the Bone*), and television dramas (e.g., *Binge*; *Skins*). This simultaneous fascination and horror accounts for the continued popularity of the monstrous pageantry of eating disorders. By bringing monstrous pageantry into scholarly dialogue with narrative theorizing, a/r/tography, and arts-based visual research methods, I argue for a new practice-based inquiry to eating disorder suffering and healing. Invoking a process-oriented view to research in which methodological and theoretical borders are crossed, blurred, and expanded through an embracing of the synergies between qualitative and artistic practice, I explore monstrosity in the experience of female eating disorders. I reflexively fold my roles as artist, researcher, and practitioner to investigate the monsters and monstrous pageantry of anorexia nervosa and bulimia, and reflect on the positive potential of art to create alternative modes of expression and communication.

Stephanie Schrab

JURIS DOCTOR CANDIDATE
STURM COLLEGE OF LAW

No Man's Land: Exploring the Boundaries Between Fan-Based Charitable Efforts and Copyright Law

Superheroes have soared to great heights of cultural and political importance over the last century, creating a new front on which fan use and copyright law are sometimes at odds. Activities such as “fan fiction” and fan films have already been addressed by the courts. However, fans who are inspired by these characters in a more transformative way - combining creativity with the heroic ideals that are at the heart of these characters through fan-based charitable efforts - are left to cross the “No Man’s Land” between what is fair use and what may be, in a greater sense, fair. Revising the fair use statute to support fan-based charitable activities would better serve the themes of access, equity, and creative potential that copyright law was designed to promote.

After conducting a literature review of jurisprudence on the fair use doctrine of

copyright law and fan activities, I conducted qualitative interviews with representatives from fan-based charitable groups. In analyzing the results from these interviews, I assessed how these groups' modes of operation reflect the uncertainty associated with the absence of applicable fair use precedent.

The rise of fan-based charitable groups reflects the rise of superheroes in our cultural landscape. This timely reflection makes them a valuable tool for increasing community well-being. Insights from these groups show that current fair use doctrine is not an adequate protection for their activities. Revising the statute would foster a beneficial symbiotic relationship between copyright owners and fan-based charitable efforts.

Diwanshu Shekhar

MASTER OF SCIENCE IN COMPUTER SCIENCE CANDIDATE

DANIEL FELIX RITCHIE SCHOOL OF ENGINEERING AND COMPUTER SCIENCE

A Bi-Encoder LSTM Mode For Learning Unstructured Dialogs

Creating a data-driven model that is trained on a large dataset of unstructured dialogs is a crucial step in developing Retrieval-based Chatbot systems. This paper presents a Long Short Term Memory (LSTM) based architecture that learns unstructured multi-turn dialogs and provides implementation results on the task of selecting the best response from a collection of given responses. Ubuntu Dialog Corpus was used as the corpus for training. We show that our model performs better than the benchmark. We also show results on experiments performed by using several similarity functions, model hyper-parameters and word embeddings on the proposed architecture.

Summer Shetehelm

MASTER OF LIBRARY & INFORMATION SCIENCES CANDIDATE

MORGRIDGE COLLEGE OF EDUCATION

Highlighting Hidden State Heritage Collections: Bringing Colorado's History to Life and Spreading Awareness of State Archival Collections

The Colorado State Archives contains a photo collection of nearly 200,000 objects. The sole finding aids for these objects are the original Register Sheets agencies used when depositing objects, which are available only in the Research Room of the Archives. As of 2017, none of these objects were findable online, making them hidden from the public. To share these depictions of Colorado's cultural heritage, collections of glass lantern slides, negatives, and images showing interesting events and places in Colorado are being digitized and transformed into exhibits celebrating our shared past. We digitized 50 glass

slides depicting life in Colorado, many of which portrayed rural school scenes. We used these, as well as other items in the State Archives collection (letters, school board publications and examinations), to create a narrative about early education in Colorado. Glass slides were prioritized for digitization due to the delicate nature of the medium. These items were scanned with an Epson Perfection V800 photo scanner following Federal Agencies Digitization Guidelines Initiative (FADGI) standards. Dublin Core metadata was created for all objects. The analog exhibit consists of two posters that will be displayed side-by-side in the State of Colorado Centennial building. The digital exhibit will be hosted by Omeka.net and include a full gallery of all digitized objects. The practical significance includes making the public aware that items like these exist in the Colorado State Archives, providing access for researchers who can't visit the State Archives, and preserving original objects while making content accessible.

Yilin Shi

DOCTOR OF PHILOSOPHY IN CHEMISTRY CANDIDATE
DIVISION OF NATURAL SCIENCES & MATHEMATICS

Magnetic Resonance Imaging at 250 MHz

Understanding tumor physiology is crucial to the development of improved cancer therapies. Probe molecules have been developed by our collaborators to measure local oxygen in tumors, the acidity of tumors, and the oxidation/reduction status of tumors. These properties vary with location in a tumor. To monitor these properties and the effects of therapeutic techniques, our group is developing an electron paramagnetic resonance imaging method to map the spatial variation of the spectral properties of the probe. Experiments are performed at low magnetic fields that are required for studies in living systems.

Imaging measurements of a nitroxide free radical probe at various concentrations were performed at room temperature with a locally-built spectrometer operating at 258 MHz. Two data acquisition methods were compared: the single-sweep sinusoidal scan and the field-stepped linear scan. Acquisition conditions, including gradient step size and field-step size, were optimized for the field-stepped method. The linear scan spectra were taken in segments and combined using a Matlab program [1]. The two methods were tested under comparable conditions. Data were deconvolved with algorithms developed previously in our lab [2]. The linewidths for the spectra, the signal-to-noise ratio, and the resolution were compared for the two methods.

The results showed that, for 0.5 mM probe, both methods produced comparable

spectra and image quality. For lower probe concentrations, the sinusoidal scan method gave higher signal-to-noise and better image quality.

[1] Z. Yu, T. Liu, H. Elajaili, G. A. Rinard, S. S. Eaton, G. R. Eaton, *Journal of Magnetic Resonance*, 258 (2015) 58–64.

[2] Mark Tseitlin, G. A. Rinard, Richard W. Quine, S. S. Eaton, and G. R. Eaton, *J Magn Reson.* (2011) 208(2): 279–283.

Niki Shoup

DOCTOR OF PHILOSOPHY IN CHEMISTRY CANDIDATE
DIVISION OF NATURAL SCIENCES & MATHEMATICS

Lewis Base Promoted Cyclization of Allenates with Naphthoquinone

Lewis based promoted cyclization of allenates with electron deficient olefins open up the possibility to generate more complex organic structures. By generating more complex molecules, we are able to produce new compounds for biomedical and material applications. Both phosphine and amine Lewis bases offer interesting annulations with allenates resulting in Lu or Morita–Baylis–Hillman type reactions. Once the Lewis base engages with the allenate, there can be several modes of nucleophilic reactivity that allows for the allenic ester to act as a two or three carbon synthon. The allenate can then react with varying electron deficient olefins generating more complex molecules with high atom economy and few byproducts.

The development of complex small molecules using easy to obtain starting materials such as 1,4-naphthoquinone is a significant goal of this project. Current research has been focused on cyclizing 1,4-naphthoquinone with varying allenate substituents using triphenylphosphine as the Lewis base. This method has proven successful with yields between 20% and 92% for eight different allenic esters. The large discrepancy in yield is due to steric hindrance of bulkier allenates. To expand on the utility of the method 2-methyl-1,4-naphthoquinone and 2-hydroxy-1,4-naphthoquinone were explored. 2-methyl-1,4-naphthoquinone gives the target product with yields around 45%. 2-hydroxy-1,4-naphthoquinone also gives the target product with yields around 25%. 2-hydroxy-1,4-naphthoquinone also gives a product with the triphenylphosphine moiety still attached with yields around 25%. Substitutions at the gamma position of the allenate have shown interesting reactivity with 1,4-naphthoquinone giving a yet determined structure using the same method.

Luke Storer

MASTER OF SCIENCE IN BIOENGINEERING CANDIDATE

DANIEL FELIX RITCHIE SCHOOL OF ENGINEERING AND COMPUTER SCIENCE

Hip Capsule Laxity Assessments of Natural vs Implanted Specimens

Proper management of the hip capsule is often a critical component of successful hip replacement surgery. The hip capsule is comprised of the iliofemoral, ischiofemoral, and pubofemoral ligaments, which integrate to form a continuous structure around the periphery of the joint whose main function is to provide the primary restraint at the hip to prevent excessive rotation. During hip replacement surgery, the hip capsule is recessed along either the anterior or posterior aspect to provide access to the hip joint. In this study, we have mechanically tested the laxity of the hip capsule in six natural and six implanted cadaver specimens using a VIVO joint motion simulator outfitted with custom fixturing. The laxity characterization included rotations about the primary hip axes (i.e. hip adduction-abduction and internal-external rotations), and in combined loading scenarios (i.e. hip adduction with full internal hip rotation). Hip rotation angles were extracted at ± 2 Nm of torque for each laxity test and averaged across the two specimen cohorts (Natural and THA). No statistically significant changes in adduction or abduction laxities were observed between natural and implanted hips. However, a notable reduction in I-E range-of-motion was observed for the implanted specimens compared to natural specimens between 30° and 90° hip flexion. Combined with capsular strain measurements, the characterized laxity assessments may be useful for informing and validating finite element models of the hip joint and surgeon choices for capsular management during hip replacement surgery.

Madison Tarleton

DOCTOR OF PHILOSOPHY IN RELIGIOUS & THEOLOGICAL STUDIES CANDIDATE

DU-ILIFF JOINT DOCTORAL PROGRAM

Bey-ification: The Deification and Dehumanization of Beyoncé by the “National Church of Bey”

Kathryn Lofton’s newest book, *Consuming Religion*, investigates different modes of consumption and religious intersection. Lofton offers her readers an avenue for doubt, disagreement, and dispute with practices of consumption and religion. Religion is not just our condition but a way toward a better future because, in our modern world, logic, institutions, and feelings are bound by and labeled as religious. In short, “if you must be religious, make a better religion.” For some groups, the idea to make a better religion or a more socially relevant one prevails.

Using Lofton’s newest book and research and information on the National Church of Bey, I will demonstrate how Beyoncé has become a celebrity commodity worthy of worship, praise, and adoration, while still being recognized as a hybrid persona—celebrity-goddess. While Beyoncé is not recognized as the creator, she is still consumed by her followers as a specific type of celebrity. I argue that Beyoncé’s followers have stolen the humanity of the “person” of Beyoncé—a process of dehumanization—and created something marketable, “a converted human... a composite sketch, with parts and pieces and accessories easily redacted and packaged, remembered and satirized” (Lofton, 107). The Church consumes Beyoncé the person, deconstructs her various roles in society, and creates a new “Bey” that is a figure of worship and adoration but unrelated to the celebrity—in characteristic totality—that many have come to know. Thus, I argue for a differentiation between “Beyoncé,” the person, and “Bey,” the object of consumption and worship.

Nicole Toro & Martin Aguilar

**MASTER OF SCIENCE IN CHEMISTRY CANDIDATE
DIVISION OF NATURAL SCIENCES & MATHEMATICS**

Binding of RNA to TDP43 prevents Aggregation and Toxicity

Protein aggregation and inclusion body formation are features of neurodegenerative diseases such as Alzheimers, Parkinsons, Huntingtons and amyotrophic lateral sclerosis (ALS). These neurodegenerative diseases share a common pathology in that all include an accumulation of insoluble protein aggregates in the brain. TAR-DNA-binding protein (TDP-43) is the major component found in the pathological inclusions of two of these diseases, ALS and fronto-temporal lobar degeneration with ubiquitin- positive inclusions (FTLD-U). Our research focuses upon the biophysical basis for TDP-43 aggregation in vitro and in cells. Current in vitro evidence indicates that TDP-43 is a natively dimeric protein and that binding to RNA inhibits aggregation. Corresponding genetic results in yeast in which specific components of the RNA-decay machinery have been knocked-out, indicate that the buildup of specific cellular RNAs is capable of counteracting TDP-43 aggregation and toxicity in vivo. Our research seeks to bridge these results to provide a comprehensive understanding of how RNA influences the aggregation of TDP-43 in vitro and in cells. Ultimately we hope to leverage this understanding to design new types of RNA-based medicines to address the unmet need for treatments of neurodegenerative disease in an aging population.

Katrina Vandeven

**MASTER OF LIBRARY & INFORMATION SCIENCES CANDIDATE
MORGRIDGE COLLEGE OF EDUCATION**

Right place right time: Macroappraisal of the Women's March on Washington and coordinating a nationwide oral history collection

The Women's March on Washington Archives Project was created on December 22, 2016 in order to actively preserve the Women's Marches, both nationwide and globally, that occurred on January 21st, 2017. We did this in order to ensure this instance of women's interaction with the state would not be or ignored, and to resist the status quo de-legitimization of women as political. The Project macro-appraised the importance of the Marches as an event demonstrating womens' citizen-state interaction. We paid particular regard to the political and temporal context of the tumultuous 2016 election and the date of the Marches, scheduled the day after the inauguration of President Donald Trump.

Jessica Villena Sanchez

**DOCTOR OF PHILOSOPHY IN GEOGRAPHY CANDIDATE
DIVISION OF NATURAL SCIENCES & MATHEMATICS**

Mobility of older adults in Mexico City: a mixed methods approach

Mexico City is going through a demographic transition. Approximately, 1.2 million older adults (age 60 and older) live in Mexico City and estimates suggest that this number will continue growing. Current low fertility rates, decrease in mortality rates and the consequent increase in life expectancy are factors influencing this fast aging process. This research seeks to identify the main mobility necessities of older adults living in Mexico City and which aspects the city government should take into consideration toward more inclusive mobility policies. A mixed methods approach is proposed for conducting this research. First, I will use GIS technologies and statistical analysis to identify variables correlated to mobility patterns of older adults. I will map those results accordingly (quantitative data). Second, I will conduct in-depth interviews and take pictures of selected neighborhoods in Mexico City that face different mobility challenges to collect and analyze the stories behind the current mobilities (qualitative data). Results will integrate both methods and will help uncover knowledge about the most important opportunities that need to be address regarding older adults mobility in Mexico City.

Xuantong Wang

DOCTOR OF PHILOSOPHY IN GEOGRAPHY CANDIDATE
DIVISION OF NATURAL SCIENCES & MATHEMATICS

Using Multi-Source Data to Assess the Dynamics of Socioeconomic Development in Africa

In recent years, numerous studies have used multi-source geospatial data, including remote sensing data, to evaluate and estimate human activities on earth and overcome the deficiencies of census data. For instance, the intensity of nighttime light (NTL) measured from space can be used to assess the dynamics of socioeconomic activities on a regional and global scale. Thus, geospatial data can be used as an alternative to measure development, especially in less developed regions with incomplete and insufficient census data like Africa. Nevertheless, the computational intensity of processing and visualizing massive geospatial datasets poses a critical obstacle for various big data driven applications. Thus, this research focuses on developing advanced data processing methods and incorporating multi-source data to assess the dynamics of socioeconomic development in Africa.

Lukas Woodcock

DOCTOR OF PHILOSOPHY IN CHEMISTRY CANDIDATE
DIVISION OF NATURAL SCIENCES & MATHEMATICS

Improving rapid scan electron paramagnetic resonance

Electron paramagnetic resonance (EPR) imaging maps the local concentration of species with unpaired electrons, including oxygen and probe molecules.[1] When applied to living systems the signals are weak. Rapid scan is a powerful technique that utilizes fast magnetic field sweeps to obtain spectral information. It is especially important for the conditions that are used for in vivo imaging because it enhances weak signals and decreases data acquisition time. A serious challenge for rapid scan EPR is the large background signal that is induced by the rapidly changing magnetic fields. Here, a newly developed data acquisition procedure is described that removes the background and enhances signal.

To perform this procedure, data are taken under two sets of conditions that change the direction of the magnetic fields. The first, labeled "scan-1," are taken under what are considered normal conditions. The second, "scan-2," are taken under the same conditions but after reversing both the main magnetic field and the rapid scan field direction. When detecting the signal with a bimodal resonator, these field reversals result in data that have the same background as scan-1 but inverted signals. Subtracting these data sets cancels the background

and amplifies the signal.

The procedure makes no assumption about the characteristics of the background signal and can be applied to several types of rapid scan experiments. Investigations are still ongoing, but this procedure has shown to result in impressive improvement of the rapid scan technique.

[1] H.B. Elajaili, J.R. Biller, G.M. Rosen, J.P.Y. Kao, M. Tseytlin, L.A. Buchanan, G.A. Rinard, R.W. Quine, J. McPeak, Y. Shi, S.S. Eaton, and G.R. Eaton, Imaging Disulfide Dinitroxides at 250 MHz to Monitor Redox Status, *J. Magn. Reson.* 260 (2015) 77 - 82.

Olivia Wyatt

MASTER OF ARTS IN PROFESSIONAL PSYCHOLOGY CANDIDATE GRADUATE SCHOOL OF PROFESSIONAL PSYCHOLOGY

Prevalence of Sport-Related Traumatic Brain Injuries in the Criminal Justice System

Very few studies have examined the prevalence of sport-related TBIs in the criminal justice system and the unique characteristics of the related criminal histories. This research can be used to inform post-TBI programming and secondary prevention efforts for athletes. In the current study (DU IRB#674894-2), individuals were screened by jail and probation staff using a revised version of the OSU TBI Identification Method. Data were collected from 781 justice-involved individuals across 17 justice sites. The basic demographic breakdown of the participants is as follows: American Indian/Alaska Native (3.9%), Asian (2, 0.3%), Native Hawaiian or Other Pacific Islander (3, 0.4%), Black or African American (12.3%), White (53.5%), Hispanic (22.7%), More Than One Race (44, 5.7%), Unknown / Not Reported (1.3%). Overall, 53% of individuals in this criminal justice setting have a significant TBI history, relative to less than 2% of the general population. Of the 781 participants, 23 (2.94%) reported a sport-related TBI. Those with a lifetime history of sport-related TBI reported more personal, property, and substance related convictions. Specifically, the rate of personal crimes is 60.9% vs. 57.9% in the general TBI population; the rate of property-related crimes was 56.5% vs. 45.6%; the rate of DUI/DWAI crimes was 39.1% vs. 32.4%; and the rate of drug-related charge was 52.2% vs. 45.6%. These preliminary data suggest the patterns of offenses for persons with sport-related TBI may be unique and warrant further study. These early results emphasize the importance of interventions to manage post-injury sequelae for athletes, specifically, drug abuse prevention.

Daniel Zimny-Schmitt

**MASTER OF ARTS IN GEOGRAPHY CANDIDATE
DIVISION OF NATURAL SCIENCES & MATHEMATICS**

An Investigation of the Performance of Urban Rail Transit Systems on the Corridor Level: A Comparative Analysis in the American West

Since the 1980s, significant investments have been made in urban rail transit across the United States, particularly using light rail technology. Most of these light rail systems have been built in Sunbelt cities which did not have legacy rail systems. As a result, they were constructed using a building blocks approach, being funded corridor by corridor. Most research, however, on urban rail performance has taken place at the system-wide level, leaving a significant gap at the level of the transit corridor. This research examined nineteen urban rail corridors in Denver, Salt Lake City, and Portland. A performance score was constructed for each corridor based upon ridership per mile, ridership growth, capital costs, and the cost of ongoing operations. These scores were then compared with a constructed profile of each corridor studied, which included aspects including but not limited to population and job density, median income, park and ride spaces, bus connections available, walkability, and headways between trains. Corridors in each city ranked high and low, with no city emerging as a clear frontrunner. Headways and population density were found to be the variables most predictive of high corridor performance, largely in line with previous studies. Qualitative data gathered from this research suggest that partnerships with municipalities, communities, and businesses also played a crucial role in the development of successful urban rail corridors.

Emily Zmak

**MASTER OF ARTS IN CONFLICT RESOLUTION CANDIDATE
JOSEF KORBEL SCHOOL OF INTERNATIONAL STUDIES**

Provisions for Climate Change Resiliency in Transboundary River Treaties

Climate change will be most apparent in alterations to the hydrologic system—shifts in movement, variations in extremes—thereby defining many resource disputes in the coming decades. Water is a fugitive resource: as its hydrologic patterns change, so too will preexisting agreements on its use and allocation. The question for transboundary water agreements is: how can agreements both satisfy parties' needs and account for future uncertainties of climate-induced changes to their basins' hydrologic systems?

This thesis will develop criteria and provisions needed for the resiliency of transboundary water agreements. The context of Central Asia provides a case

study for examining why a climate-change conscientiousness is needed, to better understand which criteria and contingencies are necessary for peaceful resource management.

