Nevada Undergraduate Research Symposium '14

Symposium Program

April 23, 2014

University of Nevada, Reno
Joe Crowley Student Union
Reno, Nevada USA

Sponsored by the National Science Foundation EPSCoR program, Nevada System of Higher Education; Office of Undergraduate and Interdisciplinary Research, Associated Students of the University of Nevada, University of Nevada, Reno; University of Nevada, Las Vegas

NSF EPSCoR NEVADA UNLV UNIVERSITY OF NEVADA LAS VEGAS ASUN ASSOCIATED STUDENTS OF THE UNIVERSITY OF NEVADA University of Nevada, Reno

Cover photographs by:
Top left: Katherine Morrow
Bottom left to right: Jean Dixon

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SYMPOSIUM SCHEDULE

WEDNESDAY, APRIL 2

Joe Crowley Student Union, Theater and Ballroom B/C

12:00 – 1:00 p.m. **Student sign in and mounting of posters**

Joe Crowley Student Union, Theater

1:00 – 1:30 p.m. **Welcome and Introductions:**
Michael Collopy, Assistant Vice President for Research
University of Nevada, Reno

Keynote Speaker:
Dr. Mridul Gautam, Vice President for Research and Innovation
University of Nevada, Reno

Nevada State Undergraduate Research Journal
Alex Sunderland, Senior Co-Editor

Joe Crowley Student Union, Theater

1:30 – 3:00 p.m. **Oral Presentation Session**

Jamie Chambers, Castle Lake Then and Now: A Dietary Analysis of Fishes (UNR Mentor: Christine Ngai-Ryan; GURA)

Rachel Flanigan, Undercutting the Gallery: Market Failure in Fine Arts Markets (UNR Mentor: Federico Guerrero; McNair)

Elizabeth McVey Hill, Anger and the Role of Emojis, Emoticons, or Pure Text in SMS Messaging (SNC Mentor: Christina Frederick)

Jennifer Reynolds-Strange, Japan: A Divergence of Youth Nationalism and Peace Culture (UNR Mentor: Hugh Shapiro; GURA)

Alexandria Snow, Using Neurogenesis to Treat Brain Disorders: What Treatments Can be Implemented Now? (UNR Mentor: Jeffrey Hutsler; HURA)

Timothy Sweet, Active Surveillance in Public Environments (UNR Mentor: Mircea Nicolescu; GURA)

Joe Crowley Student Union, Ballroom B/C

3:00 – 4:30 p.m. **Poster Session and Reception**
Students will be present to discuss posters and answer questions.
Refreshments and appetizers will be served.

4:30 – 5:00 p.m. **Remove Posters**

KEYNOTE SPEAKER

DR. MRIDUL GAUTAM, VICE PRESIDENT FOR RESEARCH AND INNOVATION

Dr. Mridul Gautam serves as the vice president for research and innovation and a professor of mechanical engineering at the University of Nevada, Reno. Prior to joining the University of Nevada, Reno in October 2013, he served as the associate vice president for research at West Virginia University (WVU) as well as the vice president for the WVU Research Corporation. He is an internationally recognized expert in the area of heavy-duty mobile source exhaust emissions, aerosol sampling, and particulate matter measurement, characterization, and control.

As a member of the President's Council, Dr. Gautam advises on major policy issues affecting the University and serves as the Institutional Official. He provides leadership for articulating and implementing a shared vision for research and addresses state and national issues of compelling interest to the research community. His office strives to support world-class research and discovery, innovation and commercialization. Furthermore, it provides faculty, students and staff with the highest quality of administrative services and a competitive infrastructure that will enable faculty to excel in their research, scholarly and artistic endeavors. The office is focused on building interdisciplinary collaborations, serving University faculty in their career development, and facilitating connections with industry. Dr. Gautam oversees the support organizations that assist University researchers both in obtaining and managing funding and in conducting research with integrity in a safe and healthy environment. The office is committed to creating an innovative ecosystem in the region and providing conditions that foster entrepreneurship and enhance economic development. Dr. Gautam strives to create an environment that will afford faculty to have career, personal and life balances.

Dr. Gautam has over 25 years of experience in initiating and managing large interdisciplinary and multi-institutional programs. His areas of specialization are the characterization and control of combustion generated emissions, heavy-duty engines, and experimental multiphase flows with a particular emphasis on ultrafine and nanoparticles. Dr. Gautam has served as the principal investigator (P.I.) on over $24 million in funding, and as a P.I. and/or co-principal investigator on over $80 million in funded research. Dr. Gautam has published more than 400 technical articles including refereed journal articles, symposia/ published proceedings and published abstracts of papers presented at professional meetings. In addition to a licensing agreement to his credit, he has been a recipient of the Outstanding Aerosol Paper Award through the American Industrial Hygiene Association and the American Conference of Governmental Industrial Hygienists, the Ralph R. Teetor Educational Award through the Society of Automotive Engineers, and several Outstanding Researcher of the Year awards at WVU. He serves on several national and state advisory committees and on several boards of directors. Dr. Gautam received his doctorate in mechanical engineering from West Virginia University in 1989 and his master’s in mechanical engineering from the Indian Institute of Technology, Delhi in 1984.

PARTICIPATING PROGRAMS

EXPERIMENTAL PROGRAM TO STIMULATE COMPETITIVE RESEARCH (NSF EPSCoR)

The Nevada System of Higher Education (NSHE) received a Research Infrastructure Improvement (RII) Award from the National Science Foundation's Experimental Programs to Stimulate Competitive Research (NSF EPSCoR). The Solar Energy-Water-Environment Nexus in Nevada project's mission is to advance knowledge and discovery through research on solar energy generation, its environmental impacts and the associated water issues, and accelerate this research by developing new capabilities in cyberinfrastructure in Nevada. Academic year EPSCoR grant proposals are solicited annually in the fall semester. Successful proposals are funded up to $4,000 for the student and $750 for the faculty mentor.

GENERAL UNDERGRADUATE RESEARCH AWARD (GURA)

The most popular program administered by the Office of Undergraduate and Interdisciplinary Research has been the General Undergraduate Research Awards (GURA). These awards are co-funded by the Office of the Vice President for Research and Innovation and the ASUN and are granted every spring semester and last for one year. All UNR students are eligible and research in any discipline is supported. Students who receive awards are able to pursue extracurricular research projects that they have developed with a faculty mentor. Approximately thirty awards are made annually on a competitive basis. The proposals are due in April with awards up to $1,500 made at the end of the spring term.

HONORS UNDERGRADUATE RESEARCH AWARD (HURA)

The Honors Undergraduate Research Awards (HURA), administered by the Office of Undergraduate and Interdisciplinary Research, is open to all senior Honors students at UNR. The awards are made in the fall of each year and provide research support for both the student and the faculty mentor, and are intended to support costs associated with completing the Honors thesis.

MCNAIR SCHOLARS PROGRAM

The McNair Scholars Program is a federal TRIO program funded at 194 institutions across the United States and Puerto Rico which is designed to prepare undergraduate students for doctoral studies through involvement in research and other scholarly activities. McNair participants are either first-generation college students with financial need, or members of a group that is traditionally underrepresented in graduate education.

PROGRAM SPONSORS

NATIONAL SCIENCE FOUNDATION

The National Science Foundation (NSF) is an independent federal agency created by Congress in 1950 "to promote the progress of science; to advance the national health, prosperity, and welfare; and to secure the national defense. With an annual budget of about $6.06 billion, we are the funding source for approximately 20 percent of all federally supported basic research conducted by America's colleges and universities. In many fields such as mathematics, computer science and the social sciences, NSF is the major source of federal backing."

EXPERIMENTAL PROGRAM FOR THE STIMULATION OF COMPETITIVE RESEARCH (NSF EPSCOR)

The goal of the NSF EPSCoR and NSHE supported program for Nevada Infrastructure for Climate Change Science, Education and Outreach is to create a statewide interdisciplinary program that stimulates transformative research, education and outreach on the effects of regional climate change on ecosystem resources, and supports use of this knowledge by policy makers. The project will build capacity to model regional climate change, evaluate methods to downscale model output, understand and quantify key ecological and hydrological processes, translate climate change science into formats usable by decision-makers, integrate models and data, and transform how students learn about climate change. In addition, this program has enhanced graduate education, stimulated undergraduate student research, promoted the involvement of women and underrepresented groups in STEM, and improved the pipeline for science and engineering through support of innovative K-12 science and math programs.

OFFICE OF UNDERGRADUATE AND INTERDISCIPLINARY RESEARCH, UNR

The Office of Undergraduate and Interdisciplinary Research works to foster an atmosphere of discovery and scholarship for all undergraduates, graduate students, and faculty. Interdisciplinary graduate programs and undergraduate research provide unique opportunities for students and faculty to address complex research issues of critical importance to the state of Nevada.

ASSOCIATED STUDENTS OF THE UNIVERSITY OF NEVADA (ASUN)

The Associated Students of the University of Nevada (ASUN) is made up of every undergraduate student at the University of Nevada, Reno. We provide a means for students to voice concerns and address issues at the university, local, state, national, and international levels. We also provide information to students on upcoming events, student events, student services, clubs, and more. We are committed to enhancing our university and enriching students just as we have since our inception in 1898.

For more information on any of the areas of student government, please visit the website at http://www.nevadaASUN.com , call 784-6589, or visit our offices on the 3rd floor of The Joe Crowley Student Union in the Center for Student Engagement.

UNIVERSITY OF NEVADA, RENO

Established in 1864, the University of Nevada, Reno is Nevada's land-grant institution. Within the University, ten colleges offer undergraduate and graduate majors. Graduate-level training and research, including a number of doctoral-level programs, further the University's mission to create scholarly activity. The university is an integral part of the thriving Reno-Sparks area.

UNIVERSITY OF NEVADA, LAS VEGAS

In its 52-year history, UNLV has undergone an amazing transformation from a small branch college into a thriving urban research institution of 28,000 students and 3,300 faculty and staff. Along the way, this urban university has become a dynamic resource for one of the country's fastest-growing and most enterprising cities. UNLV's 332-acre main campus, located on the southern tip of Nevada in a desert valley surrounded by mountains, is home to more than 220 undergraduate, master's, and doctoral degree programs, all accredited by the Northwest Commission on Colleges and Universities.

CASTLE LAKE THEN AND NOW: A DIETARY ANALYSIS OF FISHES

JAMIE CHAMBERS

Program: GURA
Mentor: Christine Ngai-Ryan
Department: Natural Resources and Environmental Science
University of Nevada, Reno

After over 50 years of stocking rainbow trout (*Oncorhynchus mykiss*), a dominant planktivore at Northern California's Castle Lake, a manipulation experiment conducted by Elser et al. explored how food web dynamics of the lake would be altered when stocking ended. Several years later their results were published, sporadic stocking resumed, and in 2009 stocking was again ceased. This second withdrawal from fish stocking at Castle Lake provided a unique opportunity to conduct similar studies to those initiated by Elser et al., and to compare their ecological snapshot 20 years ago to present day conditions. Analysis of contemporary catch and fish diet data collected between 2009 and 2012 were conducted to examine changes in population structure and food web interactions among rainbow trout, brook trout (*Salvalinus fontinalis*), and golden shiners (*Notemigonus crysoleucas*). Our contemporary analysis also examines what food items comprise the present day diets of fishes in Castle Lake, and if certain species of fish prefer a particular food source. We will present and discuss the findings of our contemporary analysis and compare it with historical data collected between 1989 and 1991 by Elser et al., and will also address the effects of fish stocking manipulation in Castle Lake while providing potential stocking scenarios for the future.

UNDERCUTTING THE GALLERY: MARKET FAILURE IN FINE ARTS MARKETS

RACHEL FLANIGAN

Program: McNair
Mentor: Federico Guerrero
Department: Economics
University of Nevada, Reno

This study examines primary markets for fine arts, where artists sell unique, creative works for the first time. Artworks are an extreme case of assets with no measurable criteria of value (Srivastava, 2012). Traditionally, artists have partnered with galleries to signal value to collectors and investors, while paying a gallery commission. New online marketplaces offer artists the opportunity to sell works directly to buyers. In online markets where a $600 painting is offered for sale next to a $15,000 painting, how do artists signal value? We hypothesize that, without an intermediary, artists will herd to new marketplaces, leading to excess entry, and asymmetric information market failure. Herding occurs in markets where participants lack information and confidence (Bikhchandani, 1992). Asymmetric information market failures occur when too many participants with too few signals of value enter a market (Akerlof, 1970). In this case, individual artists may be unable to recognize that they are participating in a marketplace with systemic market failure. This study is a comprehensive survey of artists. The survey is used to group artists by reputation level, market strategy, and price level. These factors are used to compare reported behavior, with likelihood to herd in a Bayesian probability based model of market herding. Results are reported for artists' confidence in setting prices, seller motivation, perceived buyer motivation, and knowledge of the size and median returns of the market. If the hypothesis is confirmed, this study will provide an example of herding, social construction of value, and market failure that may be applied to

other asset markets. This study will illustrate the outcomes of marketplaces where many participants do not have a primary profit motivation. The profit motivation of all participants is often assumed in economics. However, this is a frontier area of research for behavioral economics (Akerlof, 2010).

ANGER AND THE ROLE OF EMOJIS, EMOTICONS, OR PURE TEXT IN SMS MESSAGING

ELIZABETH MCVEY HILL

Program: Faculty sponsored
Mentor: Christina Frederick
Department: Psychology
Sierra Nevada College

Non-verbal emotional cues are difficult to perceive through text message conversations and can result in miscommunication between sender and receiver (Lo, 2008). The current set of studies examine text messages and the impact emojis, emoticons, or pure text (basic punctuation) have on perceived anger. For Study 1, 20 participants will indicate the three emojis and three emoticons they most commonly use to portray anger. General data about emoji and emoticon use will also be collected. In Study 2, 20 participants will read two angry and two neutral dialogues and rate an indicated messenger's (i.e., sender's or receiver's) anger level on a 7-point Likert scale. The dialogue rated with the greatest anger and the dialogue rated most neutral will be used in Study 3 where 90 participants will be randomly assigned to one of three groups, (1) Emoji, (2) Emoticon, or (3) Pure Text. Each group will read the selected angry and neutral conversation with emojis, emoticons, or pure text supplements, then rate the anger level of an indicated messenger (i.e., sender or receiver). A one-way ANOVA will be used to analyze for a significant difference between group means. We predict emojis will have the greatest impact on perceived anger, emoticons slightly lower than emojis, with pure text having the least impact. Knowledge of the role emojis, emoticons, and pure text play in text conversation anger perception may impact use in popular culture and reduce miscommunications in non face-to-face conversation.

JAPAN: A DIVERGENCE OF YOUTH NATIONALISM AND PEACE CULTURE

JENNIFER REYNOLDS-STRANGE

Program: GURA
Mentor: Hugh Shapiro
Department: History
University of Nevada, Reno

Japan, after World War Two, was never forced to undergo a sober reckoning with war as with Germany, so it is not entirely surprising that today we see the reemergence of quasi militaristic Nationalism among youth who may have little knowledge of the War. Apart from this mainstream demand to rearm Japan, runs a counter-narrative of peace in Hiroshima and Nagasaki. This project aims to analyze what I perceive as two cultures running parallel within Japanese society. My approach will be an ethnographic and archival study as well as a historical and anthropological study. I communicated with the Japanese exchange student community as well as the Hiroshima Peace Park Museum to gather personal and historical views. As the project developed I learned that Japan's reckoning with the war was cut short by the obsessions of the Cold War. There was a careful glossing over of events in Japan to the point where well educated Japanese students believe such wartime atrocities like the Nanjing Massacre never happened or that it is an invented fiction enabling countries like China to extort money. Peace culture is crucial for Japan to interact with neighboring countries in a way that does not cause conflict, which should be the goal of any society participating in the new rising global society.

USING NEUROGENESIS TO TREAT BRAIN DISORDERS: WHAT TREATMENTS CAN BE IMPLEMENTED NOW?

ALEXANDRIA SNOW

Program: HURA
Mentor: Jeffrey Hutsler
Department: Psychology
University of Nevada, Reno

Many brain disorders such as stroke, Alzheimer's, and Parkinson's disease are characterized by the loss of functioning neurons (National Institute on Aging, 2014). The ability to generate new neurons (neurogenesis) represents an opportunity to create effective, targeted treatments for these patients. Our understanding of the mechanisms and effects of neuroplasticity is changing every day. This understanding has direct and vital applications in the formulation of rehabilitation strategies following brain injuries of all etiologies. How our knowledge of and views towards neuroplasticity have changed over the years helps shape the direction of research in the field. Until the 1990's it was not believed that neurogenesis could occur in the adult brain (Reynolds & Weiss, 1992). Since that time a multitude of research has been done regarding the causes of neurogenesis and neuroplasticity, but very little in the way of effective treatments for adult humans have resulted (Hannan, 2014). Current research into potential neurogenesis related treatments has been focused primarily on the creation of drugs, but there are other options that may be feasible for implementation now. Extensive literature review and interviews with practicing neurologists allow the proposition of potentially effective treatments for brain disorder, namely enriched environment and restricted diet, which are based on the promotion of neurogenesis.

ACTIVE SURVEILLANCE IN PUBLIC ENVIRONMENTS

TIMOTHY SWEET

Program: GURA
Mentor: Mircea Nicolescu
Department: Computer Science and Engineering
University of Nevada, Reno

The growing interest in automated surveillance by organizations such as security personnel, military, and government is fueling demand for mature surveillance software. This capability is particularly desirable in public environments such as shopping malls and airports where rooms full of human operators sit monitoring a large number of camera feeds. Humans have been known to be unreliable and inconsistent in this multitask-oriented environment. Low-level interaction monitoring may be better suited for a machine, only drawing the operators' attention when a potentially suspicious event is occurring. In this project, we present a mature system for automatically detecting six types of interactions between humans and their baggage. Interactions include instances people exchanging, abandoning, stealing, and carrying a bag. Our system uses a novel combination of image and signal processing techniques to allow a human operator to quickly list instances of events they are interested in. These techniques utilize common algorithms and modern technology such as cameras capable of mapping the depth of objects in its field of view. We validate this system with a set of sample sequences exhibiting common events we expect to see in public environments. Our results show that monitoring tasks may be well suited for an automated machine.

TOWARD AN EFFICIENT FORMIC ACID PHOTO-FUEL CELL: IMPROVING THE CURRENT GENERATION BY DEPOSITING PLATINUM AND RUTHENIUM ON TITANIUM DIOXIDE NANOTUBE PHOTO-ANODES

SYED ABBAS

Program: GURA
Mentor: Vaidyanathan (Ravi) Subramanian
Department: Chemical and Materials Engineering
University of Nevada, Reno

This research focused on developing a technique for solar assisted boosting of formic acid electrooxidation for a photo-driven fuel cell applications. Platinum is traditionally used to electro-oxidize formic acid produce current in a fuel cell. Increase in current generation is seen when Titanium Dioxide Nanotubes (TNT), synergistically coupled with platinum, aids in the electrooxidation. Ruthenium along with platinum is expected to further enhance formic acid electrooxidation in the presence of light. The objective here is to examine how light can aid in boosting electrooxidation of formic acid in the presence of Pt-Ru nanocomposites.

EXPLORING PATTERNS OF GENETIC DIVERSITY ACROSS COMPLEX AND SIMPLE LANDSCAPES

MARIA ISABELLA AQUINO

Program: NSF EPSCoR
Mentor: Brett Riddle
Department: School of Life Sciences
University of Nevada, Las Vegas

Previous studies have shown that the topographically complex Great Basin desert harbors higher species richness (=number of species) than topographically less complex regions, such as the Great Plains. I predict that high species richness in the Great Basin will also translate into high levels of intraspecific genetic diversity (=genetic uniqueness of populations within a species) in the region. I will compare the levels of intraspecific genetic diversity in several species of rodents from the Great Basin ecoregion with similar species in the Great Plains, Sonoran Desert, and Chihuahuan Desert. In addition, I will comment on how the proposed solar energy development in the Great Basin will potentially affect this diversity by removing habitat and producing barriers to dispersal between populations.

NEURAL AND BEHAVIORAL DIFFERENCES IN WORKING MEMORY CAPACITY BETWEEN A CONCUSSED AND NON-CONCUSSED BRAIN

HECTOR ARCINIEGA

Program: GURA
Mentor: Marian Berryhill
Department: Psychology
University of Nevada, Reno

Working memory (WM) is essential for a variety of cognitive processes used in everyday life. Working memory capacity seems to vary among individuals with an average of about 3-4 items (Vogel & Machizawa, 2004). Working memory can be

disrupted by a variety of unforeseen circumstances such as neurodegenerative disorders, cerebrovascular accidents, or traumatic brain injuries (TBI). Allocating the proper amount of neural resources to remember an object in a working memory task seems to be different between subjects that have had traumatic brain injuries. The most common form of TBI is concussion (mild TBI). Currently, the view is that recovery from concussion happens within several weeks. Here, we tested that assumption using working memory performance as an augur for behavioral differences and high-density electrophysiology (HD-EEG) to measure neural processing speed and locations. Two groups were tested: healthy and mild-TBI survivors with concussions from 1-5 years ago. Clear group differences were apparent. Behaviorally, neural typical participants who had never had a concussion were able to hold significantly more items in WM (K=2.36 of 3 items) than mild-TBI participants (K=2.05 of 3 items). The contralateral delay activity (CDA) between the two groups showed differences between the brain activity required to hold the different set of items. In other words, the mild-TBI group had to work harder to do less well. These data have widespread implications for concussion treatment and evaluation.

DETERMINATION OF THE EFFECT OF DOCOSAHEXAENOIC ACID OF CANCER CELL DIFFERENTIATION AND INVASION

PALVINDER BAINS

Program: GURA
Mentor: Ronald Pardini
Department: Biochemistry and Molecular Biology
University of Nevada, Reno

Breast cancer cell lines display different growth patterns based on their level of aggression. When grown in a reconstituted basement membrane like Matrigel™, less aggressive cancer cells lines (BT-474, MCF10A) form spheroid-like acini structures whereas more aggressive cancers display a branching phenotype (MDA-MB-231). Docosahexaenoic acid (DHA), an omega-3 polyunsaturated fatty acid (PUFA) has been shown to inhibit growth of a number of cancer cell lines and only a few of the mechanisms factors involved in this regression have been explained. Preliminary research has shown that when grown in Matrigel™, cancer cell proliferation and invasion is inhibited by DHA and furthermore, that linoleic acid (LA), an omega-6 PUFA, maintains the proliferative growth patterns and increases the invasive index. This paper will investigate how DHA and LA supplementation alter the proteins in the extracellular matrix and resultant signal transduction.

THE IMPACT OF GROUP SIZE ON EYEWITNESS MEMORY

JENNIFER BALABAN

Program: Faculty sponsored
Mentor: Christina Frederick
Department: Psychology
Sierra Nevada College

The post-information effect occurs when outside information changes individual memory for event details (Skagerberg & Wright, 2008). Witness group size is a relevant factor to examine and may impact the accuracy of individual memory for important details of the viewed event. Allwood, Granhag, & Johansson (2003) showed eyewitness confidence is impacted by eyewitness group size. Given eyewitness confidence is impacted by group size, the current study examined the impact of group size on eyewitness memory for an event. 84 participants were randomly assigned to either a single-member reflection group, pair group, or seven-member group. Participants were unaware of the study's purpose and were intentionally not instructed to

watch for specific event details prior to watching a 6 min segment of a feature film depicting a bank robbery. Following the film segment, participants reflected either individually on paper (single-member reflection) or in groups via discussion (pair and seven-member group) about film segment details for 5 min. A 10-question quiz about film details followed this reflection period and participants had 5 min to complete the quiz. The purpose of the study was revealed during a debriefing that occurred at the conclusion of the study. Quizzes were scored out of a possible 10 points and scores were sorted by condition. A Kruskal-Wallis (Green & Silkind, 2008), the non-parametric alternative to the one-way ANOVA, revealed no significant difference (p = .355) in quiz performance between the three group sizes. Results of the current study indicate eyewitness memory is not impacted by group size.

AN ELUSIVE PEACE: THE NATURE OF CEASEFIRES WITHIN THE IRISH AND BASQUE NATIONALIST-SEPARATIST MOVEMENTS

KATRINA BEEDY

Program: HURA
Mentor: Susanne Martin
Department: Political Science
University of Nevada, Reno

For much of the latter 20th century, the main factions of the nationalist-separatist organizations Euskadi Ta Askatasuna (ETA) and the Irish Republican Army (IRA) pursued a combined strategy of armed struggle and electoral participation in pursuit of independence from their perceived oppressor regimes. For ETA, freedom meant an autonomous Basque state, untainted by Spanish governance. Meanwhile, the IRA sought to purge British influence from Northern Ireland in order to create a unified Irish state.

After years of intermittent and often indiscriminate violence, both ETA and the IRA underwent a series of peace negotiations focused on ending their armed campaigns. For a period, each successive round of negotiations failed, and it was only with ETA's 2011 ceasefire and the IRA's 2005 decommissioning of weapons that the main factions had seemingly committed to a lasting peace.

This study assesses why previous peace negotiations for ETA and the IRA may have failed, and why these newest ceasefires might continue to be more durable than those declared previously.

Through a close examination of Ireland's past history, along with an analysis of each of the IRA's past ceasefires, truces, and negotiation periods, this study derives a set of hypotheses describing conditions which appear to be more conducive to lasting peace within Northern Ireland. These hypotheses are then applied to ETA's past ceasefires, truces, and negotiation periods in order to assess whether conditions that yielded peaceful outcomes within Ireland might also have enabled peace in the Basque region. The findings ultimately shed light on conditions that may better facilitate lasting peaceful resolutions in other nationalist-separatist conflicts within established democracies.

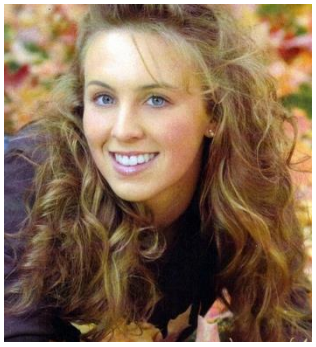
ANALYZING THE EFFECTIVENESS OF VEGETATED FILTER STRIPS FOR TREATMENT OF NUTRIENTS, COLIFORMS, AND STEROID HORMONES IN AGRICULTURAL RUNOFF

PETER BENCHETLER

Program: GURA
Mentor: Ed Kolodziej
Department: Civil and Environmental Engineering
University of Nevada, Reno

The availability of water resources and potential impacts of declining water quality on surrounding ecosystems is of growing concern, especially in arid regions such as Nevada. Nonpoint source agricultural runoff is a major contributor to water quality degradation, and prevention of such a widespread problem is essential to maintaining ecosystem health. Recent studies suggest that many of the common contaminants found in agricultural runoff, more specifically nutrients (ammonium-N and orthophosphate), coliforms, and the synthetic steroids (trenbolone acetate [TBA]), can be removed through the use of riparian buffer strips with lengths of at least 3 m. In this study, approximately 40-80% removal of these common agricultural contaminants from irrigation runoff was observed in both mesocosm scale and field scale studies. Results suggest that a combination of both physical and chemical sorption processes are responsible for the observed removal. Results further suggest that orthophosphate is likely the limiting compound in agricultural runoff management, as the physical processes that govern orthophosphate removal are not as effective as the sorptive processes that are likely responsible for ammonium and steroid removal. In other words, agricultural runoff that is managed to effectively remove nutrients and coliforms will also be effective in removing TBA metabolites.

CHICKADEES WITH BIGGER BRAINS HAVE SMALLER DIGESTIVE TRACT: A MULTI-POPULATION COMPARISON



SHELBY BROWN

Program: HURA
Mentor: Vladimir Pravosudov
Department: Biology
University of Nevada, Reno

The evolution of brain size has always been, and still is, a process that is under question. One of the biggest questions pertains to trade-offs. The brain tissue is highly metabolic and costly to maintain. However, in order for a body to function properly, other systems must be maintained and adequately energized as well. The gastrointestinal tract is thought to be relatively similar to the brain in metabolic expenses. The controversial expensive tissue hypothesis suggests that an increase in brain size comes at an energetic cost, thus a decrease in the mass of the other metabolically expensive tissues, like the digestive tract (stomach and intestines) or heart. In this project we compare the differences of mean brain mass, gut mass, and heart mass between nine populations of black-capped chickadees. All nine populations were from different regions that experience a wide range of winter climate severities. We found that the mean brain mass differed between populations and was further associated with winter climate severity. Populations found in regions of greater winter climate severity tended to have a larger brain mass and smaller stomach mass compared to populations that experienced less winter climate severity. Most importantly, we found that brain mass was inversely related to stomach mass and. However, mean heart mass was not significantly related to either brain mass or winter severity. Our findings support the expensive tissue hypothesis and indicate that the evolution of a larger brain mass may be achieved by decreasing the size of the stomach and the energetic expense of the digestive tract.

ONE PRONOUN AT A TIME: GENDER-SPECIFIC PRONOUNS IMPROVE READING COMPREHENSION

MORGAN BURKE

Program: Faculty sponsored
Mentors: Christina Frederick
Departments: Psychology
Sierra Nevada College

The current study focuses on the effect of gender-specific ('he,' 'she') and gender-neutral ('they') pronouns on male and female recognition ability. Crawford and English (1984) showed male pronouns ('he') better aid male recall and gender-neutral pronouns ('they, 'he or she') better aid female recall. The effect of female pronouns ('she') on recall ability was not studied (Crawford & English, 1984). The current study recognizes this gap and extends Crawford and English's (1984) study to include female pronouns. 150 participants (75 male; 75 female) were identified via convenience sampling and a balanced number of males and females were randomly assigned to 1 of 3 reading conditions ('he,' 'she,' or 'they'). Participants were given 15 min to read Charles Johnson's 'Moving Pictures' (Cassill & Bausch, 2000), altered from its' original, second-person, tense ('you') and rewritten in 'he,' 'she,' and 'they' tenses. Participants, then, completed a related 13-question, multiple-choice test in the consistent tense and indicated their gender. A two-way ANOVA showed significantly (p = .008) reduced test performance for both male and female participants in the gender-neutral condition. No significant interaction (p = .311) existed between participant gender and pronoun condition. Contrary to previous research (Crawford & English, 1984; Good, Woodzicka, & Wingfield, 2010), there was no difference in test performance, irrespective of gender (p = .096). The current study's findings exhibit evidence of a potential social change in gender roles, since Crawford and English's (1984) study.

COSMETICS USE AMONG TEACHERS IS IRRELEVANT WHEN CONSIDERING STUDENT RETENTION

MARGARET BURNS

Program: Faculty sponsored
Mentor: Christina Frederick
Department: Psychology
Sierra Nevada College

Research evidence shows cosmetics positively impact female teacher confidence (Stuart & Donaghue, 2011). Female teachers wearing cosmetics indicate they feel more productive, knowledgeable, and confident than female teachers not wearing cosmetics (Dellinger & Williams, 1997). Sadler (2013) shows confidence also increases teaching effectiveness. The current study aimed to assess the impact of teacher confidence produced by cosmetics on student retention. This was experimentally assessed with 60 participants (39 females, 21 males) randomly assigned to view an 8 min, pre-recorded, lesson on facial anatomy led by a teacher in no cosmetics or full cosmetics. Upon lesson conclusion, participants completed a teacher confidence assessment (5-point Likert scale) and 10-item multiple choice quiz on lesson content. Data were sorted by condition and the Mann-Whitney U (Ryan & Joiner, 2001) was used to test for differences in confidence ratings (p = .225) and content quiz scores (p = .582). Results show no significant difference between the cosmetics and no cosmetics conditions. A Pearson correlation coefficient was calculated for both the cosmetics (r = -.166) and no cosmetics condition (r = .107). No significant correlations were found in either condition. While previous research (Stuart & Donaghue, 2011) may suggest teachers who do not wear cosmetics should wear cosmetics to increase their confidence, the current study provides evidence there is no need for adjustment to cosmetics use.

FAILURE AND ITS LINGUISTIC COMPANY: A CORPUS ANALYSIS OF *FAILURE*

JULIA CABAL

Program: GURA
Mentor: Don Hardy
Department: English
University of Nevada, Reno

The word *failure,* as opposed to *risk,* is under analyzed empirically and under-theorized across cultural studies. The primary goal of this project is to utilize corpus linguistics as a tool of the Digital Humanities to examine the word *failure* and detail the ways in which *failure* attracts linguistic constructions that normalize it as part of conceptual frameworks. This investigation will hypothesize how *failure* is implicated in contemporary society and western culture.

THE RELATIVE ROLES OF SPEED AND ACCURACY IN CHILDREN DIAGNOSED WITH INTELLECTUAL DISABILITIES

MARIELA CASTRO

Program: GURA
Mentor: W. Larry Williams
Department: Psychology
University of Nevada, Reno

From the area of Precision Teaching (PT), we know that accuracy in basic academic responding is necessary but not sufficient for establishing competency with complex skills. To achieve this, the rate of correct responding must be established for basic skills, which in turn becomes the foundation for competency with more complex tasks. PT methods however, are not widely applied in teaching persons with intellectual disabilities any number of basic skills such as ADL (activities of daily living). The present research will track the acquisition of simple and conditional discriminations in order to determine if and when fluent responding occurs for such simple tasks, and what features (e.g., strengthening accuracy, speed or both) are necessary to achieve fluency in either simple discriminations or more complex conditional discriminations.

ETHICAL JUDGMENT AND CULTURE IN INTERNATIONAL BUSINESS

JORDAN CHRISTENSEN

Program: HURA
Mentor: Yvonne Stedham
Department: Business Management
University of Nevada, Reno

In today's world, countries can no longer segregate themselves from the rest of the world. With vast technological development over the past few decades, countries can now conduct business and communicate through new avenues that did not exist before, such as the Internet. These new innovations have opened up the borders of every country, so to speak, and have brought forth problems that did not previously exist in the business world. International Business is affected by many different cultural aspects that influence the way business is conducted in any given country. To successfully and effectively conduct business on an

international scale, one must first analyze and then practice the different cultural aspects of each country. This paper will investigate the ethical judgment and culture of the U.S., Japan, and Germany and analyze how each country's own idea of ethical judgment and culture influence the organizational structures and business decisions made in each country. Each country's culture will be analyzed using Hofstede's Cultural Dimensions while ethical judgment will be measured through each country's Corruption Perceptions Index number. Analyzing these specific countries will allow me to understand how the differing cultural aspects affect each country's ability to conduct business internationally, and how it affects the way in which these countries actually conduct business on an international scale.

THE EFFECTIVENESS OF THE BLENDED/TIERED VOCABULARY APPROACH WHEN TAUGHT IN ENGLISH WITH SPANISH SUPPORTS IN MAINSTREAM CLASSES WITH HIGH ENGLISH LANGUAGE LEARNER PERCENTAGES

KELSEY CONKLIN

Program: HURA
Mentor: David Crowther
Department: Education
University of Nevada, Reno

The Blended/Tiered Approach to vocabulary instruction is a mix of previously successful strategies used in classrooms, including tiered vocabulary (which involves teaching certain vocabulary based on the difficulty of the words, with more difficult words being higher tiers) and inquiry instruction (which is a hands-on approach to learning). This approach has already been shown to be effective in teaching academic vocabulary, even with English Language Learners, however, the approach has only once been used with instruction in multiple languages. This research used this approach with Spanish supports in mainstream classes with high percentages of English Language Learners in order to see if the approach is as effective with these students and if the added support of Spanish enhances the effectiveness of the approach. In order to discover this, two classes were given the same pre-test, the same six lessons, and the exact same post and post-post-tests. The only variable was that one class received Spanish supports during the lesson portion. This means that all vocabulary introduced was introduced in Spanish and English and comparisons were made between the two. During the testing portion, answers were accepted in any language. When students are trying to learn English, many see another language as a disadvantage, however, even if students know a word in another language, they still know the word. This study aimed to find out if helping students make these connections between languages in this lesson format helped students to learn better.

CHARITABLE DONATION: DECREASED ANONYMITY INCREASES GIVING BEHAVIOR

CYNTHIA CONOVER

Program: Faculty sponsored
Mentor: Christina Frederick
Department: Psychology
Sierra Nevada College

Americans generously donate their time, money, and effort toward charitable foundations (Manthur, 2013). Heuristics facilitate decisions when extensive cognitive processing is not permitted (Hysenbelli, Rubaltelli and Rumiati, 2013). Hysenbelli et al. (2013) showed having a donation model can increase the number of overall donations. The current study examines the question of how anonymity impacts giving behavior.

90 undergraduates were randomly assigned to 1 of 3 groups varying in donation decision (i.e., keep or donate) anonymity. These three groups were (1) Anonymous (only the participant knew their donation decision), (2) Researcher Only (participant required to inform researcher of donation decision), (3) Peer + Researcher (participants indicated donation decision in a group). Participants were deceived to believe the study's purpose was to examine IQ testing to minimize external influences on their donation decision. After an IQ test that reinforced the deception, each participant was given a bookstore gift card for their participation. At this time, the researcher announced the option to either keep or donate the gift card to a textbook scholarship fund for students in need. Participants indicated their donation decision following procedures for their assigned group. By comparing expected giving behavior defined by chance, a chi-square test of independence showed a significant difference ($p < .001$) between giving behavior across anonymity levels. Results of the current study suggest decreasing anonymity increases giving behavior which aligns with the findings of Hysenbelli et al. (2013). Generally, results of the current study show donations can be increased by reducing anonymity.

CHARACTERIZATION OF A NOVEL PROTEIN KINASE IN PLANTS

GREG COOPER

Program: NSF EPSCoR
Mentor: Jeffrey Harper
Department: Molecular Biology and Biochemistry
University of Nevada, Reno

Protein kinases are regulatory enzymes that are important for growth and development in plants [1]. In the model plant Arabidopsis, there are more than 1000 protein kinases. However, relatively little is known about their specific targets and molecular functions [2]. I have initiated a study into the biochemical and biological functions of a novel kinase called PCNK. What makes PCNK unique is that it has a phosphatase domain connected to a kinase domain through a cyclic nucleotide binding domain (Phosphatase/CyclicNucleotide Binding Domain/Kinase). The *Arabidopsis* PCNK is a candidate for the first cyclic nucleotide regulated kinase to be identified in plants.

To determine the biochemical function of PCNK, an recombinant enzyme was expressed in *E. coli* and purified using affinity tags. In contrasts to control proteins, the purification of the PCNK had very poor yields, and could not be purified away from contaminating proteins.

To determine the biological function of PCNK, *Arabidopsis* was transformed with PCNK linked to a hygromycin resistance marker. These lines were then crossed to wild type *Arabidopsis*, and the seeds were plated on hygromycin. The expected transmission of the transgene is 50% resistant seeds. The results show a couple crosses which deviated from the expected 50% transmission indicating a possible phenotype. Also linked to PCNK is a GFP which shows where PCNK is localized.

Another line of *Arabidopsis* harbors a *pcnk* mutation linked to a sulfadiazine marker which disrupts the *PCNK* gene. These lines were crossed to wild type *Arabidopsis* with an expected 50% Mendelian transmission of the *pcnk* mutation. The results show the expected 50% resistant seeds for the crosses.

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REPLACEMENT PROTEIN THERAPY FOR CONGENITAL MUSCULAR DYSTROPHY

VIVIAN CRUZ

Program: GURA
Mentor: Dean Burkin
Department: Pharmacology
University of Nevada, Reno

Merosin deficient congenital muscular dystrophy (MDC1A) is a fatal neuromuscular disease caused by mutations in the *LAMA2* gene resulting in the loss of laminin-α2 protein which is required for the formation of laminin-211/221 (or merosin protein). Laminin-211/221 are critical components of the basal lamina in skeletal and cardiac muscle required for muscle cell adhesion and integrity. Loss of merosin in MDC1A patients reduces myofiber adhesion and decreases the ability of skeletal muscle to generate force. Children with MDC1A are born with weak muscles and have defects in muscle repair and regeneration. Many of these children are never able to walk and are confined to a wheelchair at a young age. The progressive nature of MDC1A leads to feeding tube placement, ventilator assistance and results in premature death. There is no effective treatment or cure for this devastating disease.

Recently, the Burkin lab has shown treatment with mouse laminin-111 before disease onset reduces muscle pathology and improves viability of the dy^{W}-/- (laminin-α2 deficient) mouse model of MDC1A. As this study only examined the effects of treatment before disease onset, we wanted to know whether laminin-111 treatment after disease onset could reverse or maintain muscle disease progression. In this study we investigated the pharmacokinetics and histopathology of mouse LAM-111 treated tissue in the dy^{W}-/- mouse model after disease onset. Further, we examined the therapeutic potential of recombinant human LAM-111. The activity of both mouse and human laminin-111 (after disease onset) was assessed by grip strength, standup activity, muscle histology, immunoblotting and ELISA to view immune response. This data and further experimentation will determine whether systemic delivery of recombinant human LAM-111 after disease onset will prove to be effective for the treatment of MDC1A.

RAPID CHARACTERIZATION OF DUST PARTICLES FOR WATER-FREE CLEANING OF SOLAR PANELS

RONOBIR DAS

Program: NSF EPSCoR
Mentor: Biswajit Das
Department: Electrical and Computer Engineering
University of Nevada, Las Vegas

The goal of this UROP project is to research and develop a method for the rapid characterization of density and electrical properties of dust particles deposited on solar panels. Once developed, the rapid characterization methods will greatly help in the development of a dust removal technology for the water-free cleaning of solar panels. One of the components of the NSF EPSCoR Solar Energy-Water-Environment Nexus program is to develop a nanostructure based technology for the control and removal of dust particles on solar panels that is expected to be low cost and easy to use. The nanostructure based technology plans to control dust density by surface modification using nano-engineering through electrostatic sweeping of electrically modified dust particles. The electrical properties of the dust particles are first modified so that they can be manipulated through the application of an external electric field. To determine the effectiveness of such modification, an efficient method for the rapid characterization of the dust particles is needed, which is the

objective of this UROP project. The characterization methods being developed in this research are based on optical spectroscopy and capacitive breakdown and leakage, methods that are easy to set up and that allow rapid measurements. In the optical spectroscopy technique, a correlation between dust particle density and particle size distribution on the optical spectra is being developed by investigating the experimental data in the wavelength range of 1200 nm to 300 nm. In the capacitive breakdown method, the dust particles are used as the dielectric of a capacitor whose breakdown voltage and leakage current are measured to determine the electrical properties of the dust particles. In addition to developing the methodologies for characterization, this project will also develop a data analysis model.

TO TOUCH OR NOT TO TOUCH: UNDERGRADUATE ENDURANCE, ACCURACY, AND INSTRUCTOR LIKABILITY

KALLIE DAY

Program: Faculty sponsored
Mentor: Christina Frederick
Department: Psychology
Sierra Nevada College

Instructional touch positively impacts compliance and instructor likability, despite awareness of the touch (Legg & Wilson, 2012; Guéguen, 2002). There is a paucity of research on the impact of supportive, non-instructional, touch and the current study seeks to fill this void. 60 undergraduates were randomly assigned to either receive (Touch Group) or not receive (Non-touch Group) a supportive, non-instructional, touch from an instructor role-played by the researcher. Potential participants completed a pre-survey to indicate their familiarity with the researcher. Those who rated their familiarity above acquaintance were excused. Once selected, participants had 3 min to complete a basic math test and were told “good luck” prior to beginning. In the Touch Group, a 2 sec instructor-to-undergraduate shoulder touch occurred during the “good luck” sequence. The distinguishing factor between groups was the 2 sec touch. Endurance and accuracy on the math test, instructor likability, and touch awareness were measured. Given the data were not normally distributed, the Mann-Whitney *U* (McDonald, 2009) was used to analyze the measures of accuracy (p = .267) and instructor likability (p = .327) and revealed no significant difference in test scores between the Touch Group and Non-touch Group. A 2-sample t-test was used to analyze the measure of endurance, showing no significant difference (p = .340) between the Touch and Non-touch Group. It is of interest that 63% of those touched were unsure the touch occurred. Results of the current study do not align with existing research on compliance, likability, and perception of touch.

ACTIVE LEARNING IN PRACTICE: ALIGNMENT AND MISALIGNMENT OF FACULTY AND UNDERGRADUATE PERSPECTIVES

KALLIE DAY, CONSTANCE BARNES, CARLY COURTNEY, BRIANA CRESPO

Program: Faculty sponsored
Mentors: Christina Frederick, Robert King
Department: Psychology
Sierra Nevada College

The current study redefined and empirically scrutinized active learning pedagogy. We operationalized active learning as self-caused learning, a definition we employed axiomatically. 75 undergraduates, across class standing and major, completed the Student Active Learning Survey (SALS) which inquired into their understanding of, experience with, and perception of outcomes produced via active learning. 40 faculty, ranging in teaching

experience from 1 to over 15 years, completed the Faculty Active Learning Survey (FALS) measuring their understanding of active learning, familiarity and use of specific techniques, and concerns about incorporation in the classroom. SALS and FALS data revealed notable alignment between undergraduate (97.3%) and faculty (100%) views on the importance of incorporating active learning techniques in the classroom. Undergraduate (93.3%) and faculty (97.5%) responses also aligned indicating their value of active learning techniques. Undergraduates and faculty also expressed various concerns. Primary student concerns included faculty capacity to use active learning techniques to convey content and the overuse of particular techniques (e.g., student presentations). Primary faculty concerns included overuse of techniques, the potential cost of losing content traditionally provided via lecture, and the need for financial support to facilitate development of effective techniques. SALS and FALS indicated misalignments as well. For instance, where faculty (100%) indicated the benefits of active learning outweighed the costs, students (36%) were not convinced. Strategic modification to college practice is being implemented in forecasting new institutional directives, developing workshops to promote effective use of active learning techniques and exposing faculty to a greater variety of techniques.

ROLE OF REDUCED GRAPHENE OXIDE IN ENHANCING CHARGE SEPARATION AND PHOTOCATALYTIC ACTIVITY OF MULTI-METAL OXIDES FOR HYDROGEN GENERATION

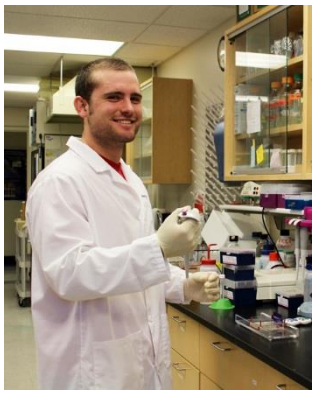
STEVEN DELACRUZ

Program: NSF EPSCoR
Mentor: Ravi Subramanian
Department: Chemical and Materials Engineering
University of Nevada, Reno

Photocatalysts are light sensitive materials that, upon illumination, provide free electrons to facilitate desired photocatalytic reactions. One such reaction is photocatalytic water splitting, which utilizes electrons from sunlight to split water into oxygen and hydrogen gas, the latter of which is an eco-friendly, alternative fuel. Unfortunately, many photocatalysts suffer from low charge carrier separation – a molecular inefficiency that inhibits hydrogen generation to an impractical rate. In efforts to resolve this issue, the coupling of graphene, an excellent conductive material of superior charge transfer capabilities, with iron-doped bismuth titanate (FeBTO), a previously studied multi-metal oxide photocatalyst, to form a composite for enhanced hydrogen generation has been examined.

Specifically, it is of interest to understand how effectively this composite absorbs photons from sunlight and utilizes the subsequently produced charged species (i.e. holes and electrons). Previously, FeBTO has been shown to possess improved catalytic activity at an optimal iron concentration. However, it has been observed that at even higher iron concentrations, catalytic activity decreases – consequential of possible increase in charge carrier recombination. Due to its excellent charge carrier mobility, graphene can rapidly accept and transport electrons before recombination occurs, therefore allowing for the formation of hydrogen. Thus, the following objectives have been and continue to be studied 1) development of a facile method for synthesis of a graphene-FeBTO nanocomposite, 2) examination of how applying graphene to the surface of FeBTO affects charge carrier separation and 3) evaluation of whether a graphene-FeBTO nanocomposite possesses improved activity for photocatalytic hydrogen generation.

GENETIC ANALYSIS OF DSCAM AND ROBO RECEPTORS IN *DROSOPHILA MELANOGASTER*



TYLER DETOMASI

Program: GURA
Mentor: Tom Kidd
Department: Biology
University of Nevada, Reno

Nerves are made up of bundles of axons. Axons are the part of a neuron that conducts signals away from the cell body to other neurons. During development axons interpret positional cues as signals to make navigational decisions. These signals are produced by ligands that are expressed in the midline and may serve as attractive or repulsive cues. Slit is an example of repulsive ligand acting through Robo receptors. Recent evidence has shown that additional receptors react to the same ligand to make an attractive cue. One such receptor, Dscam, interprets the ligand Slit as an attractive signal. In *robo* mutants, axons make dramatic guidance errors due to a lack of repulsion. As these activities are functionally opposed, double mutant stocks of *Dscam robo* and *Dscam robo robo2* were made to see if the two phenotypes would cancel each other out. I tested these stocks using genetic tests (complementation) and was unable to verify the presence of *robo* mutations suggesting that the stocks were corrupted. Additional tests using antibody staining confirmed this, so I am in the process of remaking and testing the stocks. One stock is promising and indicates that the presence of *Dscam* mutations weakens the *robo* phenotype suggesting our hypothesis is correct.

CHANGES IN WORKING MEMORY STRATEGY ALTER NEURAL MECHANISMS OF WORKING MEMORY

GABRIELLA DIMOTSANTOS

Program: GURA
Mentor: Marian Berryhill
Department: Psychology
University of Nevada, Reno

Working memory (WM) provides temporary storage of information, readily available for manipulation. One modulator of WM performance is strategy and WM improves with strategy training (Bailey et al., 2014). The purpose of this study was to measure changes in neural signatures as a function of strategy use. Two manipulations were included. First, the retrieval demands in WM tasks were either recall or recognition. Recall WM demands are more challenging and may rely more strongly on prefrontal (PFC) activations than recognition probes, which may require more posterior parietal (PPC) resources. The second manipulation was to make the retrieval demands predictable or unpredictable where predictability of WM tasks were manipulated by interleaving recall and recognition trials in a third trial block. Neural activity was recorded using high-density electroencephalography while participants completed WM trials probed by recall, recognition or unpredictable (interleaved recall and recognition). The predictions were as follows. First, changing the retrieval demands between recall and recognition would reliably shift activity in the PFC and PPC such that greater PFC activity would be associated with recall and greater PPC activity would be associated with recognition. Second, making trials unpredictable would force participants to adopt a recall WM strategy, showing an expected increase in PFC activity. A final manipulation was to assess how explicit strategy varied between subjects. Toward this aim, participants completed a self-reported strategy questionnaire after performing the WM task. Participants who actively used a strategy showed greater PFC activity during the recall and unpredictable conditions. Participants who did not use a strategy showed greater PPC activity in the unpredictable condition. However, behavioral

performance did not vary as a function of strategy use. In conclusion, strategy use does not provide benefits in WM performance, but does affect neural mechanisms of WM.

ELL PRACTICES FROM THE TEACHER'S PERSPECTIVE WITHIN A TWO-WAY IMMERSION PROGRAM

CHRISTINA FAGUNDES

Program: HURA
Mentor: Diana Barone
Department: Elementary Education
University of Nevada, Reno

Northern Nevada has a growing number of English Language Learners entering its school districts. As a result, teachers must find and use the best practices and techniques to teach these students. In this thesis, best practices are defined as "a set of guidelines, ethics or ideas that represent the most efficient or prudent course of action" (Best Practices, 2013). This thesis examines the English Language Learner (ELL) practices of three teachers and the principal at Green Academy. Each of the participants spoke on three common themes. The interviewee's responses fell under the themes of the overall supportive practices, the importance of students, and the overall language and literacy practices. This research benefits teachers searching for appropriate and effective practices to use in the classroom with their ELLs.

POTENTIAL REGULATION BY PHOSPHATIDYLINOSITOL 4,5 BISPHOSPHATE BINDING OF CALCIUM-ACTIVATED CHLORIDE CHANNEL ANOCTAMIN-1

NATALIE FREITAS

Program: GURA
Mentor: Normand Leblanc
Department: Pharmacology
University of Nevada, Reno

Ca^{2+}-activated Cl channels (CACCs) represent an important excitatory mechanism in vascular myocytes and are associated with many physiological processes such as signal transduction and smooth muscle contraction. CACCs are believed to be encoded by Anoctamin 1 (ANO1), but little is known about the processes that regulate the activity of these channels. Putative Ca^{2+} binding sites as well as binding of Ca^{2+}-calmodulin have been implicated in the activation of CACCs, but the Ca^{2+}-dependent gating mechanisms remain to be established. Phosphatidylinositol (4,5) bisphosphate ($P(4,5)P_2$) is a regulator of various ion channels and the effects of this phospholipid have been linked to intracellular [Ca^{2+}] and calmodulin activity. The inhibitory role of $P(4,5)P_2$ on CACCs has been evinced by the increase in CACC current (I_{Clca}) evoked by solutions containing clamped free [Ca^{2+}] after applying various agents that reduce $P(4,5)P_2$ levels. Furthermore, experiments have shown that ANO1 binds to $P(4,5)P_2$, and as ANO1 resides in lipid rafts, cholesterol depletion from the cell membrane is suspected to effect CACC activity by delocalizing $P(4,5)P_2$. This project investigates the inhibitory role the binding of $P(4,5)P_2$ has on CACC activity by introducing methyl-β-cyclodextrin (mβCD) and alpha cyclodextrin (α-CD) to observe the effects of collating cholesterol or phospholipids, respectively. The whole-cell configuration of the patch clamp technique was used to record I_{Clca} and test the effect of mβCD and α-CD on $P(4,5)P_2$ levels in isolated, ANO1 expressing HEK-293 cells, a mammalian cell line commonly used to heterologously express cloned ion channel proteins. The decrease in $P(4,5)P_2$ binding caused by the mβCD and α-CD proved to be associated with an enhancement of I_{Clca} and confirms the importance of the removal of $PI(4,5)P_2$ in CACC activity.

SELF-RENEWING PDGFRα CELLS ARE INDUCED IN RESPONSE TO INTESTINAL INJURY

ROBERT FUCHS

Program: Faculty sponsored
Mentor: Seungil Ro
Department: Physiology
University of Nevada, Reno

Injuries to the gastrointestinal (GI) tract cause muscular hyperplasia in smooth muscle cell (SMC) populations (Macdonald 2008). It was proposed that this injury-response phenotype is driven by a smooth muscle (SM)-specific stem cell population that is normally quiescent, but can be agitated into proliferation (Tang et al. 2012). While appetizing, this hypothesis is limited by the lack of data demonstrating a specific type of GI cell to drive this behavior. A first step towards identifying an injury-response cell is *in vivo* lineage tracing of injured SMCs (Nguyen et al. 2013). Additionally, isolating cells from injured tissue to characterize their expression profile and proliferative character could elucidate the impact of injury on SM tissue.

To address these gaps in knowledge, we injured murine GI tissue by adapting an intestinal stress model that mimics human intestinal partial obstruction. We then tracked the behavior of SMCs using immunofluorescent microscopy, cell culture, and fluorescent-activated cell sorting (FACS). We identified a novel population of stem cells present in SM based on their expression of Platelet-Derived Growth Factor Receptor α (PDGFRα), which is unique among GI cells. We showed that these PDGFRα cells are absent in healthy tissue but proliferative in injured tissue. Alongside PDGFRα cell activation, the intestinal stress reduced serum response factor (SRF) and DNA methyltransferase (Dnmt1) expression. These findings indicate that injury causes mature SMCs to lose contractility. Finally, we show conservation of these expression changes in human muscle following injury.

Taken together, our research characterizes a class of stem cell activated following injury, revealing a potential mechanism used by smooth muscle to heal itself. In addition to informing basic smooth muscle biology, these insights possess translational value: the tendency of PDGFRα cells to activate specifically during injury implies a regenerative property that could make these cells a valuable tool for cell therapy.

INVESTIGATION OF GENETIC VARIATION WITHIN BIGHORN SHEEP POPULATIONS

JENNIFER GANSBERG

Program: Faculty sponsored
Mentors: Marjorie Matocq, Jason Malaney
Department: Natural Resources and Environmental Science
University of Nevada, Reno

Due to various factors, including overharvest and disease, the range of bighorn sheep in North America declined dramatically in the early twentieth century. Though diligent management and translocation efforts are helping the species repopulate their historic range, disease continues to have a decimating effect on bighorn populations. Genetic diversity can augment immune response and disease resistance in wild populations. This project aims to quantify genetic variation within bighorn sheep populations to eventually understand the role that genetic variation may play in disease resistance. We extracted DNA from bighorn sheep hair samples collected from 3 wild populations. We amplified 16 microsatellite loci using the polymerase chain reaction. Microsatellite loci are highly repetitive, non-coding segments of DNA subject to frequent mutation, resulting in high levels of variation among individuals and within populations. Once amplified, we ran samples on an ABI 3730 automated sequencer in the Nevada Genomics Center and identified alleles using software and

verified calls by eye. We find that the populations maintain moderate levels of genetic variation but are substantially differentiated from one another. By integrating the genotype data from this project with the demographic data from these well documented herds, we will gain valuable insight into patterns of diversity and persistence in populations that will aid in future conservation efforts.

THE RELATION OF PARENT-CHILD PLAY INTERACTION TO CHILDREN'S SOCIAL AND EMOTIONAL SKILLS



ARMIN GARCIA, MARIA LEE-CARMARGO, SARAH BRIGGS

Program: Faculty sponsored
Mentor: Hyun-Joo Jeon
Department: Human Development and Family Studies
University of Nevada, Reno

Parent-child interaction quality is very important in children's early learning and development (Hirsh-Pasek & Burchinal, 2006; Jeon, Peterson, & DeCoster, 2013; Lemelin, Tarabulsy, & Provost, 2006; Tamis-LeMonda, Shannon, Cabrera, & Lamb, 2004; van Bakel & Riksen-Walraven, 2002). The current study will examine the relation among the quality of parent-child play interaction, children's temperament, and social skills. Currently, 28 families of young children were recruited in the study. The study children's age ranges from 18 month to 30 months. Participating mothers and fathers were asked to complete a parent questionnaire independently and to visit in a university laboratory. During their laboratory visit, mother- and father-child play interactions were videotaped. The research team members are establishing an acceptable level of inter-rater reliability for coding 10 different behaviors of videotaped parent-child play interaction. After completing coding parent-child play interaction behaviors, all data including the parent-child play interaction behavior and parent questionnaire data will be entered into a statistical package, SPSS. The research team will examine the relations between each parent-child play interaction behavior, children's temperament, and social skills. The current study will also explore whether there is the difference between mother-child play interaction behavior and father-child play interaction behavior. Findings of the current study will provide information about which parent-child play behavior is related to children's temperament and social skills and implications for effective parenting education intervention for toddlers.

WATER SOLUBLE RUTHENIUM CATALYSTS FOR THE HYDRATION OF NITRILES

NATHAN GELMAN

Program: NSF EPSCoR
Mentor: Brian Frost
Department: Chemistry
University of Nevada, Reno

Two of the key challenges of green chemistry are reducing waste and finding benign alternatives to organic solvents. Aqueous biphasic catalysis is a particularly attractive area of green chemistry because it affords easy separation and recycling of catalyst and reduction in the use of organic solvents. Research in the Frost lab is focused on development of effective catalysts in aqueous chemistry. Advances in aqueous catalysis could mitigate the chemical industry's impact on the environment and slow the course of climate change.

EFFECT OF TESTOSTERONE ON NEURON COUNT AND VOLUME IN THE HIPPOCAMPUS OF THE SIDE-BLOTCHED LIZARD, *UTA STANSBURIANA*

FRANK GONZALEZ

Program: HURA
Mentor: Vladimir Pravosudov
Department: Biology
University of Nevada, Reno

It has been demonstrated in a variety of vertebrates that there is a correlation between the hippocampus (HP) and spatial learning abilities. Spatial learning is an important factor when considering survival and fitness since many species use it to remember the location of food resources and to find mates, as well as for general navigation. Two areas that appear to vary significantly in the HP with differing spatial demands are overall neuron counts and volume. Both neuron counts and volume have been shown to fluctuate with certain hormone levels, such as thyroid stimulating hormone and testosterone. In the side-blotched lizard, *Uta stansburiana*, there are three morphs that differ in their space use patterns. Two of the morphs are territorial and engage in large home range size and the other is non-territorial and does not have a home range. The territorial morphs have been demonstrated to have higher circulating testosterone levels than the non-territorial morph. Since a positive correlation between testosterone levels and spatial use patterns has been demonstrated, one hypothesis is that testosterone mediates spatial learning through changes in the HP. In this study, we found that increasing the amount of circulating testosterone levels in the territorial morphs significantly decreased both HP volume and neuron counts when compared to the control. Conversely, increasing circulating testosterone levels in non-territorial morphs significantly increased HP volume and neuron counts when compared to the control. These different responses to increased testosterone levels could be due to physiological differences in neuron receptors within the HP neurons of the three morphs but further studies would need to be conducted.

WHAT ARE THE GOALS AND CHALLENGES OF USING BI TO MAKE DECISIONS IN OPERATIONS?

CAYLA HARVEY

Program: HURA
Mentor: Sheri Faircloth
Department: Finance
University of Nevada, Reno

Business intelligence (BI) is the interpretation and manipulation of data through data analysis technologies to provide decision makers with information that allows them to improve organizational performance. Companies are increasingly using BI technologies to make sense of the vast quantity of data they accumulate from their operational activities. The information they gain from data analysis is then used in decision making. BI is a powerful and evolving tool giving organizations a competitive advantage. This thesis asks what are the goals and challenges of using BI to make decisions in operations. This question is answered through the review of academic and industry literature. Further insight comes from the first-hand experience of completing a BI project and interviewing employees at a large technology corporation, Microsoft. As an intern at Microsoft I was able to work the BI team at Microsoft to analyze a large data set. The literature and firsthand experience concluded firms seek goals revolving around cost reduction, process improvement, increased customer satisfaction, and gaining a competitive advantage. The goals of BI vary by company based on the types of data available, level of technological capabilities, and the extent BI is part of the organizational culture. These three components are key for the company to achieve its desired outcomes of the BI project. Organizations much

address the challenges in each of these areas to have BI be successful. Key challenges are first having the appropriate technical capabilities to process the data and second integrating BI into all levels of decision making. Organizations who address and overcome these challenges significantly outperform their competitors.

QUANTIFYING THE UNQUANTIFIABLE: ART AND TRUST

JAMIE LEE HIMES

Program: Faculty sponsored
Mentor: Christina Frederick
Department: Psychology
Sierra Nevada College

Trust and art play important roles in healthcare by aiding clients in being vulnerable and open for growth. Clinicians must establish trust with patients to facilitate satisfactory outcomes (Hupcey & Miller, 2006). The current study examined the level of trust attained when the proximity between the researcher and participant was varied during an art production session. 90 participants were selected via convenience sampling and randomly assigned to 1 of 3 groups, (1) researcher not engaged with the participant during an art activity (alone), (2) researcher working on their own art activity parallel to the participant (parallel), and (3) the researcher and participant collaborating on the same art activity (together). Participants were tested individually to best mimic typical client-therapist interactions and were screened for their familiarity with the experimenter (those providing a rating of 3 or above on a 5-point Likert scale were excused from the study). After providing consent, participants were instructed about how to use the art materials provided and were given 8 min to paint a self-portrait in the researcher-participant configuration consistent with their assigned condition. Participants, then, rated their trust in the researcher on a five-point Likert scale. The Kruskal-Wallis (Triola, 2010), the non-parametric alternative to the one-way ANOVA, was used to compare trust rating averages across art production conditions and showed no significant difference (p = .557) between groups. Results of the current study show trust is not impacted by researcher-participant proximity in an art production session. The suggestion is for further study of this same question in a clinical setting.

THE IMPACT OF NOISE TYPES ON WORD LIST RECALL

DANA HOFFELT

Program: Faculty-sponsored
Mentor: Christina Frederick
Department: Psychology
Sierra Nevada College

Research shows listening to music can positively impact cognitive performance (Pernham & Vizard, 2011; Ramachandra, Meighan & Gradzki, 2012). Cognitive performance quality is important for undergraduates who often listen to music while studying to minimize outside distractions. It is unclear whether listening to music aids undergraduates with study or acts as a distractor itself. The current study explored the effects of 3 noise types on long-term recall. 93 undergraduates were randomly assigned to 1 of 3 noise (music, white noise, or ambient library sound) conditions during a common studying event. Participants listened to their assigned audio track for 3.05 min via headphones connected to an Apple device while studying a 24-word list presented on paper. To minimize potential memory cues, the 24 words were balanced for valence and concreteness (Chi-Shing & Altarriba, 2009), printed in fixed-width Courier font, and contained four letters each. Upon study completion, participants engaged in group repetitive subtraction for 30 sec. This distractor task was

followed by a 90 sec, written, free recall task, before which participants were instructed to recall as many words as possible from the studied word list. The number of words recalled was tabulated for each participant and sorted by noise condition. A one-way ANOVA showed no significant difference (p = .720) in number of words recalled across noise conditions. Results of the current study showed the 3 noise types assessed did not differentially impact word list recall. This suggests studying with music may not negatively impact long-term recall.

THE INFLUENCE OF MEMORY ON LONG-TERM INCIDENTAL MEMORY

ANNA JARSCHKE

Program: Faculty sponsored
Mentor: Christina Frederick
Department: Psychology
Sierra Nevada College

Gender stereotypes are pervasive throughout culture and have unknown effects on men and women. To investigate how gender affects long-term incidental memory, participants viewed a slideshow of 40 words (20 female-stereotypical; 20 male-stereotypical), each word displayed for 3 sec. The Study 1 word list was compiled with attention to gender stereotype value and word length. Instructions were given to visualize each word. After viewing the word list, participants completed a series of simple mathematic tasks to eliminate short-term memory and distract from the purpose of the study. After conclusion of these mathematic tasks, participants were asked to free recall, in writing, as many words as possible from the word list. 81 undergraduate students, aged 18 to 25, participated in Study 1. Using the Wilcoxon Signed-Rank Test, a significant difference was found for female recall of female-stereotypical words (p = .003) and no significant difference was found for male recall of gender-stereotypical words (p = .169). Study 2 included 84 undergraduate participants, also aged 18 to 25, and was conducted to examine the relative impact of words sourced from a gendered word list constructed to eliminate potential bias, balance stereotype value, and balance word length (Crawford, Leynes, Mayhorn, & Bink, 2004). Similarly, Study 2 resulted in a significant difference for female recall of female-stereotypical words (p < .001) and no significant difference in male recall of gender-stereotypical words (p = .582). Together, these findings converge to suggest female memory for gendered words is influenced by gender and male memory is not.

FAIR ELECTIONS: EVALUATING PRESIDENTIAL ELECTIONS THROUGH MATH

MATTHEW JEANOS

Program: HURA
Mentor: Thomas Quint
Department: Mathematics
University of Nevada, Reno

Every four years in the United States, a Presidential Election is held. For this election, every state is given a certain number of Electoral Votes and a candidate wins the election when the amount of electoral votes they have gathered exceeds a certain number. Over the years, many have questioned how fair this method of election is. To determine the fairness of this type of election the following thesis will represent an election as a simple game and then by evaluating the Shaply Shubik Power Index of said game. The thesis will evaluate the power index values of each state according to electoral votes along with evaluating the power index values of groups of citizens in each state. By doing so, this thesis will demonstrate two differing results: in

evaluating states, the larger states will be shown to have more power; while in evaluating the citizens, groups from smaller states will be shown to have more power.

DETERMINING SALT TOLERANCE AND UPTAKE OF *ATRIPLEX HORTENSIS*

WAILEA JOHNSTON

Program: NSF EPSCoR
Mentor: Robert Nowak
Department: Natural Resources and Environmental Science
University of Nevada, Reno

Salinity inhibits root and shoot growth and is toxic to traditional crops during germination. Salt injury in plants can resemble symptoms of drought-stress resulting in wilting, tissue loss, reduced productivity, and death. The current treatment methods for saline soils are to flush the salts from the plant root zone either downstream (artificial drainage), past the root zone (leaching requirement), or into an accumulation area (managed accumulation). These methods require even more fresh water, which is a limited resource in much of the world. Climate change will add further stress to farmers due to increased evaporative-transpiration in a warmer climate and due to uncertainty and increased variability of precipitation and thus even greater competition for fresh water.

Halophytes, or salt tolerant plants, can potentially replace conventional crops that cannot survive in these marginal lands. Furthermore, these crops may tolerate higher salinity water and thus decrease demand for the limited fresh water that is available. This study looks at the salt tolerance of *Atriplex hortensis* L. both in soil salinity and through saline irrigation and also during germination. *A. hortensis* is grown widely in Europe and Asia for human consumption and is a highly nutritious green. This species' ability to remove salts from the soil and thus its' potential to improve soil quality is also being examined.

THE EFFECT OF TESTOSTERONE ON NEUROGENESIS IN THE HIPPOCAMPUS OF THE SIDE-BLOTCHED LIZARD, *UTA STANSBURIANA*

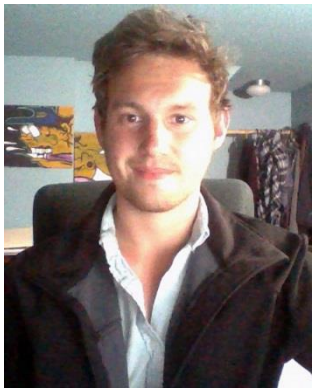
KALLIE KAPPES

Program: HURA
Mentor: Vladimir Pravosudov
Department: Biology
University of Nevada, Reno

The hippocampus is the area of the brain that is responsible for learning in vertebrates. Having adequate spatial learning ability is critical for survival because it enables animals to remember resource locations, find mates, and navigate. Varying spatial learning demands placed on the brain through different tasks has been shown to affect hippocampal morphology. Hormones have been implicated as one potential mechanism that could directly affect hippocampal morphology and consequently spatial learning ability. Manipulation of testosterone has been shown to affect spatial use and home range enlargement side-blotch lizards (*Uta stansburiana*). The side blotched lizard exhibits three different morphs and each morph correlates to a different spatial use strategy and home range size. These different territory strategies translate into different spatial use demands on the hippocampus. However, it remains unclear whether these changes were mediated through the effects of testosterone on hippocampal morphology. Neurogenesis in the hippocampus has been previously reported to occur in the adult vertebrate brain and it has been linked with spatial learning ability. We hypothesized that testosterone-mediated changes in spatial use strategies occurs via changes in hippocampal

neurogenesis rates. We specifically predicted that experimental increases in testosterone increases in testosterone levels should directly affect hippocampal neurogenesis rates. However, the results showed no increase in neurogenesis due to the elevated testosterone. This could be due to different factors and it still remains unclear if a relationship exists.

DYNAMICALLY STABILIZING CAVITY SIZE OF AN OPTICAL-CAVITY TRAP



DAVID KARR

Program: GURA
Mentor: Andrew Geraci
Department: Physics
University of Nevada, Reno

Advances in optical trapping and cooling predict new levels of short-range force measurement, allowing the possibility to detect discrepancies in Newtonian gravity. A laser is shown into a cavity at resonance, producing an optical trap to capture micron-sized beads for short-range force detection. For the necessary resonant condition both the laser frequency and the length of the cavity must be fixed. Though the laser can be stabilized prior to the experiment, thermal expansion of the cavity walls must be continually corrected for. To resolve this problem, Pound-Drever-Hall laser frequency stabilization techniques are utilized to dynamically monitor and adjust the cavity length. Here an experimental overview, progress of cavity stabilization and future directions are presented.

LABELING OF THE NEUROMUSCULAR JUNCTIONS IN EXTRAOCULAR MUSCLES TO IDENTIFY THE OCULOMOTOR NERVE RESPONSE TO SLIT/ROBO SIGNALING IN THE DEVELOPING MOUSE BRAIN

SIERRA KELLY

Program: GURA
Mentor: Grant Mastick
Department: Biology
University of Nevada, Reno

The oculomotor system is involved in movement of the eyeball and eyelid and thus the field of view. The eye moves by six extraocular muscles. The oculomotor nerve innervates four of the six muscles. As the oculomotor nerve migrates out of the midbrain and innervates the extraocular muscles it is guided by molecular mechanisms, or guidance cues. Eye movements depend on the correct migration of cranial motor axons and innervation of their corresponding extraocular muscles. Defective innervation can lead to strabismus, abnormal eye alignment or movement. Despite the importance of the oculomotor system, little is known about the molecular mechanisms that guide the nerves to their proper muscles. We propose that Slit/Robo signals, chemorepellents that guides axons to their correct target, will be important for the developing oculomotor system. I aim to define the normal innervation pattern of extraocular muscles by the oculomotor nerve using mouse embryos; also to verify if mutations in the genes for Slit/Robo signaling will result in abnormal development of the oculomotor system. Using a snake venom toxin, bungarotoxin, to label the neuromuscular junctions present in muscle fibers I can identify the timing of when neuromuscular junctions form in the eye muscles of normal embryos and thus at what stage nerve innervation takes places for each of the six extraocular muscles. This information will allow me to observe if interrupted guidance cues in Slit/Robo mutants will result in altered or nonexistent innervation of the eye muscles.

IMPACTS OF AEROSOLS ON THE SPECTRAL ALBEDO OF SNOW SURFACES IN THE VISIBLE WAVELENGTHS

SUSAN KONKOL

Program: GURA
Mentor: W. Patrick Arnott
Department: Physics
University of Nevada, Reno

In models, lower albedo of snow has contributed to warming of the earth by promoting less reflectivity of solar radiation. Pollution can be a direct cause of lower albedo of snow. People, dust, and wild fires can create large amounts of pollution. Black carbon has been shown to decrease albedo in glaciers and ice sheets. The distribution of pollution on snow may produce positive climate forcing of the planet. The question of how much reflection a snow surface will have with pollution covering its surface is investigated here. A spectral albedo meter with a wavelength range of 400 – 800 nm was used to measure radiance and irradiance on snow surfaces in the visible wavelengths at various distances from a pollution source. Then a calculation of the albedo at each data point was performed. A low albedo may imply a moderate to a large human impact on climate warming. Filtered snowmelt from each sample was analyzed in a laboratory. A carbon analysis and an xrf analysis were performed. The data taken showed carbon was the largest pollutant material on snow. The xrf analysis showed iron was the second largest pollutant on the snow field. The larger the amount of iron, the higher the absorption of solar radiation. The data collected of iron showed that its reflectivity on the snow was low and its absorption of solar radiation was high. Large amounts of carbon and iron on the surface of snow will have an impact on the snow. It attracts more warmth to snow cover causing it to melt much earlier in the season. The samples containing the most iron and carbon, both elemental and organic, were the samples closest to the highway, the source of the pollutants. This should create an awareness of how polluting on snow may accelerate climate warming.

TOWARDS AN UNDERSTANDING OF CHANGES IN THE EXPRESSION PROFILE OF THE ADL OLFACTORY NEURON OF *CAENORHABDITIS ELEGANS* AS A FUNCTION OF FEEDING STATE

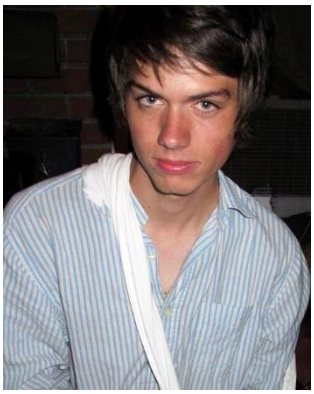
AUSTIN KOONTZ

Program: HURA
Mentor: Alexander Van der Linden
Department: Biology
University of Nevada, Reno

It is well known that olfaction as a sensory perception is adjusted in many organisms in response to changes feeding state. This research intends to uncover the molecular mechanisms involved in changes in olfactory perception as a function of feeding-state in the ADL olfactory neuron of the model organism *Caenorhabditis elegans*, a system characterized by an expansive understanding of important underlying genetic and neural networks. Alterations in gene expression in the ADL neuron will be characterized using transgenic worm lines and next-generation sequencing. A genetic construct will be created in which the gene encoding for the poly-A binding protein (PAB) conjugated with an antibody flag region (3x Flag) will be expressed downstream of the ADL-specific promoter *sre-1*. Worms properly expressing the *3xFlagPAB* gene specifically in the ADL neuron will be selected for using genetic crosses. Upon obtaining a transgenic line, RNA transcripts of worms will be isolated using immunoprecipitation and analyzed using next-generation sequencing following starvation experiments. RNA

transcripts and corresponding expression profiles within the ADL neuron of well-fed, starved, and post-starved nematodes will be compared, with observations being made for particular genes which will be up- or down-regulated as a result of feeding state. Such an understanding of these mechanisms could be utilized to prevent infection of human hosts by parasitic nematodes, and other parasites as well.

MODELING MUTUALISM IN INTERACTIVE POPULATION DYNAMICS: HOW ANTS AND APHIDS AFFECT LYCAENID BUTTERFLY ECOLOGY



ELLIOT KOONTZ

Program: HURA
Mentors: Anna Panorska, Matthew Forister
Departments: Mathematics and Statistics, Biology
University of Nevada, Reno

Modeling population dynamics which include mutualistic interactions is an important and complex problem in theoretical biology and ecology. Although modeling towards a focal species often includes consideration of interactive species, it is more difficult, yet essential, to develop models which take interactive species dynamics into account when mutualism and parasitism are present. Butterflies in the family Lycaenidae provide an excellent example for studying mutualism, since the caterpillars of this species are known to interact with ants in a way that benefits both species- caterpillars provide nectar secretions for ants in return for protection from certain predators. Furthermore, ants are known to maintain a similar relationship to aphids. This research aims to improve upon previous work on lycaenid butterfly life cycles (Forister, Gompert, Nice, & Fordyce, 2010) by adapting the models to include the dynamics of two interactive species, ants and aphids. By studying previous research and utilizing both deterministic and stochastic mathematical techniques which incorporates changes in the populations of the interactive species, we hope to generate a model which simultaneously predicts the fluctuation in the focal species while providing insight to the rich and complex interplay of mutualistic interactions in theoretical ecology. In particular, this research hopes to look at potential competition between aphids and lycaenid caterpillars for attention from ants, and describe mathematically this competition and the mutualism existent between the three species.

WALKING THE TAHOE RIM TRAIL

MICHELLE LASSALINE

Program: GURA
Mentor: Joseph DeLappe
Department: Art
University of Nevada, Reno

This creative research project explored the meditative qualities of walking and its potential to affect the way I think about and make art. The small ribbons of highway we take from one place to another dictate our understanding of a region, minimizing our physical relationship to it. I walked the 165-mile Tahoe Rim Trail over the course of fifteen-days in order to discover something about the land that would not have been perceptible by car. I documented my experience through writing, sketching, and making photographs. John Muir and Henry David Thoreau were inspired to write by their walking and exploring, and Gary Snyder wrote, “We learn a place and how to visualize spatial relationships, as children on foot and with imagination. Place and the scale of place must be measured against our bodies and their capabilities.” Through this project I learned to perceive physical space and time differently by being consciously unhurried for an extended period of time. I used

the sketches, journals, and photographs from the walk as the material for my Bachelor of Fine Arts thesis exhibition and paper, which addressed the importance of direct experiences in the landscape through observations and reflection. Rebecca Solnit sums up this sentiment eloquently in her book *Wanderlust: A History of Walking:* "Exploring the world is one of the best ways of exploring the mind, and walking travels both terrains."

ISOLATION AND CHARACTERIZATION OF A NOVEL PHAGE LYSIN ACTIVE AGAINST *PAENIBACILLUS LARVAE*, A HONEY BEE PATHOGEN

LUCY LEBLANC

Program: NSF EPSCoR
Mentor: Penny Amy
Department: School of Life Sciences
University of Nevada, Reno

American Foulbrood disease, known as the most destructive bacterial disease of the honey bee, is caused by the Gram-positive bacterium *Paenibacillus larvae*. This disease has contributed to the precipitous decline of honey bee populations worldwide. Current approaches such as burning hive equipment or administering antibiotics have failed to ameliorate this problem. Therefore, alternative therapies must be developed. Bacteriophages are viruses that infect bacteria. During the lytic cycle of viral infection, bacteriophages express proteins called lysins after genome replication and capsid assembly. First, a protein known as a holin is expressed which creates lesions in the inner bacterial membrane. The lysin can then traverse these lesions and hydrolyze peptidoglycan, causing lysis of the cell and release of progeny virions. For Gram-positive bacteria, the peptidoglycan layer is exposed on the outside, so exogenous application of purified lysin would cause rapid cell death even without the holin. Using bioinformatics, we have analyzed the genomes of numerous *P. larvae* phage and found extensive conservation of lysin and holin genes. We have identified a bacteriophage lysin (PlyPalA) isolated from the genome of a novel bacteriophage that infects *P. larvae*. PlyPalA has an N-terminal N-acetylmuramoyl-L-alanine amidase domain and causes significant reduction in turbidity of pathogenic log-phase *P. larvae* cultures. Readily expressed in transformed *E. coli* and purified by ion exchange chromatography, PlyPalA has great potential to serve as an effective therapeutic.

ANALYSIS OF SAME-SEX COUPLES' RIGHTS IN 186 COUNTRIES

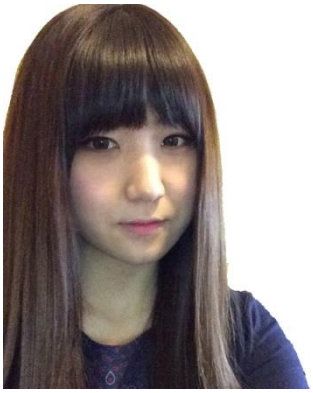
CHELSEA LEE

Program: GURA
Mentor: Derek Kauneckis
Department: Political Science
University of Nevada, Reno

The topic of civil unions, domestic partnerships, and marriages between members of the same sex is one of the most politically charged policy issues. Today, the international civil and human rights platform has generally evolved to include the fundamental idea that the lesbian, gay, bisexual, transgendered, or queer citizen is endowed with certain economic and social benefits, protections, and rights equal to those of the heterosexual community. This study examines differences in the set of rights given to same-sex couples across the world, provides a comparison of how countries rank in terms of same-sex couple rights (SSCRs), and explores the variables that determine a nation's current policy on SSCRs. Using cross-national data of generalized civil liberties and LGBTQ rights from both Freedom House and the International Lesbian, Gay, Bisexual, Trans and Intersex Association (ILGA), original research was conducted to draft an index that ranks the

surveyed countries. The study provides a visual representation of the dataset of rights afforded, or lack thereof, in 186 countries around the globe. Ordinal logit regression was employed to test three models, with differing sets of variables included in each model. Results suggested that attitudes toward homosexuality and levels of education are more significant indicators in predicting levels of SSCRs than religion, other types of minority discrimination, and civil rights within individual countries.

SLIT/ROBO SIGNALS ARE REQUIRED TO GUIDE SEROTONERGIC AXONS

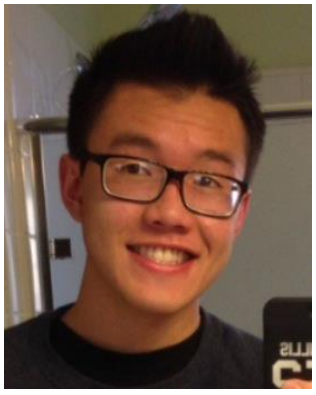


HAERAM LEE

Program: GURA
Mentor: Grant Mastick
Department: Biology
University of Nevada, Reno

Serotonin is a monoamine neurotransmitter found in a variety of neural systems throughout the brain. Serotonergic neurons develop at an early embryonic stage near the floor plate which produces several types of guidance cues with well-known roles in attracting and repelling growing axons, projecting axons along a specific longitudinal pathway to many regions of the brain and the spinal cord. Serotonin innervations are based on the accurate navigation of raphe axons to diverse targets all over the forebrain. Therefore, abnormal innervations based on inaccurate navigation could alter serotonin levels in some areas, and could be an underlying cause of Dysfunction of serotonin signaling implicated in major depression, autism, impulsivity and aggression. However, little is known about the mechanism that guide serotonergic axons during brain development. The central hypothesis of the project is that serotonergic neurons navigate through the neural tube using floor plate signals, specifically the Slit repellant signals and their Robo receptors. To determine whether Robos are involved in guiding serotonergic axons, I collected and analyzed mouse embryo brains from Robo1/2 double mutants. While serotonergic axons navigate parallel to the midline in wildtype embryos, these axons crossed the midline when Robo1 and 2 are missing. I also found that serotonergic neuron cell bodies entered the floor plate in the mutant. To investigate which Robo receptors are essential to guide serotonergic neurons, early stages of single allele knockout embryos and their littermate controls were collected. We found that Robo1 is critical for guiding serotonergic axons. These findings suggest that Slit/Robo signals are required to guide serotonergic axons at early embryonic stages, and that disruption of Slit/Robo signaling can lead to major failure of serotonin innervations into the forebrain. Overall, an understanding of the roles of floor plate signals in guiding serotonergic neurons should be essential to understand the potential contribution of axon guidance mechanisms of neurological disorders.

ELECTROPHYSIOLOGICAL CHARACTERIZATION OF A TREK-1 ION CHANNEL SPLICE VARIANT



MICHAEL LEE

Program: GURA
Mentor: Iain Buxton
Department: Pharmacology
University of Nevada, Reno

Premature failure of uterine relaxation resulting in the delivery of an underdeveloped (<37 weeks) fetus is the leading cause of newborn mortality worldwide. Despite significant efforts from the scientific and medical community, the majority of spontaneous preterm labor (PTL) cases remain unexplained. TREK-1, an outward rectifying potassium channel is gestationally regulated with expression decreasing

when pregnancy reaches full-term. Reduced expression has been hypothesized to be a contributing mechanism for triggering uterine contractions. Moreover, five genetic splice variants (SV-1 to SV-5) of TREK-1 have been identified in the myometrium of patients who delivered preterm leading to the hypothesis that TREK-1 splice variants could interfere with proper channel function. The objectives of this study were to determine functional characteristics of SV-2 using electrophysiological methods. Both basal (90 mM NaCl bath) and activated (90 mM $NaHCO_3$ bath) currents were monitored when HEK293 cells were transfected with: (1) SV-2 alone; (2) wt-TREK-1 and SV-2; (3) wt-TREK-1 and red fluorescent protein (RFP). When HEK293 cells were transfected with SV-2 alone the mean current density was 1.0 ± 0.06 pA/pF and 0.84 ± 0.04 at 0 mV for NaCl and $NaHCO_3$ bath solutions, respectively. HEK293 cells transfected with wt-TREK-1 and SV-2 had mean current densities of 2.5 ± 0.1 pA/pF and 19.7 ± 2.1 at 0 mV for NaCl and $NaHCO_3$ bath solutions, respectively. HEK293 cells transfected with wt-TREK-1 and RFP (plasmid control) had mean current densities of 12.0 ± 1.3 pA/pF and 94.5 ± 8.9 pA/pF at 0 mV for NaCl and $NaHCO_3$ bath solutions, respectively. These data indicate that SV-2 demonstrates very little functional activity and co-transfection with wt-TREK-1 results in current inhibition by SV-2. These findings suggest a potential role for TREK-1 in uterine quiescence maintenance and correlate the presence of SV-2 to decreased TREK-1 currents.

AN ANALYSIS OF LATENCY ON NETWORK CONNECTION MEDIUMS USING A PUBLIC CLOUD-BASED TRANSACTIONAL DATABASE

JONATHAN LUJAN

Program: HURA
Mentor: Michael Ekedahl
Department: Information Systems
University of Nevada, Reno

Computing applications and services that utilize public cloud services are known to have latency (delay) due to physical distances between clients and the public cloud provider, coupled with delays created by intermediate routers, and the physical connection medium itself. Latencies caused by the physical medium used to connect to these cloud services have been vastly untested. For instance, a business that uses cloud services through a cable Internet connection might experience acceptable latencies, while a business using DSL might experience unacceptable delays. This research uses empirical tests to demonstrate cloud latency effects caused by connection medium limitations and intermediate hardware through the use of a public cloud transactional database. These tests will provide a means to determine how varying the connection medium to a cloud service provider will affect download and upload latency to a public cloud database. The three connection mediums that are being tested for latency include cable Internet, DSL, and a fiber optic backbone connection provided by the University of Nevada, Reno campus. This research will serve as a tool for businesses interested in DSL, cable, and fiber optic internet connection mediums to help determine the amount of latency they will receive by using a public cloud transactional database (hosted by Microsoft Azure).

DOCOSAHEXAENOIC ACID INHIBITS HEAT SHOCK PROTEIN 90 COMPLEX AND CLIENT PROTEINS BY REDUCING INTRACELLULAR ATP LEVELS IN BREAST AND LUNG CANCER

IRVIN MA

Programs: GURA, NSF EPSCoR
Mentors: Ronald Pardini, Michael Mouradian
Department: Biochemistry and Molecular Biology
University of Nevada, Reno

A major contributor to carcinogenesis is the molecular chaperone heat shock protein 90 (Hsp90). Hsp90 regulates the proper folding and stabilization of several client proteins, including ErbB2 and HIF-1α. ErbB2 is a clinical target for the treatment of metastatic cancer, while HIF-1α is often stabilized and overexpressed in several cancers. The ability for Hsp90 to become a mature complex and to properly fold client proteins is dependent on ATP binding with the co-chaperone, p23. Specific Hsp90 inhibitors target the Hsp90 ATP-binding site to prevent formation of the mature complex. Although supplementation with docosahexaenoic acid (DHA; C22:6 n-3) has not been shown to specifically target the Hsp90 ATP-binding site, the current study demonstrates an ability to reduce available intracellular ATP levels. DHA is the longest, has been shown to possess anti-cancer activity in several cancer models. Studies from our laboratory have shown that DHA enrichment can reduce cancer cell metabolism and intracellular ATP levels in both breast and lung cancer models. In this study, a novel mechanism for the ability of DHA to inhibit the Hsp90 chaperone complex is defined. We found that the reduction in ATP levels by DHA treatment resulted in significant decreases in the association of Hsp90 and p23 in both cell lines. The decreased association of the Hsp90-p23 complex led to decreased levels of ErbB2 and HIF-1α client proteins, suggesting that DHA can modify Hsp90 chaperone function and attenuate client protein levels. Consistent with these observations, when using a dose of DHA that did not significantly reduce intracellular ATP levels, no change in the Hsp90-p23 chaperone complex or protein levels of ErbB2 and HIF-1α were seen. These results demonstrate a potential use for dietary intervention to improve cancer therapy in tumors that overexpress Hsp90 client proteins.

VELOCITY MEASUREMENTS DURING HIGH SPEED IMPACT EXPERIMENTS USING LASER INTERVALOMETER TO FIND OPERATION PARAMETERS

MELISSA MATHES

Program: NSF EPSCoR
Mentor: Brendan O'Toole
Department: Mechanical Engineering
University of Nevada, Las Vegas

The objective of this research is to provide a better understanding of the operation parameters that affect projectile velocity in the UNLV two-stage light gas gun. Researchers designing experiments for the gun, base testing off of a desired projectile velocity. The manufacture has stated that the range of velocities can vary from 2 – 7 km/s. Operation parameters affecting the velocity include: type of light gas (typically hydrogen or helium), pump tube pressure, mass of powder charge, mass of projectile, and gun barrel diameter (5.6 mm or 9.5 mm). The exact value of these parameters needed to achieve an explicit projectile velocity is not known.

This work focuses on the effect of pump tube pressure in the range of 2.1 – 4.1 MPa (300 – 600 psi) with helium and hydrogen and a powder mass of 20 g. Experiments will be conducted using 5.6 mm cylindrical Lexan

projectile. In the two-stage light gas gun, the burning of gunpowder allows the expansion of gas to force a piston to compress a light-weight gas that will accelerate the piston in the pump tube. The increase in pressure in the pump tube will eventually open a petal valve, and thrust the projectile that is placed immediately after the valve towards a target.

In the proposed experiments, 12.7 mm thick steel plates are impacted by the projectiles. The velocity of the projectile is measured by a Laser Intervalometer. The time variance between interruptions of laser beams by the projectile produce an extremely accurate calculation of its velocity.

Results from the experiments so far show projectile velocities ranging from 4 – 6 km/s. This data allows the gun operators to set procedure parameters with a high confidence of the resulting projectile velocity. Operation boundaries have also been defined to ensure safety and minimize erosion and damage of internal components of the gun.

DEVELOPING A SOFTWARE PACKAGE FOR THE MANIPULATION AND VISUALIZATION OF MULTISCALE RATE-CODED NEURAL NETWORKS

ALEXANDER MCARTHER

Program: GURA
Mentor: Monica Nicolescu
Department: Computer Science and Engineering
University of Nevada, Reno

A rate-coded neural network is a type of neural network designed to encode information by its firing rate. Traditionally, neural networks are characterized as difficult to manipulate and visualize. A program suitable for this task would need to be capable of constructing networks from scratch, modifying existing network parameters, and displaying network characteristics – all while being easy to use and powerful. A software package is detailed here to interface with this type of neural network, as well as present its contents in several simple interfaces depending on the needed information. The software package detailed here builds upon an external actor-based neural network implementation using a network interface. Through a simple protocol, commands such as adding or removing nodes from the artificial neural network, or creating and removing connections between those nodes can be relayed from a simple user interface. The user interface provided excels at constructing demonstrative neural network configurations from scratch as well as basic manipulations of larger neural networks. The visualization components are divided into three sub-visualizations depending on the information resolution required. The first visualization provides a simulated oscilloscope for each node in the network, offering very precise data for small scale analysis. The second visualization implements an activation chart for each node in the network which assists in spotting activations trends in the network. The final visualization constructs a self-balancing mesh diagram of the entire network, which can be used at much larger scales to observe the effects of individual activations on the network as a whole. The complete software package implemented in this project succeeds in meeting the designated manipulation and visualization targets of rate-coded neural networks.

LOW DOSE METHYLMERCURY EFFECTS ON REPRODUCTION AND DEVELOPMENT IN BREEDING HOMING PIGEONS (*COLUMBA LIVIA*)

KATHRYN MCGLAMERY

Program: GURA
Mentor: Chris Pritsos
Department: Agriculture, Nutrition and Veterinary Sciences
University of Nevada, Reno

Methylmercury contamination is widespread throughout Nevada and the U.S. due to agricultural, industrial and mining activities. Avian species are often exposed to this contamination via food and water. While considerable work has been conducted on acute lethal toxicity of exposure to methylmercury in avian species little has been done on low-dose non-lethal exposure. Understanding the impact of low-dose methylmercury exposure on the avian populations will aid agencies in the assessment of the biological damage occurring from this contaminant and the formation of Natural Resource Damage Assessments. Homing pigeons (*Columbia livia*) have been established in the Pritsos lab as a surrogate model for migratory birds and were used in these studies. The objective of this project was to determine the impact of low-level exposures to methylmercury on breeding homing pigeons, at levels lower than those that cause behavioral abnormalities in adults, and evaluate reproductive and developmental effects. Three groups of four breeding pairs of homing pigeons were exposed to methylmercury (II) hydroxide via drinking water at levels designed to deliver 0.0mg, 0.1mg or 0.5/kg MeHg/day over three rounds of breeding. Offspring were also exposed to MeHg in their water during the study. Several reproductive parameters were evaluated over the course of the three successive breeding rounds as well as several developmental parameters in the offspring. Fertility and reproductive success was reduced for all three breeding rounds in the exposed groups with controls having near or equal to 100 percent success in both parameters. Results suggest that low-level exposure may result in negative effects on reproduction and chick development.

PHYSIOLOGICAL EFFECTS OF BINAURAL BEATS AND MEDITATIVE MUSICAL STIMULATION

ELIZABETH MCVEY HILL

Program: Faculty sponsored
Mentor: Christina Frederick
Department: Psychology
Sierra Nevada College

The current study examined the physiological effects of meditation music and binaural beats on humans, solo and in combination. A binaural beat is the presence of two separate auditory tones with equal amplitude and slightly differing frequencies (Goodin et al., 2012). Meditation music is used in conjunction with binaural beats to calm individuals (Chan et al., 2008). There is reason to believe binaural beats and meditation music impact human vital signs (Wahbeh et al., 2012). Heart rate, blood pressure, and oxygen saturation were recorded from 60 participants, tested individually, and randomly assigned to one of three listening groups: Beat + Music, Music Only, or Beat Only. Participants heard their selected auditory stimulation through headphones for 6 min. Physiological responses were recorded before and during auditory stimulation. A one-way ANOVA showed a significant difference in mean heart rate between listening groups (p = .046). Due to sample size limitations, a subsequent Tukey test (Abdi & Williams, 2010) could not identify where the significant difference was. The largest difference in averages (at 9.05 bpm) existed between Beat Only and Music Only

groups, therefore, indicating this is where the significant difference was likely located. No significant difference was found between listening groups in blood pressure (systolic: p = .937; diastolic: p = .954) or oxygen saturation (p = .752). It is recommended future studies in this domain incorporate larger sample sizes to ensure statistical sensitivity. The current study suggests listening to binaural beats can act as an aid for calming individuals by reducing heart rate.

TRANSLATING PARIS DADA: UNDERSTANDING THE NONSENSE OF FRENCH ANTI-ART

BROOKE MIKKELSEN

Program: HURA
Mentor: Louis Marvick
Department: French
University of Nevada, Reno

The Dada movement, and art and literature movement started during World War I as a rejection of societal and artistic conventions, is generally left out of American education despite its widespread influence on the art world and the meaning of "Art" itself. The literary side of this ignorance can be partly attributed to the relative lack of translated versions of the Parisian works. Efforts to translate Zurich and Berlin Dada have been largely successful, but works from Paris have been ignored due to the French's belief in Dadaism's lack of merit. To the French and French literature researchers in general, Dada is seen as merely a stepping stone to Surrealism, which is a more popular and better-taught subject born from the former and including many of the same participants and, early on at least, the same philosophies. Though Surrealism evolved to become a physical representation of the unconscious, and is therefore quite different than the Dada that birthed it, French Dada is still generally ignored. In this paper, previously untranslated works by Soupault, Aragon, and Eluard are translated spiritually more than literally, so that English-speaking audiences can understand the importance of Paris Dada and its impact on Art and the world.

DETECTING TOPOLOGICAL DARK MATTER WITH GPS SATELLITES

MAC MURPHY

Program: GURA
Mentor: Andrei Derevianko
Department: Physics
University of Nevada, Reno

Despite solid evidence for the existence of dark matter (~25% of the global energy budget in the Universe), its nature remains a challenge to modern physics. In this work we use the existing GPS constellation as a 50,000km-aperture dark matter sensor array. We focus on dark matter in a form of stable configurations of light fields (topological defects or TDs). Such defects may lead to transient changes of particle masses and coupling constants, thereby affecting atomic clock frequencies and clock phases across the GPS constellation. Based on cosmological models, the most probable speed of TDs in the barycentric reference frame is ~300km/sec. A TD sweep across the array would generate step-like functions in clock phase for a period of ~200s for the GPS constellation. Since GPS carrier phase data is acquired with few-mm precision at 1s intervals, detecting ~1ns signals in the atomic clock phase over a 200 s aperture is achievable. The phase deviations would propagate across the GPS system with a preferred directionality in the celestial frame. Observing such a signature would provide evidence of the existence of TDs with a high confidence level, as there is no known mechanism for background events that would mimic such a signature. We present preliminary results of our analysis.

REDEFINING TRADITIONAL MIXED-STATUS LATINO FAMILIES IN THE UNITED STATES: WOULD IMMIGRATION REFORM SEPARATE OR UNITE FAMILIES?

IVÓN PADILLA-RODRÍGUEZ

Program: GURA
Mentor: Emma Sepúlveda Pulvirenti
Department: UNR Latino Research Center
University of Nevada, Reno

The United States' most recent immigration flux has created a large undocumented, immigrant population that encompasses millions who currently reside in America. Today, of the estimated 12 million undocumented individuals who live in the United States, 8 million are of Latin American descent (Pew Center). The undocumented are constantly faced with legal barriers such as the inability to acquire driving documentation in most states or healthcare. Equally deterring is the fear of reporting crimes because of possible deportation—a risk become reality due to the Secure Communities legislation. The Obama administration's unprecedented 1.5 million deportations have also reinforced a need in the community for immigration reform (U.S. Immigration and Customs Enforcement). Currently, S. 744, the "Border Security, Economic Opportunity, and Immigration Modernization Act," proposes to give lawful status to the U.S. undocumented population, enhance border security, and make various changes to visa allocations. Similarly, H. R. 15, which bears the same name as S. 744, also aims to reform the United States' immigration policies, but with less of an emphasis on border security. These comprehensive immigration reform bills are awaiting action in the U.S. Congress. If either of these bills are ultimately made law, the rights of Latino immigrants will still necessitate future protection and advocacy due to their logistical implementation shortfalls such as weighing enforcement principles against family unity and accurately defining what constitutes a "family," considering the traditional, nuclear family composed of two opposite-sex parents with their own biological children is slowly becoming an anachronism (U.S. Census Bureau).

THE IMPACTS OF INVASIVE CHEATGRASS (*BROMUS TECTORUM*) ON WESTERN FENCE LIZARD (*SCELOPORUS OCCIDENTALIS*) POPULATIONS IN NEVADA

KRISTINA POMERLEAU

Programs: HURA, NSF EPSCoR
Mentor: Chris Feldman
Department: Biology
University of Nevada, Reno

Cheatgrass is an annual grass that originates from Eurasia and has dominated shrub landscapes across North America. It has created monocultural communities in over 60% of Nevada, and is spreading quickly. Areas that were formerly sparse or clear of cheatgrass have become densely blanketed with the invasive. This invasion affects more than just the scenery, but also plant diversity and the local ecosystem function. By outcompeting natives for resources, cheatgrass alters entire plant community composition. Furthermore, cheatgrass is highly flammable, and increases the risk of wildfire. Thus, cheatgrass is recognized in Nevada as one of our most serious environmental issues. Paramount to these concerns is the threat cheatgrass may pose to Nevada's wildlife. Cheatgrass monocultures are endangering Nevada's native lizard populations. Lizard populations are important in desert ecosystems because of their essential role in insect population control. The few studies that have investigated the impacts of cheatgrass on small vertebrates display difficulty moving through dense areas of cheatgrass. Decreased mobility hinders a small animal's ability to escape when predators

attack, decreases their ability to forage for food, and increases energetic costs of movement. Thus, cheatgrass decreases viability in native lizards populations. I examined the Western Fence lizard (*Sceloporus occidentalis*) populations as a model species. This lizard is common in Nevada, and in and around Reno. I predicted that this lizard's abundance and population density will be lower in cheatgrass invaded areas. By observing the impacts that cheatgrass has on the Western Fence lizard, we can gain insight on the influence of cheatgrass on other lizard populations in sagebrush and desert communities. Therefore, this research will not only help lead conservation, but also determine the urgency in Nevada ecosystems.

NEVADA STATE UNDERGRADUATE RESEARCH JOURNAL (NSURJ)

KRISTINA POMERLEAU, ALEX SUNDERLAND

Program: NSURJ
Mentors: Nicky Damania, Sandra Rodriguez
Department: ASUN
University of Nevada, Reno

The mission of the Nevada State Undergraduate Research Journal (NSURJ) shall be to educate, support, and provide a competitive edge for all students in the NSHE system. This shall be accomplished by providing a universally accessible, student run, and highly selective peer reviewed research journal specifically targeted at the undergraduate students of the NSHE system. Additionally, the ASUN shall maintain a mutually beneficial relationship with the University of Nevada, Office of Undergraduate Research, to facilitate research to be published in the journal. This Journal shall be available to all majors representing a wide variety of research in all Nevada schools.

VISION-BASED ROBOT LOCALIZATION FOR SPHERES

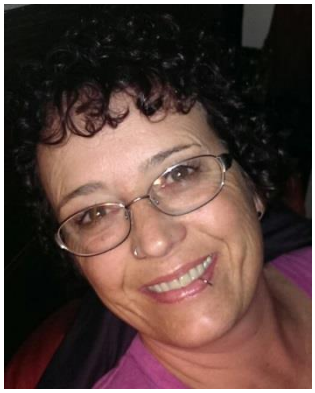
JARED RHIZOR

Program: GURA
Mentor: Monica Nicolescu
Department: Computer Science and Engineering
University of Nevada, Reno

NASA SPHERES are microgravity robots that operate on the International Space Station. The SPHERES are equipped with an Android Nexus S for computation. We present a modular system that finds a map of the environment and uses a 2D camera image from the Nexus S to find the location and orientation of the robot in real-time. The process of finding the location and orientation, or localization, is the first step to allow the SPHERES to assist researchers on the International Space Station.

A modified version of Kinect Fusion is used to generate a map of interest points in the robot's environment. Several interest point detector and descriptor pairs can be selected for use within this system. Interest points are then detected on a 2D Nexus S camera image. These points are matched to the interest points found in the map of the environment. The correspondences between the 2D image and the 3D map are used to estimate the location and orientation of the robot using the Efficient Perspective n-Point (EPnP) camera pose estimation algorithm. This system is tested and evaluated in a real-world environment. The use of a computer and the use of the Nexus S for real-time computation are also compared.

UNDERSTANDING ISLAMIC MARRIAGE IN NEVADA

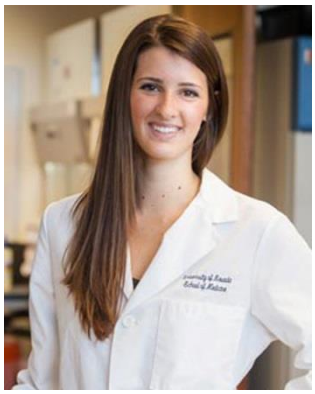


ROSEMARY SEASON

Program: GURA
Mentor: Erin Stiles
Department: Anthropology
University of Nevada, Reno

This project explores the cultural and legal dynamics of Islamic marriage that exist between the Shi'a community and the community of Reno, Nevada, the shari'a and secular experiences of this specific group of people when negotiating a marriage, and the rituals involved in experiencing "law as culture" (Rosen, 1941) through the vehicle of marriage. There is a large body of literature on the relationship of Islamic divorce in the secular and religious courts in the United States, but very little research has been conducted on the subject of Islamic marriage in the United States and no research has been done on this subject in the state of Nevada. This research will therefore be a valuable contribution to the limited amount of literature on Islamic marriage in the United States. Ethnographic fieldwork conducted with the Shi'a community in Reno, Nevada will provide the bulk of the information obtained for this thesis. Anthropological literature on methodologies and theoretical approaches to the study of Islam will be used to understand the importance of studying Islamic marriage within a specific cultural context. Arabic terms will be used to identify specific practices and legal elements that cannot be fully understood by being translated into English. The Arabic terms will be defined in such a way as to give the reader a firm grasp of the complex nature of these terms which will provide a better understanding of the legal and cultural elements that are explored in this thesis.

IMPLEMENTATION OF A LUCIFERIN-LUCIFERASE ACTIVITY ASSAY FOR THE DETECTION OF EXTRACELLULAR NUCLEOSIDE DIPHOSPHATE KINASE FROM BREAST CANCER CELLS



KATIE SPEIRS

Program: GURA
Mentors: Iain Buxton, Senny Wong
Department: Pharmacology
University of Nevada, Reno

Metastasis of primary breast cancer tumors is the main cause of death related to the disease. Growing tumor cells require an adequate blood supply, and have an intrinsic ability to attract new blood vessels in a process called angiogenesis. One factor secreted from breast cancer cells is nucleoside diphosphate kinase (NDPK), which functions to promote cell migration, growth, and tumor-mediated angiogenesis. Understanding the role of NDPK in promoting angiogenesis is important because understanding nucleoside function could lead to the prevention of metastasis development. The assay developed for the detection of NDPK utilizes the enzyme's transphosphorylation activity to generate ATP, which can be detected and quantified through luciferin-luciferase coupling. The assay consists of three reactions. The first involves the addition of purified NDPK to an ADP and UTP substrate mixture, which is allowed to react for a set amount of time to generate ATP. Next, the reaction is quenched with RAK buffer at pH 1 and quenched with pH 13. Finally, a firefly luciferase and luciferin mixture is added mechanically. ATP and luciferin act as substrates to generate a light signal which is quantified. The amount of light produced correlates with the concentration of NDPK present in the sample. This assay could be used to confirm the presence of NDPK and its activity in serum samples of patients with a suspected risk of breast cancer.

A SURVEY OF THE EFFECTS OF DOCOSAHEXAENOIC ACID ON MEMBRANE TRANSPORTERS

ALEX SUNDERLAND

Program: GURA
Mentors: Ron Pardini, Amy Chattin
Department: Biochemistry and Molecular Biology
University of Nevada, Reno

Docosahexaenoic acid (DHA) is an omega-3 fatty acid that has been shown to incorporate into the plasma membrane, decrease intracellular ATP levels, exhibit anti-oxidative and anti-inflammatory effects, increase the efficacy of chemotherapy, and induce apoptosis in cancer cells. Internal data has even shown that it can decrease 2-Deoxy Glucose uptake without a decrease in protein expression. DHA, commonly found in fish or fish oil supplements, offers dietary intervention in the forms of: preventing cancer, increasing chemotherapy treatment, and increasing patient prognosis. While the mechanisms for these benefits are not fully understood, additive and synergistic effects have been achieved via chemotherapy drugs and DHA that increase survival rates and life expectancy amongst cancer patients, ranging from the brain to the colon. It is thought that many of these effects are mediated through membrane transporters such as Glucose Transporter 1 (GLUT 1), Monocarboxylate Transporters (MCTs), and ATP Binding Cassettes (ABCs). GLUT 1 is a ubiquitously expressed glucose transporter that has been implicated in cancer considering most cancers exhibit a preference for glycolysis over oxidative phosphorylation. MCTs are proton symporters that contribute to a cancer's acidic microenvironment often by removing lactate, a byproduct of glycolysis, from the cell. It has been suggested that MCTs may also contribute to chemoresistance and therefore inhibition could lead to chemo-sensitizing effects. Lastly, ABCs are a family of transporters that use ATP to shuttle substrates across the membrane. ABCs are also implicated in cancer and multidrug resistance, as well as responsible for the intake of fatty acids and sterols. Often time transporters are found in lipid rafts which are organized regions of the plasma membrane rich in cholesterol and sphingolipids, insoluble in non-ionic detergents, and can be disrupted by DHA. It is thought that DHA may inhibit these transporters by disrupting the lipid rafts causing the variety of cancer-health benefits. The purpose of this research is to survey glycolytically and mitochondrially active cancer cell lines to determine the possible effects DHA may have on these transporters.

PEACE MEANS EQUALITY: EXAMINING THE EFFECT OF WOMEN'S POLITICAL PARTICIPATION ON STATE MILITARIZATION AND INTERNAL CONFLICT ACROSS AFRICA

CHAI SWADOWSKI-LARSEN

Program: Faculty sponsored
Mentor: Bozena Welborne
Department: Political Science
University of Nevada, Reno

No other region in the world has suffered from more continuous intrastate conflict and civil war than Sub-Saharan Africa. Recent research suggests that increased gender inequality within states results in increased internal conflict (Caprioli, 2005), but surprisingly little research has been conducted to determine whether the inverse is true. Many scholars have reported on the increase of women's political engagement in post-conflict societies (Tripp, 2010), but this project's contribution will be to examine the effect that this has had on the likelihood of emerging internal conflict. I seek to discover what impact, if any, increased gender political equality and participation can have on the propensity of a state to reengage in internal conflict. I do this

using a logistic regression across 29 sub-Saharan African states from 1995 to 2010. These findings are then supplemented by a case-study comparison analysis of the republics of Liberia, Rwanda, and Botswana, which are reflective of this trend.

GLACIER SPECTRAL ANALYSIS: A STUDY OF GLACIER ENERGETICS

KYLE SWANSON

Program: NSF EPSCoR
Mentor: W. Patrick Arnott
Department: Physics
University of Nevada, Reno

Glacier sensitivity to climate trends make them a point of critical interest for international climate monitoring programs. Through collaboration with the American Climber Science Program (ACSP) and the Desert Research Institute (DRI), this research will advance the knowledge of glacier energetics. We are developing and refining methods to analyze the radiative balance at the snow and/or glacier surface. A dual spectrometer system was developed to measure the spectral albedo of the snow surface. At each location, of albedo measurements, the surface layer of snow was collected to analyze in the laboratory. Snow was melted and filtered onto quartz fiber filters. Filters are analyzed for transmission spectroscopy, elemental and black carbon analysis, and general elemental analysis. We will look for relationships between the albedo of the snow and the chemical composition. These relationships will allow scientists to quickly measure snow and glacier albedo to determine the energy budget and to facilitate interpretation of satellite remote sensing. We are evaluating snow progressively farther from the road at Tahoe Meadows as a test site. This newly developed capability will allow groups such as the ACSP to analyze their data for snow collections in the Cordillera Blanca region of South America, and in the Himalayas of Nepal.

LEDS PHASING OUT HPS LIGHTING AS THE FUTURE'S “GREEN” ENERGY FOR INDOOR AGRICULTURAL PRODUCTION

MIGUEL TORRES JR.

Program: NSF EPSCoR
Mentor: Stanley Omaye
Department: Agriculture, Nutrition, Veterinary Science
University of Nevada, Reno

Light emitting diodes (LEDs) are new lighting devices quickly replacing traditional incandescent lights. In fact many states in the United States have phased out incandescent lights for their energy inefficiency. In their place Compact Fluorecscent Light Bulbs (CFLs) have been used as the next interim lighting measure, but they too are less efficient and last less time than LEDs just as incandescent sources. LEDs are solid state lighting devices highly efficient energy-wise, long lasting, and they contain no mercury unlike our current indoor lighting sources. This makes LEDs a more environmentally friendly alternative requiring no special disposal techniques for used bulbs. Additionally LEDs are designed to specifically convert electrical energy to electromagnetic radiation efficiently with less than 10% given off as heat which is much lower than CFLs (75%) and Incandescent (>75%). In recent years increasing studies have suggested that LEDs are the future's green energy alternative to High Pressure Sodium (HPS) lights in indoor agriculture, moreover, they are energy conservative exhausting less energy and downsizing our carbon foot print. This study will focus on quantifying the

energy outputs of both devices, amount of energy used, and the effectiveness as a supplemental light source extending the photoperiod for plants during a naturally shorter photoperiod season.

A MIXED MODEL FOR TRANSITIONAL JUSTICE: LESSONS LEARNED FROM KENYA AND SOUTH AFRICA

NICK TSCHEEKAR

Program: HURA
Mentor: Robert Ostergard
Department: Political Science
University of Nevada, Reno

During the late 1980s and early 1990s a variety of countries in Latin America and Eastern Europe underwent transformations from states of conflict to democracy. The approaches taken by countries during the process has become known today as transitional justice. Transitional justices seeks to provide justice to victims of former oppressive regimes and to also restructure a state's institutions and governance increase the rule of law, build democracy, and allow for sustained peace. Traditional practices of transitional justice have been performed using a top-down approach in which international and national leaders develop the policies and mechanisms for transition, with minimal input received from a country's civil society. This project analyzes the transitional justice processes implemented in response to South Africa's apartheid rule and Kenya's 2007 post-election violence. Through a comparative case study between South Africa and Kenya, it is revealed that a mixed model for transitional justice- in which civil society (non-governmental actors and organizations and a country's citizens) and national and international leaders work congruently to build democratic institutions- is an effective model for developing a sustained peace in transitional societies. With the use of a mixed model approach for transitional justice, societies are able to produce an enduring form of reconciliation and strengthened rule of law to prevent a return to political violence.

A COMPARISON OF THE EFFECT OF 2-DEOXYGLUCOSE AND MITOCHONDRIA TARGETED DRUGS ON METABOLIC STRESS PATHWAYS TO SUPPLEMENTATION WITH DOCOSAHEXANOIC ACID: DOES SYNERGISM EXIST?

ERIKA VICENTE

Program: GURA
Mentor: Ronald Pardini
Department: Biochemistry and Molecular Biology
University of Nevada, Reno

Recent published studies have shown the synergistic effects of glycolytic inhibitors coupled with mitochondria-targeted drugs on cancer cell growth. Inhibition of glycolysis stops the primary energy source that cancer cells use while drugs targeting the mitochondria prevents a reliance on oxidative phosphorylation as a second energy source for cancer cells, resulting in an induction of metabolic stress and a decrease in cellular energy. Findings in our laboratory have established that docosahexaenoic acid (DHA), a long-chain omega-3 polyunsaturated fatty acid, inhibits cancer cell growth in a similar way: induction of metabolic stress through inhibition of glycolysis. The current study will determine whether DHA-induced decreases in ATP are sufficient to induce metabolic stress by observing the metabolic inhibitors, 2-deoxyglugose (2DG) and Mito-CP (a mitochondria targeted drug). 2DG and Mito-CP will be administered at doses causing similar decreased ATP levels as DHA alone. The question of whether or not metabolic stress is induced in this way will be evaluated.

Potential synergism between the three drugs will then be investigated. A dose response to treatment with DHA, 2-DG + Mito-CP, and 2-DG + Mito-CP + DHA on cell viability, AMPK activation (a marker of metabolic stress), and ATP levels will be observed. The findings from this study will demonstrate whether there is potential in using a combination of DHA supplementation and therapeutics targeting the cell's primary energy sources in the treatment of cancer.

DECARBOXYLATION OF GRINDELIC ACID BY KOLBE ELECTROLYSIS TO FORM GRINDELENE, A VALUABLE BIO-FUEL/INTERMEDIATE FOR PHARMACEUTICALS

JONATHAN WHIPPLE

Program: GURA
Mentors: Glenn Miller, Rainer Busch
Department: Natural Resources and Environmental Science
University of Nevada, Reno

Biofuel production on arid lands of Nevada is being examined using a common native plant, *Grindelia squarrosa*, (gumweed). Gumweed is a hardy and versatile plant, indigenous throughout the Great Basin of Nevada and much of the intermountain West. It can be found particularly along the sides of highways where runoff offers increased water for this deep rooted plant. Gumweed has been successfully cultivated in an experimental setting at the University of Nevada, Reno farms. A bio-crude oil was extracted from harvested gumweed to provide 70 – 85 gal/acre on an annualized basis, in amounts comparable to that of soy beans, except gumweed needs substantially less water for production. Extraction of gumweed during the pre-flowering stages provides a group of terpenoid compounds, composed primarily of grindelic acid, a C_{20} hydrocarbon acid. Traditionally, grindelic acid was converted to the decarboxylated hydrocarbon grindelene by producing a methyl ester using a known carcinogen, diazomethane. The methyl ester was reacted with lithium aluminum hydride, a highly flammable, dangerous compound, to produce grindelene. Kolbe electrolysis offers a green chemistry alternative for the production of grindelene. Kolbe electrolysis was used to decarboxylate grindelic acid and react it with a methyl radical (from potassium acetate) to convert grindelic acid into grindelene. Grindelene has potential as a fuel hydrocarbon, but also as a chemical intermediate for production of a variety of other compounds like pharmaceuticals.

SIMULTANEOUS PHOTOCATALYTIC DEGRADATION OF POLLUTANTS AND GENERATION OF CLEAN FUEL

KEENAN WILLIAMS-CONRAD

Program: NSF ESPCoR
Mentor: Ravi Subramanian
Department: Chemical and Materials Engineering
University of Nevada, Reno

The improvement of the photocatalyst pyrochlore-structured bismuth titanate (BTO) to make hydrogen production through photocatalysis a sustainable process is presented. The improvement to this photocatalyst is made by the addition of Co^{2+} ions into the photocatalyst BTO to make a composite. The ions advance BTO's conductivity, by improving the band gap through an impurity band, and induce a red shift upon the catalyst causing a raise in the photocatalyst's responsiveness to visible light from solar energy. The composite Co-BTO has demonstrated that the addition of the Co^{2+} ions has greatly improved the effectiveness of the photocatalyst in generating hydrogen, thus the composite Co-BTO is being used in tests to produce hydrogen,

from a class of water based eco-toxin pollutant degradation. The hydrogen generation will be performed in a slurry reactor under UV-visible illumination. This composite is synthesized by a wet chemical approach and is characterized by scanning electron microscopy, spectroscopy, and XRD analysis. Samples of varying levels of Co^{2+} in the BTO have been synthesized and experimented with so as to find the composition or loading of the Co-BTO composite that shows the most promise in producing the most hydrogen from pollutant degradation.

USING MINDFULNESS-BASED TREATMENTS FOR TRAUMA PATIENTS

RACHEL WILLIMOTT

Program: HURA
Mentor: Holly Hazlett-Stevens
Department: Psychology
University of Nevada, Reno

This thesis will make the argument for using mindfulness-based therapies for individuals suffering from posttraumatic stress disorder (PTSD). PTSD affects 5% of men and 10% of women in the general population and is associated with a host of mental health problems including anxiety, depression, physical pain, substance abuse, social impairment, and a lower quality of life. Avoidance – the attempt to block anything associated with the trauma, including memories, thoughts, emotions, people, and places – is at the core of PTSD. Avoidance is often the root of substance abuse, social withdrawal, and a reduced ability to feel positive feelings. It is also hardest symptom to treat. Mindfulness is a practice used in successful interventions that teaches nonjudgmental awareness and acceptance of the current moment. These treatments have successfully treated individuals with depression, anxiety, chronic pain, and addiction. Therefore, mindfulness can be an excellent tool for those suffering from PTSD. This paper will discuss the characteristics of mindfulness, describe several mindfulness-based therapies, and evaluate the efficacy of these treatments. PTSD will be addressed as well, including symptoms, available treatments, and the weaknesses of those treatments. Finally, the justification of using mindfulness-based therapies for PTSD and the current research investigating mindfulness for PTSD will be discussed.

LOCALIZATION OF AVERSIVE GUSTATORY MEMORY

KURTESHA WORDEN

Program: GURA
Mentors: Alex Keene, Pavel Masek
Department: Biology
University of Nevada, Reno

The mushroom bodies (MBs) of insects are involved in formation of olfactory and visual memories. Kenyon cells, the intrinsic MB neurons, receive a dopamine signal that mediates the reinforcement of aversive memory formation. Approximately 130 dopamine neurons, composed of 20 neuronal cell types are associated with MBs, and specific subpopulations were identified to be involved in different types of memories. We have developed a single fly gustatory learning assay for establishing aversive taste memory in *Drosophila*. Flies respond to appetitive stimulus applied to tarsi with extension of their proboscis. Associating the appetitive stimulus with the application of bitter quinine on their proboscis leads to suppression of the response that persists for greater than 30 minutes. We have previously shown that associative gustatory learning is dependent on MBs. We are currently investigating the MB-associated neurons required for this memory formation. To precisely map the neural circuitry underlying gustatory learning, we have generated 450 split-GAL4 constructs and

have tested 80 selected lines with specific expression in the Kenyon cells, dopaminergic, or output neurons associated with MBs. We silenced individual neural populations during memory formation by blocking synaptic transmission through expression of temperature sensitive *shibire*^{TS1}. We have identified two sub-populations of dopamine neurons, MBs subsets in α, β or γ subsystems, and output neurons involved in aversive taste learning.

SYNTHESIS OF THE TWO-DIMENSIONAL POLYMER, FANTRIP

WILLIAM WULTANGE

Program: NSF EPSCoR
Mentor: Benjamin King
Department: Chemistry
University of Nevada, Reno

In contrast to linear polymers, artificially synthesized two-dimensional polymers are a new frontier in chemistry, as little research has been conducted regarding them. Two-dimensional polymers hold high potential for real life application due to their ability to maintain precisely defined monodisperse pores that are on the nanometer scale. We have successfully synthesized the organic two-dimensional polymer, fantrip, which is a molecule with three partially fluorinated anthraceno blades. The initial step of the process was to synthesize the monomeric molecule, which could then be polymerized. Monomer synthesis was done in a non-linear fashion, synthesizing several compounds separately and then reacting them to produce fantrip. The building blocks first synthesized were hexabromotriptycene and tetrafluoroisoindole. By reacting these two compounds, we are given the fantrip precursor, which resembles fantrip, but contains methylamine bridges on the anthraceno blades. A final oxidation step of the fantrip precursor yields the fantrip monomer. Subsequent irradiation caused a photo-induced polymerization of fantrip monomer units, forming a periodically ordered, unimolecular sheet.

TOUCH SCREEN INTERFACE FOR ROSLYN: A TOUR GUIDE ROBOT

NISHOK YADAV

Program: HURA
Mentor: David Feil-Seifer
Department: Computer Science and Engineering
University of Nevada, Reno

The tour guide robot will be an autonomous system that can provide tours to anybody on the second floor of the Scrugham Engineering and Mines building. The robot will not only be able to navigate the halls, but navigate them in a socially acceptable manner. This means it will not collide with pedestrians while in motion and it will also not leave its user behind. The robot will be navigating the halls autonomously and should require no supervision by a human. In order to interact with the user, there will be a touch-screen display mounted on top of the moving robot base. As the robot moves throughout the hall, information will appear on the screen related to the landmarks being passed (i.e. laboratories and offices). The interface will allow the user to interact with two main modes: map or interactive mode. The user will also be able to select a destination on the screen in order to begin the tour. The goal of the interface is to provide an easy way for any user to participate in a tour of the Computer Science and Engineering department. All available options should be easy to access and portray their functionality with a quick glance.

PERCEPTIONS AND MOTIVATIONS OF CONSCIOUS CONSUMPTION

ANDREW ZOLL

Program: HURA
Mentor: Michelle Roberts
Department: Anthropology
University of Nevada, Reno

In today's industrialized world, efforts in environmental sustainability are at the forefront of many social and political issues. Perhaps the most familiar and accessible avenue toward "green" behavior in the eyes of the average American consumer is through the purchase and consumption of ethical food products. This study seeks to identify the overarching trends in consumer perceptions of "organic", "fair trade", and "local" food (Long, 2010), as well as perceptions of the stores in which they are sold. Further, an understanding of the outside social, cultural, or economic factors that work with or against such perceptions in forming motivation toward sustainable consumer behavior in Reno, Nevada is also a goal. This is accomplished through the administration of surveys to university students and shoppers at a sustainability-focused grocery store, as well as through interviews with key figures in the local sustainability community. An anthropological understanding of the mentalities behind consumers' conscious consumption of food is critical in addressing, both socially and politically, the growing need for sustainable food systems. In doing so, establishing a greater place for concerns about sustainability in the public arena may be accomplished.

NOTES

WHY UNDERGRADUATE RESEARCH?

Develop Skills to Conduct Research:
The job market is continuously evolving and the rate of change is fast because of the rapid development of new technologies. The job market is also highly competitive as employers try to be efficient and do more with less. An adaptable work force gives employers an edge and hence the ability to adapt is a requirement and no longer a luxury. Furthermore, effective communication skills are now essential in nearly all fields of practice. Undergraduate research teaches students the process of developing creative ideas, formulating and executing research and presenting the outcome. The skills learned through undergraduate research enable the college graduate to develop and adapt to new ideas and pursue them in a systematic way. The ability to communicate, both in written and verbal form, enhances the overall effectiveness of the individual and helps to make her/him a success.

Develop and Produce New Knowledge:
One of the major roles of universities is to create and investigate new ideas. Undergraduate students can be an important part of teams that that often involve graduate students and research associates, all operating under the guidance of a faculty mentor. Because of their fresh and unbiased look at new ideas, undergraduate students often strengthen the research team and can positively affect the direction of research.

To Motivate Talented Students and Recruit Them to Graduate School:
Many highly capable students do not pursue graduate degrees, frequently because of a lack of understanding about the possibilities that graduate education offer both during school and following graduation. The perception that graduate education is hard, costly and not rewarding is commonly overcome by becoming involved in research as an undergraduate student. The satisfaction that comes from solving a problem or attempting a creative endeavor that has not previously been attempted can create a new perspective and potentially encourage students to attend graduate school.

Improve a Sense of Community and Group Dynamic:
The exposure of many students to the university setting is often limited to attending classes and occasionally meeting with an advisor. Undergraduate research provides a mechanism for students to interact more closely and frequently with faculty mentors and other researchers on campus. The improved sense of belonging and accomplishment enriches the educational experience of the student and provides opportunities to explore potential career paths.

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