Joe Crowley Student Union, Ballroom Lobby
12:00 – 12:30  Registration and Poster Hanging

Joe Crowley Student Union, Theater
12:45 – 1:00  Welcome and Presentation
Scott Mensing, Professor of Geography and Director, Undergraduate Research
Zachary Brounstein and Candace Peacock Senior Co-Editors, Nevada State
Undergraduate Research Journal

1:00 – 1:15  Key Note Address
Ravi Subramanian, Associate Professor of Chemical Engineering and Undergraduate
Research Mentor of the Year

1:20 – 1:30  Häsler R. Gómez
Art Department, “And The Death Of The Earth Fell Upon My Life”

1:30 – 1:40  Andrew Cooper
Department of Agriculture, Biotechnology & Natural Resources, “The effect of DHA in
combination with 2-deoxyglucose and Metformin on ATP, p4MPK, and mTOR”

1:40 – 1:50  Mariela Cortés-López
Biology Department, “Accumulation of Circular RNAs in the aging mouse brain”

1:50 – 2:00  Amber Lubera
English Department, “The Disambiguation of Devotional Texts: Examining the
Manuscript Collocation of The Abbey of the Holy Ghost and The Charter of the Abbey of
the Holy Ghost”

2:00 – 2:10  Jacqueline Cope
Managerial Sciences Department, “Culture, Sexism, and Legal Remedies: A Three
Country Study of Gender Inequality at the Corporate Level”

2:10 – 2:20  Adam Kirosingh
Department of Mathematics, “Visualization of Topological and Geometric Objects”

2:20 – 2:30  Kyle Kelly & Sarah Fricke
Psychology Department, Sierra Nevada College, “Don’t be a Fool, Save a School:
Humorous Messages Decrease Water Usage”

Joe Crowley Student Union, Ballroom
2:30 – 5:00 pm  Poster Symposium and Reception
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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 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.

Visit our website for upcoming solicitations and more information:
www.unr.edu/ugresearch
Dr. Vaidyanathan (Ravi) Subramanian, 2015 Outstanding Undergraduate Research Faculty Mentor

Ravi Subramanian is currently an associate professor of chemical engineering. He is on the graduate faculty of the Electrical and Biomedical Engineering Department and an adjunct in the Chemistry Department. He is also the solar energy thrust area coordinator in the Renewable Energy Center at the University. His area of research focus is on nanostructured materials for solar energy utilization. He has expertise in the synthesis, characterization and application of photoactive materials in photovoltaics, clean fuel production and environmental remediation. In his 12 years of research he has developed inorganic materials including semiconductor-semiconductor and semiconductor-metal nanocomposites for applications related to solar energy utilization and fuel cells.
The Honors Undergraduate Research Awards (HURA), administered by the Office of Undergraduate 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.

Nevada INBRE, part of the IDeA Network of Biomedical Research Excellence, is a National Institutes of Health program designed to help traditionally underfunded states build biomedical infrastructure. Nevada INBRE also works with NSHE partner institutions to promote biomedical research knowledge and educational opportunities across the state of Nevada via biomedical and science pipeline programs.

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.

The most popular program administered by the Office of Undergraduate Research has been the Nevada Undergraduate Research Awards. 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, scholarship, and creative activity in any discipline are 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.
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."

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.

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

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.

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.
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.
Häsler R. Gómez

Title: “…And The Death Of The Earth Fell Upon My Life.”
Funding Source: Nevada Undergraduate Research Award
Mentor: Tamara Scronce
Department: Art
University of Nevada, Reno

My artwork is born from personal experience and from a longing to understand what it means to be human within a society that fosters disconnect, a disconnect that I believe has alienated us from each other and from ourselves. My artwork aspires to bridge and heal the disconnect by raising meaning through objects, materials, and processes that explore and reference the intellectual and emotional experiences that inhabit our daily lives.

This series of sculptures explores ideas of ritual, the body, pain, and healing as they relate to the artwork and philosophy of Joseph Beuys, the ‘wounded healer’ concept in psychological therapy, and the cultural practice of milagros. The objects presented in this exhibition aspire to embody the trauma of healing through the use of symbolism, allusion, metaphor, image, and language. These objects explore the body not only as a representation of the human form but also as a vessel for psychological states of being. My artwork does not attempt to pose answers, only questions, questions that the viewer is invited to consider. Ultimately, my intention is to create an environment where change can occur, a place where one can contemplate existence, pain and fear, a place where one can find hope and perhaps even heal.

Andrew Cooper

Title: The effect of DHA in combination with 2-deoxyglucose and Metformin on ATP, p4MPK, and mTOR
Funding Source: Nevada Undergraduate Research Award, Nevada INBRE
Mentors: Dr. Ron Pardini and Amy Collins
Department: Agriculture, Biotechnology, and Natural Resources
University of Nevada, Reno

DHA is an omega-3 polyunsaturated fatty acid that has shown to inhibit cancer by decreasing cancer’s energy source, ATP. It has shown to enhance the glycolysis-inhibiting drug, 2deoxyglucose, but antagonizes the effects of the mitochondria-inhibiting drug, Metformin. The current study will look further into the combination treatment of DHA with each drug, and determine whether there is a specific characteristic of a drug that interacts with DHA more favorably to inhibit cancer cell growth. Results will determine an optimal way to alter diet in order enhance the effects of certain drugs when targeting cancer.
Mariela Cortés-López

Title: Accumulation of Circular RNAs in the aging mouse brain
Funding Source: NIH Integrative Neuroscience COBRE
Mentor: Dr. Pedro Miura
Department: Biology
University of Nevada, Reno and Universidad Nacional Autónoma de México

Circular RNAs (circRNAs) are an expanding class of non-coding RNAs most commonly generated by back-splicing of exons from protein coding genes. Their endogenous functions are unknown, but recent evidence suggests they can act as “sponges” for microRNAs. The expression of these molecules have been reported in a variety of species, with a common trend of high enrichment in nervous system tissues. Intriguingly, a subset of circRNAs dramatically increase across the lifespan of D. Melanogaster, suggesting a possible role in aging (Cell Rep.9:1966-80). Here we show that age-dependent accumulation of a number of circRNAs also occurs in different mouse brain regions including cortex and hippocampus. We performed ribo-depleted total RNA-seq to determine the age-induced regulation of circRNAs during normal mouse aging genome-wide. Reads mapped to the junctions of backspliced exons revealed expression of 2378 circRNAs among the cortical samples. Consistent with our previous findings in Drosophila, we determined a global trend of age-dependent circRNA accumulation in the cortex. Nearly 300 circRNAs, normalized to mRNA levels from their host genes, were upregulated >2-fold in cortex of 22 month-old mice compared to 1-month old mice, whereas less than 150 were >2-fold downregulated. Gene Ontology analysis of the upregulated circRNAs revealed strong enrichment in biological process terms such synapse assembly/organization, neurotransmitter levels/secrretion/transport and neuron projection neurodevelopment/morphogenesis. Expression trends were confirmed by qRT-PCR and RNaseR assays. The biological relevance, and mechanism responsible for this accumulation remains to be determined. Ongoing work is investigating whether this accumulation of circRNAs during aging might be detrimental to nervous system function.

Amber Lubera

Title: The Disambiguation of Devotional Texts: Examining the Manuscript Collocation of The Abbey of the Holy Ghost and The Charter of the Abbey of the Holy Ghost
Mentor: Angela Bennett Segler
Department: English
University of Nevada, Reno

Manuscripts, by the broadest definition, are books that were created before the invention of printing. Traditionally the study of manuscripts has been centered on central authors, such as Chaucer and Langland, and their large, dramatic works. However, this approach is neglectful to many of smaller medieval texts. Manuscripts are expensive and extremely time consuming which means no piece of work in a manuscript can be considered superfluous or unimportant. Until recently, the tools did not exist to examine the entire corpus of work, including the smaller, overlooked texts. Recent technological developments have significantly changed the way in which scholars can view data and conduct research. One of the lead innovators in the study of late medieval English Manuscripts is my mentor Professor Angela Bennett Segler. Her research, entitled “Mapping Systems of Manuscripts: Medieval English Vernacular Manuscript Networks” focuses on the relationship of texts to each other within a given manuscript and how the organization and inclusion of texts defines the identity of the manuscript. It also compares the collocation of texts to determine the function of a given text as it is being used in manuscript collections. Following this lead, I have used her methodology to analyze “The Abbey of the Holy Ghost” and its companion “The Charter of the Abbey of the Holy Ghost”.

These texts are small and cannot be analyzed in the same way that textual giants, such as those mentioned above, can be. Rather, these texts must be viewed within the larger context of devotional manuscript contexts. In this research, each manuscript containing either the “Abbey” or the “Charter” has been analyzed for shared texts. Each manuscript has also been compared by date, language, size and percentage of the manuscript that contains the target texts. Using data visualization networks this data has been graphically analyzed to show how the function of the text has changed over time. Comparatively, this analysis has revealed key differences in the function of the “Abbey” versus the “Charter” despite their immense similarity of form. This holistic analysis provides new insight into the use of...
Although women have advanced into many of the same positions as men in the workplace in recent years, only about 5% have managed to earn the title of CEO of Fortune 500 countries since the first woman was appointed CEO of a Fortune 500 company in 1972. Among the reasons for the lack of gender equality in corporate governance are gender discrimination and cultural values. Whether a country is more masculine/feminine, individualistic/collectivistic, or has a low or high power distance according to Hofstede’s cultural framework can be a predictor of the level of gender equality within a country. Organizations, academics, and countries across the world are taking notice of gender equality issues and have presented research that correlates gender diverse boards and leadership with increased company and employee performance. As a result of the attention and research the issue of gender equality in corporate governance has gained, countries like Japan, Norway, and the United States are implementing legislation with varying means of enforcement as a way to remedy the problem of gender inequality in upper level management positions.

Mathematical abstraction is often a hurdle for building an intuitive understanding of topological and geometric shapes. By creating models of mathematical concepts and rendering them with 3D printing technology, the objects are elucidated and the topics are made more approachable for students learning mathematics and other potential recruits into the STEM disciplines. In this study, I explored solids, surfaces, and curves by printing a polygonal wheel with a curved track on which the wheel rolls without the axle moving up and down, trefoil variants, and monkey’s saddle surface. Different mathematical descriptions, such as parametric plots or inequalities, may produce similar shapes, but some mathematical techniques allow the printed model to better display some of the properties it intended to convey. While printing 3D objects presents new design challenges, the resulting manipulative objects are exceptionally valuable tools to make difficult to grasp concepts more accessible.
California and Nevada residents are experiencing one of the worst droughts in history (Diaz & Wahl, 2015). These drought conditions have stimulated many to become more aware of their own environmental impact. DeLorme, Hagen, and Stout (2003) showed environmentally-aware messages in public spaces encourage self-awareness of one’s environmental impact. This increased awareness, however, does not translate into modification of opinions regarding one’s own water usage (DeLorme et al., 2003). Message content is relevant and previous research indicates humorous messages, rather than factual information, most greatly impact behavior because these messages remain in participant memory longest (Skalski, Tamborini, Glazer, & Smith, 2009). The current study examined the impact of message content type (humorous, factual, or control) on water usage. 90 undergraduate participants were selected via convenience sampling and randomly assigned to complete a painting task prior to one of three message exposure conditions. Following safety instructions, an even coat of paint was applied to each participant’s non-dominant hand. Participants, then, decoratively embellished their painted hand for 3 min. On completion of this painting phase, participants washed their hands using a sink outfitted with an Orbit Flow water meter that recorded the volume (in L) of water used. Varied by message type, a water conservation message was relayed using a laminated water droplet shaped sticker located in plain view as participants washed their hands. A one-way ANOVA showed a significant difference (p = .007) in water usage across message content types. A subsequent Tukey test (Tukey, 1949) pinpointed this difference between humor and control conditions. These findings align with previous research indicating humorous messages were remembered longer than factual messages (Skalski, Tamborini, Glazer, & Smith, 2009), thus, potentially impacting behavior more markedly. Results of the current study are relevant for any community with water conservation concerns as application may minimize water usage.
Annica Aguzzi

Title: Evaluating the application of HD-EEG to localize visual processing with high spatial and temporal resolution
Funding Source: Nevada Undergraduate Research Award
Mentor: Gideon P. Caplovitz, PhD
Department: Psychology, Caplovitz Vision Lab
University of Nevada, Reno

The functional architecture of the visual system is topographic: neighboring neurons represent neighboring locations in the visual field. Visual information is represented in the brain across multiple cortical 'maps' of the visual field. Over the past 20 years, functional magnetic resonance imaging (fMRI) has been used to localize specific visual processes to one or more of these visual maps. While fMRI offers the high spatial resolution necessary to perform this function, it lacks the temporal resolution necessary to identify dynamic interactions between these maps. This project identified a plausible alternative approach of non-invasive neuroimaging that offers both high temporal and spatial resolution. We used High Density Electroencephalography (HD-EEG) to perform Dipole Source Localization on brain-wave data elicited by flashing checkerboards, both onset and with reversal pattern. Unlike fMRI, EEG data can be analyzed with high temporal resolution potentially allowing us to identify neural interactions occurring between visual maps. Results show that the targeted regions of interest of the brain are giving the response expected hence opening more doors to the evaluation of activity in regions of interest with High Density Electroencephalography.

Anita Albanese

Title: Evaluating the application of HD-EEG to localize visual processing with high spatial and temporal resolution
Mentors: Dr. Fang Jiang and Dr. Tiziana Vercillo
Department: Psychology
University of Nevada, Reno

Determining the temporal order between actions and sensory events is extremely important for causality judgments. Previous works found that the perception of motor-sensory temporal order can be affected by recent experience. When a fixed delay between a motor event (such a key-press) and a visual stimulus (like a flash) occurs, the brain recalibrates the timing of the two events so that a visual stimulus that is briefly presented after a motor action is perceived as occurring before the motor action. Since recent studies have shown that the temporal processing declines as a function of age, we investigated whether the mechanism of motor-sensory recalibration is compromised in elderly individuals. Seven young and four elderly adults adapted to a 200 ms delay between a motor action (a keypress) and its sensory effect (a flash) and were later tested in a motor-sensory temporal order judgment task. While after adaptation, young adults all experienced changes in the perceived simultaneity between the motor action and the sensory feedback, described by a positive shift of the Point of Subjective Simultaneity (PSS), elderly individuals did not show any sign of motor-sensory recalibration. Average thresholds for elderly participants were 201 ms, much higher than those of young adults that were 70 ms, denoting lower temporal precision. Participants who performed the task with higher precision (i.e. lower thresholds) showed a stronger effect of recalibration suggesting that temporal sensitivity is crucial for motor-sensory recalibration. Elderly individuals also showed longer visual reaction times and a stronger bias in judging motor-sensory simultaneity indicating that ageing might affect the timing of visual and/or motor processing. Results from this study suggest that the poor temporal precision and the decline of the motor-sensory processing induced by ageing compromise the ability to adapt motor-sensory temporal judgment to the recent experience.
Raghavi Anand

Title: Novel Synthesis of Reduced Graphene Oxide and Its Application to Photoelectrochemical Cells
Funding Source: NSF EPSCoR, Nevada Undergraduate Research Award
Mentor: Dr. Ravi Subramanian
Department: Materials and Metallurgical Engineering
University of Nevada, Reno

Graphene, single atomically thick carbon sheets, has generated much interest for its ability to efficiently transport charges in applications ranging from photovoltaic cells, photonics, sensors, and batteries. Presented here is an investigation into alternative techniques for the reduction of graphene oxide to find an environmentally-friendly and cost-effective method to prepare this nano-material. The reduction potential of selected reducing agents was quantified using a Cu(II) solution, and the materials’ performance was evaluated for the enhancement of a photoelectrochemical (PEC) cell. The effects of the traditionally-prepared reduced graphene oxide and alternatively-reduced graphene oxide in promoting the photoactivity of titanium dioxide were studied in the PEC cell. Additionally, using these facile reduction techniques, doping the reduced graphene oxide (rGO) with metallic and semiconductor nanoparticles was performed, and their effects on the performance of the PEC cell was evaluated.

Cuyler Beatty

Title: Weibel Instability in astrophysical plasma clouds due to shock fronts and relativistic electromagnetic particles and how they relate to star formation
Funding Source: McNair
Mentor: Melodi Rodrigue
Department: Physics
University of Nevada, Reno

When an ambient plasma gas cloud is disturbed by a shock front or extremely relativistic electromagnetic particle, the cloud will begin to accelerate rapidly. This rapid acceleration creates instabilities in the plasma which make the nature of such events a widely researched topic. Shock fronts and extremely relativistic electromagnetic particles are predicted to occur in gamma ray bursts. The instabilities of astrophysical plasma clouds (Weibel instabilities, two stream instabilities, and Buneman instabilities) are studied by using code models called 3-D relativistic electromagnetic particle (REMP) codes. These models predict that after the ambient plasma cloud is accelerated, the instabilities create a non-uniform plasma that can start to gather mass around larger clumps of plasma. However, the codes are limited in how much they can look at and how many different things it can take into account. The code used to model the plasma cloud focuses on the Weibel instability and how that evolves in time. Instabilities have not only been observed in astrophysical plasma clouds but also in laboratory plasma experiments. It is believed that these instabilities are the events needed to start star formation in an astrophysical plasma clouds.
Zachary M. Birdsell

Title: Does Priming Influence Stereotype Identification?
Mentor: Christina Frederick
Department: Psychology
Sierra Nevada College

Priming is a process where prior exposure to a word or situation influences a later experience (Gerrig & Zimbardo, 2002). Stereotypes are generalizations about specific groups assumed to have certain characteristics (Lawrence, 2004). The current study explored the effect of priming on positive and negative stereotypes. Positive stereotypes are generalizations in which a group is viewed to have a valued characteristic (i.e., nerds are intelligent). Negative stereotypes are assumptions in which a group is viewed to lack a valued characteristic (i.e., jocks are unintelligent). 90 participants were selected via convenience sampling and randomly assigned to complete positive or neutral priming for five minutes. Positive priming was achieved using a word search associated with positive stereotypes and the alternative was a word search unrelated to stereotypes. Following the priming phase, participants completed a 20-question test about their personal stereotypes. A two-way ANOVA was used to compare stereotype test results across priming and gender. For positive stereotypes, no main effect of priming or gender was observed. There was also no interaction between priming and gender. The same pattern of results was observed for negative stereotypes. Results of the current study show priming does not influence individual responses to stereotypes. It is possible the manner in which individuals respond to positive and negative stereotypes may change with time and social acceptance.

Jayne Boehmler

Title: Investigation of Trans-Pacific Aerosol Pollution from Siberia, Russia wildfires to Reno, Nevada during April, 2015
Mentors: Dr. W. Patrick Arnott and S. Marcela Loria-Salazar
Department: Atmospheric Science
University of Nevada, Reno

In an effort to advance the current knowledge of air pollution transport over international borders to the western U.S., we analyzed data from April 2015 as a case study for long-range transport of wildfire smoke plumes over Reno, Nevada, likely traced back to Siberia, Russia. The presence of smoke from fires diminishes air quality and visibility as well as affects public human health. Thousands of acres burned, generating large quantities of aerosol pollutants that were likely transported aloft across the Pacific Ocean over Reno, NV. Using a combination of satellite and ground-based in situ measurements we tracked the advancement and physical developments of the smoke plume. Trajectory models from NOAA’s HysPLIT and observations from NASA OMI satellite strongly suggest that the smoke plumes were indeed carried aloft from Siberia to Reno. Aerosol optical depth (AOD) measurements from AERONET CIMEL Sun photometer taken in Reno during the month of April revealed aerosols to be present throughout the entire column of the atmosphere during the days following the violent wildfires in Siberia. EPA aerosol monitoring stations in Reno and Sparks, NV revealed that there were increases in PM2.5 concentrations at the surface in Reno. However, the concentrations were not significant enough to indicate that the smoke was affecting public human health; implying that the plumes witnessed over Reno during April did not come with in the boundary layer but rather remained in the free atmosphere. This study demonstrates that under severe fire cases and when certain meteorological conditions have been met, smoke aerosols can degrade the air quality of regions over 8500 km away from the source. Investigations in long-range transport of aerosols will aid in quantifying the implications of aerosols in local radiative forcing, regional haze coverage and air quality in the western U.S.
Kenneth Brooke

Title: Taming the Bear: Applying Game Theory to Improve Diplomatic Relations Between the United States and Russia  
Funding Source: Honors Undergraduate Research Award  
Mentor: Dr. Robert Ostergard  
Department: Political Science  
University of Nevada, Reno

There is a dilemma facing the United States: the unpredictability of Russia’s leaders in decision-making on an international level. However, if we assume that Russia is a rational actor, there are methods of predicting how its leadership will make decisions, and how the United States can influence those decisions. Through the application of game theory, country risk analysis, and further economic modeling methods, this study will provide an identification of Russia’s behavior and reactions to US measures such as sanctions, military intervention, and diplomatic discussions. To identify the nuances of US and Russian foreign policy, this study will explore the actions of both nations in the Crimean Crisis of 2014 and the Syrian Civil War. These results will provide an important conjectural perspective to the US policy making process in dealing with Russia, with the intention of finding a method to improve diplomatic relations between the two powers.

Michelle Chiu

Title: Development of ZnOS Electron Transport Layer for Perovskite Solar Cells  
Mentor: Shubhra Bansal  
Department: Mechanical Engineering  
University of Nevada, Las Vegas

Harvesting the sun’s renewable energy via solar cells can end humanity’s dependence on nonrenewable fossil fuels. With > 120 TW of solar power irradiating the earth, photovoltaics (PV) offers the promise of essentially limitless energy for powering our society, if the cost of the technology can be made competitive with other traditional carbon-based sources. To improve the cost metric ($/kWhr) it is crucial to dramatically reduce solar module fabrication costs, as well as to improve device efficiencies and stability. Perovskite (CH3NH3PbI3) solar cells have shown great potential in recent years in converting the sun’s light into energy. However, stability challenges are impeding their commercialization. One of the stability issues in perovskite solar cells is the titanium oxide (TiO2) electron transport layer, which exhibits electron trap states within the bandgap under UV. Trap defect states are areas where electrons and holes recombine instead of being drawn out of the metal contacts to create electricity. Due to its tunable bandgap and high transmission, ZnOS is a promising candidate for replacing TiO2. ZnOS is currently used in CIGS solar cells at 1GW production levels and does not exhibit the stability issues that TiO2 has. Having a large bandgap is attractive because it lets more light reach the active perovskite layer where electron and hole pairs are created. Chemical bath deposition (CBD) is the method used to deposit ZnS. The method is varied in order to analyze the effects of each deposition variable to get the properties best suited for perovskite materials. Variables that have been tested are the bath temperature and the substrate preheat temperature. Under this project the deposition conditions of ZnS are being optimized to for transmission (>85%), bandgap (>3.2 eV) to enable high efficiency and stable perovskite solar cells.
Kendra Clark

Title: The Gendered Recluse: Examining the Implications of Changes in Readership in the The Guide for Anchorites
Mentor: Angela Bennett-Segler
Department: English
University of Nevada, Reno

Medieval manuscripts are hand-inscribed books written between the 5th and 15th centuries. These texts, mostly religious in nature, provide valuable insights into the past, giving scholars concrete artifacts to better understand medieval values and cultures. In her research titled “Mapping Systems of Manuscripts: Medieval English Vernacular Manuscript Networks,” Asst. Prof. Angela Bennett egler has sought a solution to the issue of smaller medieval texts being overlooked in favor of the study of more well-known canonical texts such as Chaucer’s The Canterbury Tales, through focusing on the relationships that medieval texts have with one another within a given manuscript.

Within the context of research, I have focused on the text of the Ancrene Wisse, or the medieval guide for anchoresses. This text is known primarily within the academic community as a companion to the Katherine Group of manuscripts, but is studied by relatively few scholars. However, though the Ancrene Wisse as a text has considerable implications for how medieval values suggested internal and external isolation for women, this text is often overshadowed due to traditional tendencies for academia to focus primarily on canonical medieval texts. In my research, then, I have analyzed the various iterations of Ancrene Wisse within several manuscripts, examining the dates, locations, and contents of each manuscript. In realizing that, though the Ancrene Wisse was originally written for women, its readership changes to include or exclusively be written for men, I was able to use Dr. Bennett Segler’s method of research to contextualize this change in readership and better understand Medieval gendered prescriptions for isolation.

Ashlyn Conlin

Funding Source: Nevada Undergraduate Research Award
Mentor: Dr. Chris Jeffrey
Department: Chemistry
University of Nevada, Reno

Trenbolone acetate, an anabolic steroid widely used in beef cattle to promote growth, has been identified as a high-risk environmental contaminant as it is found to regenerate in the dark. Dienogest, a potent oral contraceptive, is structurally and synthetically similar to trenbolone acetate and can also undergo photo-transformation that results in compelling photoproducts, followed by its reversion to the parent compound in the dark. Therefore, this research is focused on the investigation and isolation of these dienogest photo-transformation products utilizing photochemistry and chromatography. An ultra violet photoreactor of 300nm was utilized to mimic the effects of sunlight during the visualization of photo-transformation.

Nuclear magnetic resonance was employed in determining photoproducts after isolation from simple chromatography techniques. Dienogest and its photoproducts both serve as significant endocrine disruptors within our aquatic systems, therefore this research is necessary in order to understand these effects.
Lily Cooper

Title: Art as a Medium of Expression
Funding Source: Honors Undergraduate Research Award
Mentor: Megan Berner
Department: Art
University of Nevada, Reno

The medium of art in the form of painting, poetry and videography is brought together to communicate intimate, but universal emotions of the human experience: loss, depression, isolation, grief and toil. The purpose of art as a medium for an emotional outlet and personal expression is to inform art critics interested in how an artist's personal experiences are portrayed in her paintings and in analyzing an artist's work through knowledge of the artist's background. Art is a means of tacit communication of the universal human experience (Määttänen, 2012). This thesis will inform those who view my own artwork about the influences reflected in my artwork. This thesis is a personal exploration of my artistic evolution and how my past experiences have shaped my artwork. This thesis will examine artistic expression through literature review and in-depth analysis of original works of Frida Kahlo and myself.

This thesis explores my inner evolution of artistic expression through my fine art and videography to overcome my lifetime experiences of ethnic identity and physical barriers. Similar to Frida Kahlo's art, my art is driven by my personal experiences I use as a means to perceive and conceptualize the world. I use my experiences of infant abandonment, cultural disassociation, multi-racial stigmatization, social isolation, depression and self-contempt to create and direct my artistic path. This thesis analyzes my own artistic evolution and how my art parallels my life events through extensive constructive criticism of my paintings and videos. My art will be exhibited in the spring 2016, the exhibit will compare my art with that of Frida Kahlo's, whose life experiences of physical pain, biracial identity and adulterous relationships heavily influenced her artwork.

Briana Crespo

Title: Effect of Delivery Modality on Comprehension
Mentor: Christina Frederick
Department: Psychology
Sierra Nevada College

The current study examined the effect of communication modalities on comprehension. Undergraduate students have options for the modality in which their course content is delivered and educational institutions should strive to provide content in the most effective way possible. Students select content delivery modalities based on accessibility and preference (Whitten, Davis, Ford, Speicher, & Collins, 1998). Helms (2014) studied face-to-face vs. online course delivery over the course of a semester and showed those in the face-to-face modality group earned higher grades than those in the online modality group. Whitten et al. (1998) studied the use of face-to-face interaction vs. interactive videos to educate their participants and a self-report survey showed no difference in satisfaction between delivery modalities. While student performance does appear to be compromised (Helms, 2014) across delivery modalities, student satisfaction does not appear to suffer (Whitten et al., 1998) the same consequence. Given compromised student performance among delivery modalities, the current study compared student performance under the most readily available forms of undergraduate education. Three communication modalities (face-to-face, video, and written) and their impact on comprehension were studied. Each delivery modality group was presented with the same content for 5 min. Following content delivery, participants completed a 10-item multiple-choice content test. The Kruskal-Wallis (Kruskal & Wallis, 1952), the non-parametric alternative to the one-way ANOVA, indicated no difference ($p = .372$) in comprehension across face-to-face, video recorded, and written delivery modalities. Results of the current study do not align with those of Helms (2014). It is recommended further research pair specific delivery modalities with specific content types to determine if inconsistencies in content have contributed to conflicting results across studies. It may be the case that specific content may more effectively produce comprehension when communicated via a particular determined delivery modality.
Cassidy D’Amour

Title: Student Veteran Programs in The United States: Literature Review and Survey Findings  
Funding Source: Honors Undergraduate Research Award  
Mentor: Dr. Victoria Follette  
Department: Psychology  
University of Nevada, Reno

There is an increase in military veterans in the United States who are attending colleges and universities, especially as servicemen and women are returning from recent military actions in Afghanistan and Iraq. Military veterans transitioning back into civilian life and postsecondary education face unique challenges and thus have unique needs. Different campuses offer a variety of Veteran Administration and other student veteran-centered programs. This thesis examines the empirically supported college and university programs for veterans, what psychological and physical challenges student veterans may face, what the components of the best student veteran programs are, and what the needs are for additional program evaluation. Review of the current literature and gathered information on ten of America’s Top Military-Friendly colleges according to BestColleges.com show that student veteran-specific financial, psychological, and career-related assistance programs are necessary to help veterans transition into postsecondary education.

L. Shay Daylami

Title: Frequency Effects on Consonant Gemination in English  
Funding Source: Honors Undergraduate Research Award  
Mentor: Ian Clayton  
Department: English  
University of Nevada, Reno

English consonant geminates are the lengthened or “doubled” sounds that occur typically between a prefix and a root, such as the [n] sound in the word unknown. This research was based on an extensive review of the literature on English consonant gemination and frequency effects, which led to a pilot experiment I ran to test the possibility of a frequency effect on English consonant gemination.

The existing literature on gemination is fairly sparse—there are two main papers that discuss it. The first, Kaye (2005),* suggests that consonant gemination is unpredictable and that different speakers do it to different degrees. His arguments were largely introspective, but he presented empirical evidence that shows a high degree of variation in the duration of geminated consonant length. The second, Oh & Redford (2012),** investigates the differences in duration between geminates occurring at word-boundaries and with prefixes (e.g. “dim morning” versus “innumerable”). Their findings indicate more predictability, but the factors that affect consonant length are still not clear.

Segment length in English is non-contrastive, meaning that changing the length of a sound within a word will not change the word’s denotation. Segment length does vary in English, but this variation is typically predictable. This research addresses the possibility of an effect of word frequency on consonant length.

Andrew Delloro

Title: Is visual attention allocated differently to real-world manipulable objects vs. pictures?
Funding Source: Nevada Undergraduate Research Award
Mentors: Jacqueline C. Snow and Rafal M. Skiba
Department: Psychology
University of Nevada, Reno

Healthy observers typically show a mild asymmetry in visuospatial attention in which they favor the left side of space—a phenomenon known as ‘pseudoneglect’. Although this effect is observed frequently, predominantly in the context of manual line-bisection tasks, the mechanisms that underlie leftward pseudoneglect are currently not well understood. Here, we used a modified version of the Posner cueing task to examine whether the allocation of visuospatial attention differs for real objects (that afford grasping and interaction) versus two-dimensional images of objects (that have an ambiguous size and distance and to not afford grasping). The stimuli were everyday tools, and vegetables. The image stimuli were matched closely to the real objects for size, illumination, apparent distance, and background. All stimuli were presented within reach. We found that RTs and accuracy to detect briefly-appearing targets were better when the targets were positioned on the left side of the real objects. The same lateralized attention bias was not observed in the image displays. In a follow-up experiment, we tested participants on the same task, but increased viewing distance so that the stimuli were out of reach. Under these conditions, the leftward attentional bias for the real objects disappeared. Our results indicate that pseudoneglect depends critically on whether or not the stimulus is a tangible object, and whether it is within reach. These data suggest that pseudoneglect may reflect capacity limits on attention driven by our ability to interact with object with a limited number of effectors.

Henry Paul Denny

Title: Mitochondrial Structure in Fission/Fusion Knockout Models at the Calyx of Held
Funding Source: Nevada INBRE
Mentor: Dr. Robert Renden
Department: Cell Biology and Physiology
University of Nevada, Reno

Mitochondrial fission and fusion events are essential for cellular homeostasis, allowing for DNA quality control under oxidative stress. There is strong evidence to suggest that reduction or loss of mitochondrial quality control contributes to a wide range of neurological disorders, from Charcot-Marie-Tooth disease to some Parkinsonian disorders. However, the role of mitochondria at the presynaptic terminal is still poorly defined. Because loss of ubiquitous mitochondrial regulatory proteins leads to early lethality, we selectively knocked down the mitochondrial fission protein Dynamin Related Protein 1 (DRP1) and fusion protein Mitofusin 2 (Mfn2) in vivo at the presynaptic terminal of a giant excitatory synapse in the auditory system, the calyx of Held. This models the presynaptic effect of mitochondria-related neurological disorders with high temporal and spatial resolution. Electrophysiological results from our lab support an association between mitochondrial homeostatic failure and detrimental alterations in synaptic physiology, including significant alterations to size and frequency of individual events and ability to reliably sustain neurotransmission. In this project, we used confocal microscopy to reconstruct the presynaptic terminal and show the effects of DRP1 or Mfn2 presynaptic knock-out on mitochondrial structure and distribution within the calyx. Comparisons between infected and non-infected cells reveal a 25% DRP1 knockdown in infected terminals. Preliminary data suggests these DRP1 KO presynapses contain fewer, enlarged mitochondria. Although synaptic vesicle clustering is unaffected, proper localization and function of mitochondria may be negatively affected. We will carry out the same protocols in to knock-out Mfn2 in presynapses and measure relative protein knockdown and alterations to mitochondria structure and distribution. We are expecting similar rates of protein elimination in Mfn2 animals, but increased fragmentation of mitochondria within infected calyces. This data will give insight to the pathogenesis of mitochondrial-related neurological disorders, at a time when mental health is one of the greatest burdens on Western healthcare.
Paige dePolo

Title: Three-Dimensional Visualization of the Berlin-Ichthyosaur State Park fossil beds using terrestrial LiDAR
Funding Source: Nevada Undergraduate Research Award
Mentor: Dr. Paula Noble
Department: Geological Sciences and Engineering
University of Nevada, Reno

Terrestrial LiDAR (Light Detection and Ranging) is a nondestructive technique that uses the reflection of laser impulses off surfaces to create point clouds. Although terrestrial LiDAR has been applied extensively in the fields of neotectonics and mine surveying, its application to the study of in situ vertebrate fossils has not been well evaluated. A Maptek 8800 LiDAR unit was used to collect georeferenced three-dimensional data on a large in situ death assemblage of the enormous Late Triassic ichthyosaur, Shonisaurus popularis Camp. The fossil beds are protected by a permanent shelter, the “fossil house,” at Berlin-Ichthyosaur State Park in Nye County, Nevada. The beds are approximately 25 x 15 meters and expose at least nine partially articulated adult specimens. The scans are composed of point data in the form of Cartesian coordinates with associated color intensities. Seven high-resolution (1mm point spacing) scans captured the beds from multiple angles. Additional stations captured the building interior, exterior, and additional site features at lower resolution. The millimeter scale resolution of the S. popularis remains demonstrated by the LiDAR point cloud is suitable for analysis of gross bone structures and represents a viable and efficient means of digitally capturing in situ fossil sites, particularly for large bodied organisms. LiDAR imaging allows for the accurate measurement of the spatial relationships between skeletal elements. LiDAR datasets also provide an important baseline for conserving in situ fossil exhibits and evaluating disturbance or deterioration of exposed fossils and their protection measures. Recent and future improvements in LiDAR technology (e.g. increased resolution) will establish this underutilized tool as an important resource for field study of vertebrate fossils. Integration with other digitization techniques (e.g. structured-light scanning, photogrammetry) remains a technically challenging but important goal in creating rich three-dimensional datasets from large in situ fossil assemblages.

Molly G. Doyen

Title: Identifying Cellular Functions for Phosphatidic Acid During Pollen Tube Tip Growth and Fertilization
Funding Source: NSF EPSCoR
Mentor: Jeff Harper
Department: Biochemistry
University of Nevada, Reno

Phosphatidic Acid (PA) is a signaling lipid that can function to recruit cytosolic proteins to specific membrane locations. In pollen, changes in PA have been proposed to be important for coordinating dynamic processes involved in pollen tube tip growth and fertilization. To test PA signaling in the plasma membrane, a construct over-expressing a recombinant Phosphatidic Acid Binding Domain (PABD) with a targeting motif that localizes the PABD to the plasma membrane was developed. This protein is referred to as a PABD-disruptor, because it was designed to bind PA at the plasma membrane and thereby disrupt the ability of PA to function as a signaling molecule to recruit other proteins to this location. Transgenic plants were generated with this construct that expressed a PABD-disruptor with a YFP (Yellow Fluorescence Protein). Using confocal microscopy, we showed that our PABD disruptor preferentially localized to the plasma membrane in pollen tubes. To test for a PABD-dependent disruption of pollen fertility, reciprocal crosses were done with hemizygous plants in which half the pollen harbored a PABD-disruptor, and the other half were wild-type. The transmission efficiency of the mutants were measured by scoring F1 progeny for the successful transmission of a hygromycin selection marker which was linked to the PABD transgene. Strong to moderate negative distortion was found in a majority of the transgenic lines tested, suggesting that PABD-pollen were less competitive than wild type. To identify the cellular functions affected by the PABD, we germinated pollen grains on an agar surface and used fluorescence microscopy to observe pollen grain germination and tube growth. Delayed or no germination was observed in PABD pollen in comparison to WT. These results are consistent with the PABD-dependent attenuation of pollen fertility in pollen outcrosses, and support a model in which PA signaling at the plasma membrane is critical to pollen grain germination.
Nathan Escorial

Title: Characterization of Smooth Muscle Myosin Light Chain Kinase’s Actin Binding Domain through Maltose Binding Fusion-Protein Crystallization
Funding Source: Nevada INBRE, Nevada Undergraduate Research Award
Mentor: Dr. Patricia Ellison
Department: Biochemistry and Molecular Biology
University of Nevada, Reno

This research focuses on Myosin Light Chain Kinase (MLCK) and its involvement in the phosphorylation of Smooth Muscle Myosin (SMM) which initiates smooth muscle contraction. Increased expression of MLCK contributes to diseases such as asthma and hypertension which are characterized by abnormal smooth muscle contraction. We are focusing on the first 75 residues of the N-terminus of MLCK, termed N1-75, which is the actin binding domain (ABD). This domain is necessary and sufficient for MLCK binding to thin filament actin, allowing MLCK to stay in close proximity to myosin in order for phosphorylation of myosin to occur rapidly. Without this critical binding domain, MLCK is unable to localize near myosin and other myofilaments and cannot initiate muscle contraction. Currently, there are no published crystal structures of the full length kinase due its inherent flexibility and large size. In order to promote feasibility of crystallization, our goal is to construct a maltose binding fusion protein which is hypothesized to help mitigate crystallization to allow us to obtain a high resolution 3-D structure of the N-terminal domain providing great insight into MLCK’s regulation and activity. In order to generate the recombinant fusion protein, N1-75 DNA will be inserted into a plasmid containing the maltose binding protein for cloning, expression, purification and then hopefully crystallization.

Richard Evangelista

Title: Does pH effect the survival of cancer cells differently from healthy cells? An Experimental analysis
Mentors: Brielle Bjorke, Any Rost, Suzanne Gollery
Department: Biology
University of Nevada, Reno and Sierra Nevada College

Cancer cells and non-cancerous cells primarily use two different metabolic pathways. Cancer cells utilize glycolysis, even in the presence of oxygen, producing a surplus of lactic acid and H+ outside of the cell. In contrast, non-cancerous cells utilize oxidative phosphorylation which does not alter extracellular H+ concentration. Previous work demonstrates that cancer cells are able to thrive in a pH around 6.0, while non-cancerous cells function optimally at the physiological pH of 7.4. Due to a difference in extracellular pH, we hypothesize cancer cells and non-cancerous cells will have different thresholds for stress-induced apoptosis. The aim of this study was to test the sensitivity of Hela (cancer) and COS (control) cells to low and high pH, and determine when each cell type reaches their apoptosis threshold. To determine how Hela and COS cells respond to changes in extracellular pH, cells will be placed in three different pH environments: 9, 7.4, and 4.0, and rates of apoptosis will be measured at four different time points: 30 minutes, one hour, two hours, and four hours. Rates will be analyzed using statistical analysis of the ratios of live to dead cells counted for each sample. We predict that there will be an exponential rate of cell death in cancer cells due to an initial rapid proliferation with elevated levels of glycolysis, while non-cancerous cells will display a more gradual rate of cell death. We expect the largest difference will be at the longest time point. Further research may lead treatments that manipulate pH to treat cancer.
Title: Serological Survey of Vector-Borne Diseases in the Northern Nevada Coyote (Canis latrans) Population
Funding Source: Honors Undergraduate Research Award
Mentor: Dr. Mike Teglas
Department: Agriculture, Nutrition, and Veterinary Sciences
University of Nevada, Reno

Coyotes (Canis latrans) serve as a reservoir population for many vector-borne diseases which can spread to the domestic animal population. Coyotes have been documented as being infected with the parasitic worm Dirofilaria immitis, and the bacterial pathogens Borrelia burgdorferi, Ehrlichia canis, Anaplasma platys, and Anaplasma phagocytophilum, which have been identified as causing disease in both domestic canines and in some cases, humans. There have been studies conducted on the prevalence of these organisms in both domestic canine and coyote populations, but none of the studies tested the Nevada coyote population. The wild coyote population acting as an unquantified reservoir population can mean the risk of these disease-causing organisms spreading throughout domestic animal and human population is underestimated. Here we show that the coyotes in Northern Nevada are infected with Dirofilaria immitis, which indicates that they are a reservoir for the parasite in Northern Nevada. Using the IDEXX SNAP 4Dx test and the DiroChek microwell assay test we tested blood samples collected from coyote carcasses collected in Northern Nevada coyotes to discover the presence of the parasite or bacterial pathogens. In 30 coyote blood samples tested, 6 were found to have a positive result on the DiroChek microwell assay test for Dirofilaria immitis, 2 were found to have a positive result on the IDEXX SNAP 4Dx test for Dirofilaria immitis, and none of the samples tested positive for Borrelia burgdorferi, Ehrlichia canis, Anaplasma platys, or Anaplasma phagocytophilum. The 2 positives on the IDEXX test were also positive on the DiroChek test. Our results can be used to create more accurate risk assessments of the spread of Dirofilaria immitis to domestic canines, and as justification for further studies of the prevalence of disease-causing organisms in Nevada coyote populations.

Title: Synthesis and Photochemical Study of o-bromobenzene(trifluoromethyl)carbene
Funding Source: Nevada Undergraduate Research Award
Mentor: Dr. Robert S. Sheridan
Department: Chemistry
University of Nevada, Reno

Trifluoromethyl aryl carbenes have found many applications in research and industry, such as in photoaffinity labeling or in graphitic and carbon nanotube surfaces. However, the photochemical properties of these carbenes are not fully understood. In this project, a novel o-substituted trifluoromethyl carbene, o-bromobenzene(trifluoromethyl)carbene was synthesized. A multi-step synthesis was used to obtain the diazirine precursor to the carbene, which was isolated in a cryogenic nitrogen matrix and then irradiated to photochemically generate the carbene in the matrix. The carbene was then characterized using IR and UV/Vis spectroscopy, and irradiated further in order to observe its photochemical behavior. The study is ongoing, and we are particularly interested in observing an expected intra-molecular rearrangement yielding a bromonium intermediate, which could occur through heavy-atom quantum mechanical tunneling.
Vicente Gapuz

Title: The Annotation and Expression Profiling of circRNA in the Aging Honeybee
Funding Source: Nevada INBRE, NSF EPSCOR, Nevada Undergraduate Research Award
Mentor: Pedro Miura
Department: Biology
University of Nevada, Reno

Apis mellifera, more commonly known as honeybees, are arising as a model organism for aging research due to their flexible yet strict lifespans that are interlinked with their specific roles in the hive. These changes in lifespan that are not due to genetic alterations likely involve regulation of gene expression. Circular RNAs (circRNAs) have recently been found in many organisms from archaea to humans. Recent studies have shown that the accumulation of circRNAs is age-dependent (Westholm et al, 2014). Although circRNAs have been annotated in Drosophila melanogaster, Caenorhabditis elegans, mice, and humans, they have not yet been studied in A. mellifera. Here, we searched for genes in A. mellifera that express circRNAs and tested whether accumulation of circRNAs is age-dependent as previously observed in D. melanogaster. We searched for protein homology between circularized exons in D. melanogaster and orthologous genes in the A. mellifera genome. Using bioinformatics approaches, we designed oligonucleotide primers to detect putative circRNAs in the heads of A. mellifera by RT-PCR. Several circRNAs were confirmed through analysis of published RNA-seq data and by sequencing of circularized PCR products, including circRNAs from foxo and muscleblind genes. Accumulation of these circRNAs in the heads of newly emerged bees and foragers were measured by qRT-PCR. Total RNA-seq libraries have been prepared for brain and hypopharyngeal gland tissues of newly emerged bees and foragers. In future studies, we will profile circRNAs in brain regions of bees from different life stages at genome-wide using total RNA-seq.

Alexes Garrett

Title: Determining Halophyte Growth in Saline Environments
Funding Source: Nevada Undergraduate Research Award
Mentors: Bob Nowak and Laurel Saito
Department: Natural Resources and Environmental Science
University of Nevada, Reno

Salinization of soil and water resources can occur as a result of agricultural irrigation, especially in arid and semi-arid environments. Water pumped from aquifers may contain salts that remain in the soil after water evaporates and can accumulate over time. High concentrations of salts in soils or water can inhibit the production of conventional commercial crops. A reduction in harvestable commercial crops can have a detrimental effect on the agricultural workers who depend on the economic value those crops. The utilization of highly salt-tolerant plants, known as halophytes, in saline soils has the potential to provide economic value from salt-affected lands while also reducing the soil salinity. In addition, many halophytes can be harvested for direct human consumption, or as forage for livestock production. However, the salinity thresholds that different halophytic plants can withstand while producing an economically beneficial yield are relatively unknown. With this project we are examining the capacity of Rainbow Quinoa and AC Saltlander green wheatgrass to grow under different salt stresses within a controlled greenhouse environment. Plants were potted in five different concentrations of saline soils: 2, 4, 6, 8 and 12 dS/m. Plants were then irrigated with different salinities: 1, 2, 4 and 6 dS/m. Halophyte growth characteristics such as plant height and leaf area were tracked from each set of treatments as a function of time. This presentation will describe the relationship between plant growth and soil salinity as well as plant growth and irrigation salinity based on measured data from the experiment. The data from this experiment will be used in a larger project that is modeling management and harvest options of different halophytic species.
Heather Gilmore

Title: Examination of Neighborhood Level Crime Hot Spots  
Funding Source: McNair  
Mentor: Dr. Emmanuel Barthe  
Department: Criminal Justice  
University of Nevada, Reno

Crime hot spots have been central to the study of crime and place. Hot spot studies examine if there are specific areas that may be more problematic for law enforcement and where these might be. These studies often show that hot spots correlate with heavily populated areas. Focusing on areas with an increased crime level, or certain types of crimes, allows for more effective law enforcement. The purpose of this study is to not only look at areas with a higher frequency of crimes, but to establish a ratio per population. For this study, service calls and population were analyzed for the city of Reno, Nevada. This was done by taking calls for service and mapping them according to crime type and by census tract. (From there, differences in the population based maps and the non-population based maps were seen.) The top three census tracts for each crime type were then made into a density map, revealing a neighborhood-level distribution of crime. Satellite images of the problem areas were then used to show what specific structures might be the cause of the calls. From there, a better approach can be used for the relevant crime problem.

Rebecca Gonzales-Clayton

Title: Monazite growth from the Eocene to the Miocene: new interpretations of the metamorphic history of Greater Himalayan rocks in the eastern Himalaya  
Mentor: Dr. Stacia Gordon  
Department: Geology  
University of Nevada, Reno

Across the Himalaya, mid- to lower-crustal Greater-Himalayan (GH) rocks have been exhumed during active continent-continent collision. In Bhutan, GH rocks are divided into upper and lower levels by an intra-GH shear zone, the Kakthang thrust (KT). To decipher the metamorphic, melt-crystallization and exhumation history of the GH rocks exposed above and below the KT, monazite from metapelites and migmatites was dated and trace elements analyzed by laser-ablation, split-stream ICPMS. The trace elements from monazite were used to establish near-peak conditions versus undergoing initial exhumation and garnet breakdown. Samples from N–S transects that cross the KT in central and eastern Bhutan were collected. The eastern transect reveals a progressive younging in the timing of near-peak metamorphism moving structurally lower within the GH, with dates of ca. 23–20 Ma for the structurally-highest sample versus ca. 18–16 Ma in the structurally-lowest sample. The eastern Bhutan metapelites further reveal the youngest monazite ages of 13–15 Ma have a higher HREE abundance, suggesting garnet breakdown during growth. The migmatites yield ca. 14–16 Ma melt-crystallization ages, consistent with the GH having undergone cooling and initial exhumation to cause garnet breakdown by ca. 15 Ma. In comparison, the central Bhutan transect reveals older near-peak metamorphic ages, with garnet-stable monazite populations at ca. 48–46 Ma within the KT zone and ca. 38–30 Ma for rocks in the middle of the upper-GH and ca. 25–22 Ma for the structurally-highest sample. Youngest monazites from central Bhutan yield growth or recrystallization at garnet-unstable conditions range from ca. 17–26 Ma. Results suggest earlier metamorphism and exhumation of GH rocks in central Bhutan compared to the east and west. Thus, significant along-strike differences in the burial and exhumation history need to be considered when evaluating models for the tectonic evolution of the GH as a whole.
Invasive fungal disease (IFD) is a major cause of morbidity and mortality for patients in hospital settings throughout the world. Many different fungal species are responsible for IFD, including Candida, Aspergillus, Fusarium, Rhizopus, and Mucor. While IFD symptomatology is often indistinguishable from bacterial infection, the courses of treatment are very different, requiring a confirmed diagnosis to enable administration of appropriate therapeutics. Early treatment of IFD is crucial to patient outcome, but current diagnostic methods such as culture may have poor sensitivity and have a lengthy time-to-result. The need for a more rapid and reliable IFD diagnostic prompted extensive work in our laboratory to develop an antibody that can be used to construct an immunoassay for the detection of fungal infection. One antibody showed great promise: a pan-fungal monoclonal antibody (mAb), 2DA6. The goal of this study was to use mAb 2DA6 to develop and optimize a lateral flow immunoassay (LFI) and assess the LFI sensitivity to relevant fungal species for potential use as rapid IFD diagnostic.

Meditation has a variety of well-known physical and psychological health benefits (Barbor, 2001). The relationship between meditation and interoception has been investigated, but more research is necessary. Craig (2003) defines interoception as internal feelings and signals such as hunger, thirst, and vasomotor activity that represent a sense of the physiological condition of the entire body. In humans, body signals play a role in emotional states and can affect mood states, both positively (Seth, 2013) and negatively (Paulus & Stein, 2006). Previous research on meditation and interoception (Bornemann, Herbert, Mehling, & Singer, 2015) employed the Multidimensional Assessment of Interoceptive Awareness (MAIA; Mehling, Price, Daubenmier, Acree, Bartmess, & Stewart, 2012) to measure 8 aspects of interoceptive awareness (Noticing, Not-Distracting, Not Worrying, Attention Regulation, Emotional Awareness, Self-Regulation, Body Listening, and Trusting). After a 3-month period of contemplative training using meditative practices (e.g., breath meditation), results showed significant improvement in 5 of 8 aspects of interoceptive awareness. Other previous research shows that even practices like coloring can have a meditative effect (Curry & Kasser, 2005). The present study investigated the short-term effects of various meditative practices (coloring a mandala, audio-guided meditation, and video-instructed yoga) on interoceptive awareness. 90 participants, tested in small groups, were randomly assigned to complete one of three meditative activities for 10 minutes. Immediately following the meditative activity, participants completed the MAIA (Mehling et al., 2012). The Kruskal-Wallis (Kruskal & Wallis, 1952; $\alpha = .01$) was used to analyze scores for each of the 8 scales of the MAIA. Results showed no significant differences between conditions on any of the 8 scales. There was, however, a notable difference ($p = .05$) between conditions on the Noticing scale, which assesses the awareness of comfortable, uncomfortable, and neutral body sensations. The implications of this potential difference and future research directions will be discussed.
Nicole Haddad

Title: Increased willingness-to-pay for real foods versus image displays.
Funding Source: Nevada Undergraduate Research Award
Mentor: Jacqueline Snow
Department: Psychology
University of Nevada, Reno

Understanding the factors that drive healthy vs. unhealthy food choices, and caloric intake, are central to curbing rising rates of obesity. In everyday life food choices are most often made when consumers are confronted with real foods (e.g., at the cafeteria or supermarket), yet previous studies have focused predominantly on food choice behavior towards, and estimates of caloric content of, planar image displays. Importantly, however, unlike images real foods can be physically consumed and they have an actual (rather than inferred) caloric content. Here, extending a recent study in the domain of economics, we examined whether observers were willing to pay more for snack foods presented as real objects versus planar images, in the context of a Becker-DeGroot auction. We also examined whether caloric density, and 'healthiness', influenced willingness-to-pay. Critically, we used a within-subjects design to ensure that variations in bids were not attributable to between-group differences, and trials in the different display conditions were interleaved randomly throughout the testing session. We also used identical display sequences and procedures in the real-food and image conditions, and our stimuli were matched closely for size, viewpoint, and illumination. Under these controlled viewing conditions, observers' willingness-to-pay for snacks increased by 9.35% when they were presented with the real items versus matched image displays. Further, after controlling for a-priori likingness, the true caloric density of the foods predicted how much participants were willing to pay for real foods, but not for foods displayed as images. These results suggest that the overall reward value of healthy and unhealthy foods, and the influence of caloric content on valuation, depend critically on the food being physically present at the time of choice.

Jonathan Heywood

Title: Photooxidation of Chloride to Perchlorate in Soils
Funding Source: NSF EPSCoR
Mentor: Dr. Glenn Miller
Department: Natural Resources and Environmental Science
University of Nevada, Reno

A derivative of perchloric acid (HClO4), anionic perchlorate (ClO4-) is a naturally occurring and commercially manufactured chemical contaminant of drinking water and terrestrial ecosystems. Human perchlorate exposure has been associated with hypothyroidism, which can be placated by iodide supplementation in adults but can lead to lifelong physical and mental impairments in developing children. Though low-level exposure to naturally occurring perchlorate for short periods is not a strong human health concern, chronic exposure following infiltration of perchlorate into ground and surface drinking water sources can yield adverse health effects. Anthropogenic processes are the primary driver of perchlorate contamination in nature; however, it has been found that perchlorate can be produced by chloride (Cl-) oxidation with nitrate (NO3-) and titanium dioxide (TiO2) in non-human ecosystems. We have demonstrated the production of perchlorate from titanium dioxide in the presence of varying concentrations of chloride and in Mojave Desert soils following irradiation under UV-lamps for periods of one to eight weeks as an analog for natural sunlight exposure. Perchlorate concentrations were found to be higher in samples irradiated for longer periods, suggesting the potential for ongoing accumulation in environmental soils. Further, it was determined based on sampling protocol that perchlorate dissolves readily in water, indicating the potential for leaching of perchlorate accumulated in surface soils into groundwater following precipitation events. Our results exhibit the potential for widespread perchlorate generation in natural environments following the photooxidation of chloride by soil substituents. Given the adverse environmental and human health effects of perchlorate exposure, we anticipate that further research examining perchlorate generation in soils from diverse geographic regions following UV irradiation will have relevance to water quality assessment, food safety, and regulation of the chemical's manufacture and use.
John Hladky

Title: An Innovative Glider Design for an Aerially Deployed UAV
Funding Source: Nevada Undergraduate Research Award
Mentor: Dr. Jeffrey LaCombe
Department: Mechanical Engineering
University of Nevada, Reno

A primary limiting factor currently facing small UAV’s is limited range due to power to weight ratio con-straints. One solution to this is to use a secondary vehicle to travel the majority of the mission distance, from which a UAV deploys for final approach to its objective site. This paper describes the development and preliminary testing of an autonomous bisymmetrical glider to be used in such a scenario. A rocket is used to carry this UAV to a deployment altitude of approximately 10,000 feet above the targeted landing site, at which point the craft is ejected. To enable this, the vehicle needed to be configurable to be able to fit within the payload bay of the rocket and be under the maximum weight restriction. After release from the rocket, the glider has the ability to alternate between two primary operating modes, functionally distinguished by the rate of decent in each configuration. During decent, articulation of control surfaces allows the platform to control its horizontal movement, and thereby reach a specific preprogrammed landing site. The design methodology, construction, controls programming, and preliminary testing results are presented within this paper to evaluate the potential capabilities and difficulties the proposed system.

Sierra Hooft

Title: Secondary Traumatic Stress, Vicarious Trauma, and Compassion Fatigue Among Victim Advocates
Funding Source: Honors Undergraduate Research Award
Mentor: Lorraine Benuto
Department: Psychology
University of Nevada, Reno

Secondary Traumatic Stress, Vicarious Trauma, and Compassion Fatigue are conditions resulting from ex-posure to secondary trauma. Victim advocates provide support and information to victims after they have been victimized and work intensely with victim populations. Their work with trauma victims makes them susceptible to STS, VT, and CF. This quantitative study examines the prevalence and predictive factors of STS, VT, and CF among victim advocates across the United States. A survey was emailed to victim advoca-tes across the country to measure the conditions. The results from this study provide a better understanding of those that are affected by STS, VT, and CF, and helps guide prevention and intervention efforts for all advocates in the field.
Functional Analytic Psychotherapy (FAP) is a relatively new and aspiring therapeutic intervention which may improve the treatment of individuals with interpersonal difficulties. The fundamental element of FAP is its mechanism of change, wherein the therapist consistently provides the client with contingent shaping; a type of responding which closely attends to and assesses the underlying function of a client's behavior. In using contingent responding, the therapist dually reinforces and increases the prevalence of the client's effective behavior and reduces counterproductive behavior within the context of the therapeutic relationship. This study intends to add to the field of research with an analysis of therapist-client interactions that specifically tests the hypothesis that contingent responding is a highly effective mechanism of change due to its acute attention to behavioral function, as well as the basic processes of learning. This hypothesis was tested by coding every therapist-client interaction as defined in the FAPRS Manual (Callaghan & Follette, 2008) for a single subject over the course of treatment, and using a lag sequential analysis to empirically determine if contingent responding indeed leads to behavioral change as posited by FAP theory. Results indicate that contingent responding from the therapist yields a marked increase in positive behavioral change and an expansion of the client's useful behavioral repertoire for in-session behavior with a 95% confidence interval. Contingent responding is shown to produce positive behavioral change during therapeutic sessions and could be a highly effective mechanism for improving overall client behavior, and in theory, such shaping will translate improvements into the client's social environment outside the therapeutic relationship.

Plants have specialized cell layers embedded with lipid polymers that function as a barrier and provide protection from the environment. Suberin is one of these polymers. It is a lipid-phenolic heteropolymer deposited in the cell wall of certain cell types including potato skin, the outside of mature roots, and in the specialized cell layer surrounding the water-conducting tissue. It regulates water and ion intake, and is produced in response to abiotic stressors and tissue wounding. Despite years of research, little is known about how suberin synthesis is regulated under normal and stressed conditions. To date, a positive regulator of wound suberin deposition has not been reported. Here, we identify the transcription factor from Arabidopsis thaliana, AtMYB102, as a candidate for regulating wound suberin production. AtMYB102 is a member of a small clade of the R2-R3 superfamily of MYB transcription factors that includes AtMYB41, a known regulator of suberin biosynthesis under conditions of drought and salinity. Wounding assays showed a rapid increase in AtMYB102 transcript abundance in response to wounding, a subsequent increase in the expression of genes known to function directly in suberin synthesis, and an accumulation of suberin monomers compared to unwounded controls. Knock-out mutants, myb102-1 and myb102-2, had significantly decreased abundance of biosynthesis gene transcripts after wounding. Furthermore, transient expression assays demonstrated that AtMYB102 is sufficient in activating the synthesis and deposition of suberin monomers. Our results strongly implicate AtMYB102 as a transcriptional regulator of wound suberin production. Given the importance of suberin for many physiological processes and plant defense, dissecting the regulatory steps of wound suberin production will be important for understanding fundamental biological processes while also having implications for agriculture.
Hancock and Block (2012) suggest time perception is a central component of human psychological experience. James (1890) describes present-time as focus of attention. In the current study, time estimation was used as a metric for present-time perception. A prospective paradigm was employed to investigate present-time perception under conditions of auditory stimulation. In a prospective paradigm, participants are aware of time as a factor of the study (Lontez, 2013). 75 participants took part in this within subjects design. Three conditions of auditory stimulation (white noise, consistent, inconsistent) were presented with variations in Hz and volume. Participants estimated a total of nine durations (3 of each condition) with an actual duration of 30 sec. Participants were randomly assigned to one of three counterbalanced auditory stimulation orders. Mean duration estimation for each condition was shorter than the actual duration mean of 30 sec. A repeated measures ANOVA showed a significant difference between mean duration estimation values (p < .001) across conditions. A subsequent Tukey test making pairwise comparisons showed the duration estimation difference (p < .001) existed between consistent and inconsistent conditions. These results indicated time, under conditions of changing tone and volume, was estimated to be different across consistent and inconsistent conditions. According to these findings, time perception appears to be influenced by factors of auditory stimulation in the external environment.

Animals depend on olfaction to find food and mates, both of which are critical for their survival and fitness. Animals can discriminate novel environmental odorants but more often remember and identify odorants that were frequently encountered in the past. In the Drosophila larva, sophisticated olfactory function is based on the activities of only 21 olfactory receptor neurons (ORNs). An intriguing question in the field of sensory biology concerns the functional equivalency of sensory neurons. Preliminary evidence from our laboratory suggests that each larval ORN contributes differently to olfactory function. Based on these results, we hypothesized that olfactory information processed through different ORN channels are differentially modulated by short-term conditioning. To test this hypothesis, we first modified an existing larval odor-conditioning paradigm. We train naïve Drosophila larvae to associate an aversive tastant, quinine, with an odorant and then test their behavioral response to the odorant in a simple two-choice paradigm. Based on their performance before and after training, learning indices are calculated. To test the effects of short-term conditioning on olfactory processing through different ORN channels, we measured learning indices for five different odorants that were recently characterized to elicit strong, specific responses from individual ORNs. Larvae show different levels of learning indices to the different odorants. These results are independent of the volatility of an odorant and the sensitivity of an ORN to its cognate odorant. Our results, so far, suggest that short-term conditioning differentially affects olfactory processing through different ORN channels. The molecular mechanisms and neural substrates that underlie differential modulation of ORN activity remain to be identified. Nevertheless, our studies provide a crucial starting point to address mechanisms that determine appropriate olfactory responses to familiar and unfamiliar odorants.
Riley Kellermeyer

Title: ORN activity patterns in Drosophila larvae elicited by ecologically relevant odorants
Funding Source: Honors Undergraduate Research Award
Mentor: Dennis Mathew, Ph.D.
Department: Biology
University of Nevada, Reno

Most insects locate their food source through olfaction. In Drosophila larvae, attraction and repulsion to environmental odorants are based on the activity of 21 olfactory receptor neurons (ORNs). While a considerable amount of information has been generated regarding the ORN responses of worms, flies, and mammals to odorants, less is known about their role in driving behavioral output. This gap in knowledge prevents development of odor coding models that can elucidate general principles of information processing and instruct effective solutions for insect control. In this study, we examined the hypothesis that ecologically relevant attractive or repulsive odorants elicit specific patterns of ORN activity in the Drosophila larva. To measure this, a two-choice behavioral paradigm was used to test the behavioral response of wild-type Drosophila melanogaster larvae to 54 odorants selected from its ecological habitat. Using this behavioral screen, a panel of 10 odorants that elicited the strongest attractive or repulsive responses in larvae was identified. This panel was used to assess the response patterns among the 21 larval ORNs. For this, we expressed each larval odorant receptor in an in vivo expression system, the “empty neuron” system, and measured neural responses using single-unit electrical recordings. The panel of strong behavioral determinants elicit both excitatory and inhibitory responses from a variety of larval odors. Many of these receptor-odorant combinations exhibit varying response dynamics. Preliminary evidence suggests that ecologically relevant odorants elicit specific patterns of ORN activity. Conserved patterns of sensory neuron activity may instruct downstream olfactory coding of behavioral valence. By comparing amplitude, temporal dynamics, and distribution of all ORN responses, we aim to identify conserved patterns among sensory neuron activity elicited by attractants and repellents. The results from this study have the potential to impact development of more reliable odor coding models and to transform existing methods of insect control.

Victoria Kelley

Title: The effect of Corbicula fluminea on meiofaunal biomass in Lake Tahoe
Mentor: Jeffrey Baguley, Ph.D.
Department: Biology
University of Nevada, Reno

Corbicula fluminea is an invasive species of bivalve that has taken up residence in sub-alpine, oligotrophic Lake Tahoe. In order to understand some of the consequences they have begun to have on the lake’s ecosystem, this study was designed to evaluate how different population sizes of C. fluminea affect the amount of meiofaunal biomass contributed by nematodes and harpacticoids. Samples were taken in the form of sediment cores from three different sites with varying levels of C. fluminea over the course of three months. The three sites, in order of decreasing levels of population levels of C. fluminea, were Marlette Bay, Lakeside, and Camp Richardson. For both harpacticoids and nematodes there was greater carbon content found per square meter at Lakeside than at Marlette Bay and Camp Richardson, however, it also experienced large variations in carbon content across the three months studied, while the other two did not.
Kyle E. Kelly

Mentor: Christina Frederick
Department: Psychology
Sierra Nevada College

Sports psychologists have examined the effect of self-talk on performance (e.g., Theodorakis, Hatzigeorgiadis, & Chroni, 2000). Research indicates improved performance in athletes following positive (Theodorakis et al, 2000) and instructional (Díaz-Ocejo, Kuitunnen, & Mora-Mérida) self-talk. Given this pattern of results in athletes, the current study examined the impact of three forms of self-talk (positive, negative, neutral) on task completion with the goal of extending research with athletes to the workplace. Performance evaluations are common in the workplace making performance (units completed) a relevant dependent measure. 90 undergraduates from a small liberal arts college were identified via convenience sampling and randomly assigned to one self-talk condition during construction of an office supply crossbow. Detailed instructions on building technique were provided. Following instruction, participants listened to a self-talk audio track through headphones for 10 min. During this time, participants verbally echoed the self-talk dialogue they heard through the headphones and constructed as many office supply crossbow units as possible. A Kruskal-Wallis (Kruskal & Wallis, 1952), the non-parametric alternative to ANOVA, showed no significant difference (p = .261) in the number of units completed across self-talk conditions. Results indicate no relationship between self-talk type and performance under tested conditions. It is recommended future research employ a task more similar to office work in a comparable examination of the impact of self-talk on performance.

Adam Kirosingh

Title: Immunoglobulin G Subclass Switch Enhances Performance of Immunodiagnostic Targeting Francisella tularensis Lipopolysaccharide
Funding Source: NSF EPSCoR, McNair, Nevada Undergraduate Research Award
Mentor: David AuCoin
Department: Molecular Microbiology & Immunology
University of Nevada, Reno

An antigen capture ELISA is being developed for diagnosis of tularemia. A subclass switch family of mouse IgG monoclonal antibodies with specificity to the lipopolysaccharide of the bacterium Francisella tularensis was generated. The influence of the constant region of an antibody on binding affinity has direct implications in the development of immunoassays to diagnose disease. Our results show changing the constant region of a mouse IgG antibody from IgG3 to IgG1 and then to IgG2b increase the limit of detection of LPS. The results of this study reveal the significance of antibody subclass in the development of immunodiagnostics.
Prem Balaji Senthil Kumar

Title: The effect of Taxotere and long chain polyunsaturated fatty acids on prostate cancer. Does an increase in fat in diet enhance the effects of chemotherapy?

Funding Source: Nevada INBRE, Nevada Undergraduate Research Award

Mentor: Ronald Pardini

Department: Biochemistry and Molecular Biology

University of Nevada, Reno

Prostate cancer is second only to lung cancer for cancer-related deaths in American men. Taxotere (Docetaxel) is a chemotherapeutic drug, commonly used to treat hormone refractory prostate cancer (HRPC), a type of prostate cancer that is resistant to hormone therapy. Since hormone refractory prostate cancer can still proliferate without androgens, Taxotere is prescribed to prevent growth through the disruption of the tumor cell's microtubules. Although effective, it is toxic at high levels. Omega-3 polyunsaturated fatty acids (PUFA) have been shown to increase the therapeutic index of many chemotherapeutic agents, including Taxotere. This study will assess combinations of PUFA ratios (omega-6:omega-3) in conjunction with Taxotere for additive or potentially synergistic therapeutic index increases in the HRPC cell line, PC-3. In our laboratory, preliminary in vivo mice studies have shown that Taxotere interacts favorably with long chain fatty acids and does not discriminate on the type of PUFA. Increases in the efficacy of Taxotere may improve the quality of life in prostate cancer patients.

Stephanie D. Kwon

Title: The Impact of Background Stimuli on the Perception of Fear in Facial Expressions

Mentor: Christina M. Frederick Ph.D.

Department: Psychology

Sierra Nevada College

Byrnes (1983) found bright colors were associated with positive emotions (e.g., happiness) and dark colors were associated with negative (e.g., sadness) emotions. Facial expression is a form of nonverbal communication (VandenBos, 2007). The current study focused on the basic emotion (Matsumoto, 1992) of fear. Fear is relevant because fearful facial expressions are important for communicating to others about potential threats (Beck, Cardini, Ladavas, & Bertini, 2015). The current study examined the impact of background stimulation (static, blue, and black) on the perception of fear in facial expressions. 30 undergraduate participants were selected via convenience sampling and completed this study that employed a within subjects design. Participants were screened for color deficiencies using the Ishihara plates (Ishihara, 1972). Ratings of the amount of fear displayed in a particular facial expression were made for 72 still-images originally categorized as fearful, angry, happy, and neutral. A repeated measures ANOVA indicated no significant difference in the impact of background stimulation on the perception of fear in facial expressions (p = .103). By contrast, happy facial expressions produced a significant difference (p = .036) in fearful ratings with static and black backgrounds. Findings indicate background stimulation does not impact the perception of fear in facial expressions. Further research should consider the relationship between various background stimuli and facial expressions connected to other basic emotions.
Sarah Law

Title: Parkinson’s Disease: effects of PINK1 and PKA on mitochondrial and autophagosomal trafficking and mitophagy in neuronal connections
Funding Source: NSF EPSCoR, Honors Undergraduate Research Award
Mentor: Dr. Ruben K. Dagda
Department: Pharmacology
University of Nevada, Reno

The proper localization of high quality mitochondria to distinct neuronal compartments is critical to maintain the integrity of neurites (dendrites and axons). When mitochondria are worn out or damaged, autophagosomes (AVs) recognize and entrap damaged mitochondria to target them for lysosomal-mediated degradation through a process termed mitophagy. Mutations in the mitochondrial serine/threonine kinase PTEN-induced kinase-1 (PINK1) are associated with familial recessive forms of PD. Preliminary data from our lab suggests that loss of PINK1 function is associated with robust dendritic pathology including decreased local PKA signaling in dendrites, decreased mitochondrial content in dendrites, increased mitochondrial fragmentation, and impaired mitochondrial movement in dendrites of primary cortical neurons. PKA can be targeted to microtubules and to mitochondria by binding to dual specificity A-kinase anchoring protein 1 (D-AKAP1) to promote mitochondrial interconnectivity, decrease autophagy and promote dendrite outgrowth in neurons. Therefore, based on these observations, I hypothesize that mitochondrial PKA restores mitochondrial content in dendrites in PINK1-deficient neurons via multiple mechanisms including enhancing mitochondrial trafficking, decreasing mitophagy, and promoting mitochondrial fusion. By performing live cell imaging, we observed that PKA/D-AKAP1, but not a PKA-binding deficient mutant of D-AKAP1 increases mitochondrial content in dendrites, reverses mitochondrial fragmentation and partially reverses the loss of dendrites in PINK1-deficient neurons. Mechanistically, we observed that D-AKAP1 slows the trafficking of AVs in dendrites and phosphorylates Miro-2 -a mitochondrial trafficking adaptor and substrate of PINK1- as corroborated by Phostag analyses of SH-SY5Y cells that transiently express D-AKAP1 and by LC MS/MS. These data suggest that mitochondrial PKA increases mitochondrial content in dendrites by slowing AV trafficking while concomitantly elevating mitochondrial trafficking. Collectively, our data gives proof of principle for developing anti-PD treatments that can reverse the loss of dendrites by eliciting PKA signaling in dendrites.

Michael Lee

Title: Analysis of BK channels in Freshly Isolated Myocytes from Different Pregnancy States
Funding Source: Nevada INBRE, NSF EPSCoR, Nevada Undergraduate Research Award
Mentor: Dr. Iain Buxton
Department: Pharmacology
University of Nevada, Reno

Spontaneous preterm labor (prior to 37 weeks gestation) is a devastating medical mystery that needs to be addressed. Babies that are delivered preterm are significantly more likely to have lifelong medical consequences that are costly to their families as well as society [1]. There are currently no effective tocolytics to prevent uterine contractions and preterm labor. Therefore, it is imperative that we investigate the causes of the onset of labor. Ion channels are pore forming membrane proteins that play a role in the maintenance of resting membrane potential in excitable cells. BK channels are large conductance, calcium and voltage sensitive, potassium channels that play a large role in membrane excitability [2]. BK channels are present in a wide variety of cells and tissues. Of particular importance to our research is that BK channels are important regulators in altering contractility in the pregnant myometrium. We hypothesize that the presence of BK channels plays a large role in the maintenance of uterine quiescence to full term (37 weeks). We have shown BK channel expression is altered in pregnant myometrium compared to nonpregnant. In the future we hope to correlate BK channel activity and expression to a risk of preterm labor.
Emily E. Lopez

Title: un’altra vista  
Funding Source: Nevada Undergraduate Research Award  
Mentor: Peter Goin  
Department: Photography  
University of Nevada, Reno  

As a photographer, it is easy to become “blinded” by one's own background, perspective and preferences. This tendency is even more prevalent when making photographs in a foreign environment. As an American, I have inadvertently subscribed to various stereotypes based on information provided by the media, peer groups, and figures of authority. My images are meant to define my role in an international setting, and describe the change in perception that occurred once my cultural bias was removed.

While abroad, I was drawn to the mundane, subtle and anti-aesthetic. Deconstructing my environment into fragments has allowed me to take on a more authentic view of European cultures. My Intention has been to bear witness to my environment, and communicate my experiences both abstractly and subjectively.

Shelby Sands, Amber Lubera

Title: Vowel Quality and Sound Context of Vocal Fry.  
Mentors: Dr. Valerie Fridland and Dr. Ian Clayton  
Department: English  
University of Nevada, Reno  

Vocal fry is a speech feature connected with voice quality. It is produced with a low pitch and “creaky voice” phonation. It is often compared to a murmured voice or a mix between a full voice and a whisper. In the field of linguistics, the feature vocal fry has garnered attention and press as a highly stigmatized speech feature in young women. Despite the fact that it is highly controversial, there is a distinct lack of research into the sound contexts that influence or generate vocal fry. Our research explores how vowel quality and sound contexts, such as voiced and voiceless codas, affects the rate of production of vocal fry in young western American speakers. We found that front vowels, in both voiced and voiceless context, produce the most production of vocal fry. Our results also showed a pattern that associated vocal fry with the lowness of vowels and voiceless codas. Our results demonstrate that vocal fry is phonologically motivated as well as the well-studied syntactic motivation. We anticipate that our approach, which examines vocal fry as a phonological feature will contribute to the discussion of this highly socially stigmatized feature.
Steven Lucas

Title: Matrix isolation investigation of a benzothiazolyl carbene  
Funding Source: Nevada Undergraduate Research Award  
Mentor: Dr. Robert Sheridan  
Department: Chemistry  
University of Nevada, Reno

For some time, our group has been studying the low-temperature spectroscopy and photochemistry of 5-membered ring heteroaryl carbenes. These highly reactive molecules have been shown to undergo complex rearrangements. Some of the photoproducts of these carbenes include highly strained 6-membered ring cumulenes, which are very rare and poorly understood. We will describe experiments on the first benzothiazolyl(trifluoromethyl)carbene using low-temperature matrix isolation techniques. Besides the carbene, we will also present spectroscopic evidence for the corresponding 6-membered ring ketenimine photoproduct.

Adriel Luippold

Title: Analyses of Mercury in Pet Food  
Funding Source: Nevada Undergraduate Research Award  
Mentor: Mae S. Gustin  
Department: Natural Resources and Environmental Science  
University of Nevada, Reno

There are no regulations for mercury content in the pet food industry. There may be high concentrations of mercury in pet food, notably in fish-based formulas. The objective of this project is to analyze the mercury content in pet food and to infer whether or not the concentrations may affect the health of consuming animals. In order to measure the mercury content in pet food, samples will be taken from a variety of popular pet foods on the market. The samples will be analyzed for mercury content using Milestone DMA-80 technology. The found concentrations will then be compared with threshold and dietary standards developed for wildlife to assess the health risk to pets.
Maebh Lynch

Title: CRISPR-Cas9 Mediated Deletion of Calmodulin 1 Extended 3’ UTR leads to Cardiac Defects in Mice
Funding Source: Smooth Muscle Plasticity COBRE phase III pilot project; Integrative Neuroscience COBRE
Mentors: Dr. Pedro Miura and Dr. Sean Ward
Department: Biology
University of Nevada, Reno and Queen’s University Belfast, UK

Alternative Polyadenylation (APA) was recently discovered to be a widespread and common mechanism of increasing transcript diversity. APA produces transcripts with varying 3’ Untranslated Region (UTR) lengths through the use of different Polyadenylation Signals. The 3’ UTR is important for the stability, localization and efficient translation of RNA transcripts, and is enriched for RNA Binding Protein sites and microRNA (miRNA) seed regions. Using RNA-seq analysis, we previously identified thousands of murine genes that express unannotated extended 3’ UTRs in brain tissue. Though extended 3’ UTRs are widespread, their functions remain largely unknown. Calmodulin 1 (Calm 1) is a highly conserved gene that encodes a calcium ion sensor. Calm 1 generates an extended 3’ UTR that is abundantly expressed in neural and cardiac tissue. This isoform contains a seed region for miR-133a which has been shown to play a regulatory role in the heart. We sought to characterize the function of the extended 3’ UTR of Calm1 in the mouse. To generate mutant mice that specifically lack the extended 3’ UTR of Calm 1, we utilized the genome editing system CRISPR-Cas9. This strategy successfully deleted the extended 3’ UTR of Calm 1 while leaving the short 3’ UTR intact. The successful deletion was assessed using Northern Blot and Quantitative PCR. Mutations in the Calm 1 gene in humans have been associated with ventricular tachycardia and sudden death. Interestingly, we found that loss of this extended 3’ UTR resulted in lethal cardiac defects in adult mice. The hearts of these mice exhibited concentric hypertrophy and structural abnormalities. These findings shed light on the role of Calm 1 extended 3’ UTR. Future work will uncover the precise influence of this isoform on transcript stability, subcellular localization and translation.

Austin James Marett

Title: Sugar-Coating Metabolism: A Comparative Analysis of Global Metabolite Profiles in C. elegans O-GlcNAcylation Mutants
Funding Source: NSF EPSCOR, Honors Undergraduate Research Award
Mentor: Patricia Berninsone, PhD
Department: Biology
University of Nevada, Reno

In the field of molecular biology, it is becoming increasingly clear that the use of gene knock-out experiments alone is insufficient to characterize the functions of the majority of genes. Approximately 85-90% of the genes in most organisms are “silent” and cannot be explored using these traditional methods. One subject where this is particularly true is in the study of posttranslational modifications of proteins, which occur completely independently of any transcription, gene splicing, or translation. Protein modification is known to be vital to the regulation and control of enzymes, including those involved in the metabolism of sugars. In this study, I examine a specific form of cyclical protein glycosylation, O-GlcNAcylation, in the model organism Caenorhabditis elegans using a metabolomics approach. By comparing global metabolite profiles of wild type N2 C. elegans and two knock-out mutant strains oga-1 and ogt-1, which respectively possess deletions for the OGA and OGT enzymes involved in O-GlcNAcylation, I demonstrate that interruption of O-GlcNAcylation produces predictable alterations to core metabolites involved in glucose metabolism and the nutrient-sensing hexosamine biosynthetic pathway (HBP). These results suggest that O-GlcNAcylation is directly dependent on, and impacted by, several other fundamental cellular pathways and metabolites. Once identified, such metabolic systems and their intermediates may serve as therapeutic targets in the treatment of diseases that also perturb the same pathways, such as diabetes, obesity, and various cancers.
Laura Martinmaas

Title: The Aphasia University Boot Camp: Effects on Quality of Life for People with Aphasia  
Funding Source: Honors Undergraduate Research Award  
Mentors: Tami U. Brancamp and Ph.D., CCC-SLP  
Department: Speech Pathology and Audiology  
University of Nevada, Reno

Aphasia is a language impairment resulting from trauma to the brain, and it is most often caused by a stroke. Aphasia can cause loss of receptive language, expressive language, and numerous other aspects of communication. Such losses often lead to decreased socialization and decreased quality of life. This project investigates the quality of life changes individuals with aphasia experience after participating in the Aphasia University Boot Camp. The Boot Camp was developed by Aphasia Recovery Connection, a nonprofit organization focused on improving life participation for people with aphasia, and was organized in conjunction with the Speech Pathology and Audiology Department from the University of Nevada, Reno. Using the Life Participation Approach to Aphasia, the Boot Camp provided strategies to people with aphasia and their families so they may re-enter social lives. The Boot Camp consisted of seven days of trainings in Las Vegas and 21 days of follow-up practice sessions via Google+ Hangouts. The Assessment for Living with Aphasia was administered before the Aphasia University Boot Camp and after the 21 days of follow-up to assess changes in quality of life for the attendees with aphasia. This research will provide insight into the effectiveness of the Boot Camp and the Life Participation Approach to Aphasia.

Courtney Matera

Title: Neural Correlates of Facial Perception and Emotional Recognition  
Funding Source: Honors Undergraduate Research Award  
Mentor: Michael Webster  
Department: Psychology  
University of Nevada, Reno

Current models of face perception hold that expressions are encoded relative to a norm or neutral face. Anti-expressions are created by projecting an expression (e.g. a happy face) through the neutral face to form the opposite facial shape (anti-happy). The two faces thus differ from the norm by the same physical amount, but may differ in their emotional salience. The role of expressions and anti-expressions as related to the brain response from a psychological aspect is still unknown but imperative to nonverbal communication. This study will examine the nature of this norm-based coding by comparing neural responses to an expression and its anti-expression. The study used behavioral adaptation and electroencephalography (EEG) recordings to test the relative strength of expressions and anti-expressions, for example to test whether observers recalibrate the neutral expression in similar ways when exposed to expressions or anti-expressions. We found there was a significant brain response when a subject was presented with a pairing of expressions versus anti-expressions as well as expressions versus neutral faces using real faces. The results of these studies helped to reveal how the brain represents information about faces and allude to the psychological and perceptual aspects correlated with expressions. These findings can also support further research on the importance of the recognition of expressions, paired emotions and nonverbal communication in patients with neurological disorders that do not have that trigger.
Cayler Miley

Title: Building a Web Based Search Application for SiLK
Mentors: Jeff Springer and Nancy LaTourette
Department: Computer Science and Engineering
University of Nevada, Reno

Monitoring a large-scale network requires a robust application to query enormous amounts of data and present search results with readability for security analysis. Building an application to find and report on security events from many network gates presents problems involving efficiently querying massive databases and presenting lists of IP addresses, ports, and other network data in a way that allows the application user to effectively process security events with a high threat level in real time. In this presentation, the process of creating an application that can handle large scale searches for unwanted communication on a network and present the data it returns is completed through the use of a web service and a browser interface. Our developmental approach was to use a python framework called Flask to interface a query from a Graphical User Interface (GUI) to the System for Internet Level Knowledge (SiLK). The GUI offers an easy way for users to search on all of the conversations a particular set of IP addresses has had during a set time interval and sort through large sets of data to determine if a security event needs to be created based on the information provided by the web service. As development continues, we have encountered problems with a way to inform the user of the status of a large search and to optimize the search process for the web service. The process and logical use for an application of this kind offers an excellent way to interest local students in cyber security, which has resulted in two videos on the cyber security topics for presentation at local high schools. The development of the application is still continuing and is scheduled for production testing in May of 2016.

Michelle Nguyen

Title: mir-124 Regulates Olfactory Behavior in Drosophila Behavior
Mentor: Dennis Mathew
Department: Biology
University of Nevada, Reno

Animals are dependent on olfaction for survival. Olfactory function is based on the activities of few neuronal classes in an olfactory circuit. In the Drosophila larva, olfactory behavior is based on the functions of 21 first-order olfactory receptor neurons, ~21 second-order projection neurons, and a handful of inhibitory local neurons. The mechanisms of olfactory information processing are not yet well understood. Micro-RNAs (miRNAs) are small, regulatory RNAs (~22 nt) that play important roles in posttranscriptional regulation. A behavioral screen conducted using Drosophila larvae identified miR-124 as one of several miRNAs that play a role in olfactory function. In Drosophila, miR-124 has previously been shown to affect a variety of neuronal functions including neural development and circadian locomotor function. In this study, we characterize the role of miR-124 in Drosophila larval olfaction. We hypothesized that changes in miR-124 levels in the olfactory neurons will cause defects in behavior. To test this hypothesis, we genetically altered the global levels of miR-124 and measured their behavioral responses to several odorants. When tested in a two-choice paradigm, larvae with low levels of miR-124 show higher attraction to odorants compared to wild type larvae. In contrast, larvae over-expressing miR-124 reduced the attraction towards odorants. Similar trends were observed in the larval tracking paradigm. Our results provide evidence that it affects normal olfactory function in larvae and that larval olfaction is sensitive to miR-124 expression levels. It also suggest that miR-124 negatively regulates olfactory function. In the future, we plan to further test our hypothesis by genetically altering the levels of miR-124 locally in various olfactory neurons. The exact neural substrate for miR-124 action remains to be determined. Our studies provide a viable entry point to understand the neural mechanisms of olfactory response to an odorant.
Alexandra Novenschi

Title: Circadian Modulation of Olfactory Information Processing
Funding Source: Nevada INBRE
Mentor: Dennis Mathew, Ph.D.
Department: Biology
University of Nevada, Reno

Animals depend on olfaction to search for food, a behavior that is critical to their survival and fitness. Feeding, and thereby the search for food, in most animals, are under circadian control. Despite recent research exploring the relationship between circadian rhythms and olfaction, a clear understanding of the molecular and cellular basis of this relationship has not emerged. Moreover, the extent to which circadian rhythm affects olfactory behavior in simple organisms such as the Drosophila melanogaster larva is not known. The Drosophila larva is a convenient model system to explore these questions because its sophisticated olfactory function is based on the activities of few classes of neurons in a numerically simple olfactory circuit and it is amenable to genetic manipulation and a number of behavioral paradigms. We hypothesized that Drosophila larvae respond differently to odorants at various points in its circadian cycle. To test our hypothesis, we measured the behavioral response of second instar Drosophila larvae to odorants at four different circadian time points (ZT-0, ZT-7, ZT-14, and ZT-17). To measure behavioral response to odorants, we used a simple two-choice behavioral assay. Larvae exhibited different behavioral responses to odorants at certain circadian time points. In several instances, larvae exhibited the most behavioral difference between the ZT-7 and ZT-17 circadian time-points. While we are in the process of improving our experimental measurements, our preliminary results, so far, suggest that a larva’s olfactory responses are influenced by its circadian rhythm. The cellular substrates that are involved in the circadian control of the simple larval olfactory circuit remain to be identified. However, our studies provide a crucial starting point to address mechanisms that alter an animal’s olfactory responses at different times of the day and to help improve our understanding of olfactory information processing.

Cordero Nuanez

Title: In-situ SEM micro-compression behavior of vertically aligned carbon nanotube (VACNT) brushes
Funding Source: McNair
Mentor: Dr. Siddhartha Pathak
Department: Materials Science and Engineering
University of Nevada, Reno

Layers of vertically aligned carbon nanotubes (VACNTs), known as VACNT brushes, have been suggested for applications in superhydrophobic, compliant and energy-absorbing coatings. While the individual carbon nanotubes (CNTs) have been announced as the strongest material known, much less is known about VACNTs in terms of their mechanical behavior under compression. In this work, we study the mechanical response of arrays of highly dense brushes of small-diameter (1-3 nm) non-catalytic multiwall (2-4 walls) VACNT brushes, measured using scanning electron microscopy (SEM) in-situ micro-pillar compression testing.

These highly dense VACNT brushes were produced by high temperature vacuum decomposition of 6H SiC single crystals using the carbide-derived carbon (CDC) technique. In this technique, the conformal transformation of SiC into carbon results in a very high density (~0.95 g/cm3), which is 10 or more times higher than VACNTs produced by other techniques, and a very small 0.35 nm inter-tube distance. At this small inter-tube distance, electron beam irradiation has been shown to introduce stable links between neighboring carbon nanotube. The purpose of this current work is to study the mechanical behavior of VACNTs subjected to such inter-tube bridging.

We utilize focus ion beam (FIB) micromachining technique to fabricate VACNT micro-pillars of varying diameters with varying degrees of intertube bridging. Our results show that increasing the volume of the crosslinked region in VACNT pillars results in an increase of their mechanical properties under compression such as their elastic moduli (which increases from ~13 GPa to ~100 GPa) and yield strength (from ~ 0.5 GPa to 4 GPa), but decreases the viscoelastic response (as well as ability to withstand large strains) of the VACNTs. These results are explained in terms of VACNT inter-tube bridging, and the lack of sliding between CNTs in their crosslinked state.
Kaitlyn E. O'Hara

Title: What's Mood Got to do With it? The Impact of Material Vs. Immaterial Items on Mood
Mentor: Christina Frederick
Department: Psychology
Sierra Nevada College

Western culture is inundated with materialistic ideals, such as the belief that material items can produce happiness (Thomas & Millar, 2013). Everyday massive amounts are being consumed that classify as materialistic, wasteful, and largely short-term (Wolff & Biernatzki, 1994). Tatzel (2002) defines materialism as a compulsion to amass and possess items. Mayer and Gaschke (1988) define mood as a two-pronged experience including both a direct experience of mood and indirect reflection. The current study examined how mood is affected by receiving material vs. immaterial items via three conditions (compliment, money, or a blank slip of paper). Mood was measured using the Brief Mood Introspection Scale (BMIS; Mayer & Gaschke, 1988). The participant variable of gender was also considered. 90 participants (45 F, 45 M) were selected via convenience sampling and randomly assigned to one condition. After receiving an item, participants completed and placed the BMIS in a provided collection box. A two-way ANOVA showed no significant difference (p = .698) in BMIS scores across conditions. These results do not align with previous research, but this may be due to the nominal monetary value offered in the money condition. The main effect of gender was significant (p = .013) with males scoring higher than females on the BMIS, regardless of condition. This suggests males generally experience a more pleasant mood than females. Materialism is a defining characteristic of our age, therefore, future research is encouraged (Thomas & Millar, 2013).

Devon Payne

Title: The Use of 13CO2 Metabolic Flux Analysis on Seven Strains of Escherichia coli
Mentor: Brian Hedlund
Department: Life Sciences
University of Nevada, Las Vegas

I am interested in studying the effects of high temperature on life, especially its effects on carbon use efficiency (CUE). CUE is the ratio of carbon used for biosynthesis to total carbon acquired. I am comparing the stable isotope 13C-amino acid (AA) metabolic flux analysis (MFA) technique with the recently developed 13CO2 method as a means to get information about a cell's CUE. The 13CO2 method is mainly used in studies of natural microbial communities, and thus serves to benefit by being rigorously tested in a pure-culture setting. These techniques are used to determine the amount of activity in the central carbon pathways (CCPs; glycolysis, the citric acid cycle, and pentose phosphate pathway). The methods work by using the probabilities of specific carbon atoms becoming oxidized during different steps of metabolism, using 13C-labeled metabolites as a means to trace where in the CCPs oxidation has occurred. Both methods will be used on several strains of Escherichia coli. The results from both methods will be compared with differences in the results serving as clues for where refinements of either model can be made. The 13CO2 method is a rapid and less-expensive approach to determine CUE. If this model can stand up to the current standard of 13C AA it will provide numerous benefits to both pure-culture and natural studies of microbial metabolism. This is the first extensive use of this method in a pure-culture setting. Data has been generated for the 13CO2 method that shows differences between the strains. The 13C AA experiments are still underway, along with the development of the model.
Candace Peacock

Title: Exploring Failures in Working Memory – A Steady-State Visual Evoked Potential Study
Funding Source: Honors Undergraduate Research Award
Mentor: Marian Berryhill, PhD.
Department: Psychology
University of Nevada, Reno

Working memory consists of three stages: encoding, maintenance, and retrieval. It has been demonstrated that working memory (WM) capacity is limited to about four items. However, there are ambiguities regarding why some items are correctly retrieved and why others are subsequently lost. Previous studies have not been able to demonstrate which stage these items are lost because they only measure the processing of all items shown in a memory array. This investigation employs a novel paradigm pairing frequency tagging and a full report paradigm. Frequency tagging allowed us to disentangle individual items that were encoded and compare these items to which items were actually retrieved. Two attentional models were tested in regards to encoding: the ‘graded attention’ model and the ‘all or nothing’ model. These two models describe how neural resources are allocated to items in a memory array. This study found that frequency tag amplitudes were larger for items correctly retrieved as compared to items subsequently forgotten. The data were also found to be consistent with the ‘all or nothing’ attentional model which indicate that attentional resources are spread to all items during encoding. The results indicate how important WM encoding is to explaining underlying mechanisms for why WM fails.

Shahil Pema

Title: Biological Control of Diamondback Moths with
Funding Source: NSF EPSCoR
Mentor: Angela Smilanich
Department: Biology
University of Nevada, Reno

Diamondback Moth caterpillars (Plutella xylostella), a prominent pest of cruciferous crops, are most often controlled with the use of pesticides, which can have far reaching harmful effects on the surrounding environment. Current alternatives utilize Bacillus thuringiensis (BT), but are causing pest populations to become resistant. Other natural enemies may be used to control P. xylostella populations and, additionally, may have varying effects on populations selected for resistance to the bacteria BT compared to populations that are still susceptible. The effectiveness of these alternative methods of control were quantitatively analyzed by observing the mortality of P. xylostella. The larvae were then exposed to the Junonia coenia densovirus to determine if the virus was efficient as a biocontrol agent. BT susceptible and resistant strains were also given artificial diet for Diamondback larvae and cabbage leaves to look at possible effects of plant chemistry. Results will be discussed on the difference in the susceptibility of the two strains to the Junonia coenia densovirus. This data will provide insight into the dynamic between P. xylostella and its natural predators and possibly allow for better, eco-friendly, methods of controlling P. xylostella pest populations.
Johnathan N. Pietz

Title: Oculomotor nerve and muscle development.
Funding Source: Nevada Undergraduate Research Award
Mentors: Professor Grant Mastic, Dr. Minkyung Kim and Dr. Brielle Bjorke
Department: Biology
University of Nevada, Reno

Eye movement is governed by extraocular muscles, which perform contractions that manipulate the eye's position. The six extraocular nerves and the nerves that control them, the trochlear, abducentes, and oculomotor nerves, are all of interest in order to understand how the eye operates at both global and local levels of function. To describe how the eye develops and functions the anatomy of wild type embryos at various stages of development must be mapped, with the different nerves and extraocular muscles distinctly labeled. Specific functions of the muscles and nerves can be studied by comparing the wild type embryos with mutant counterparts. Mice embryos were chosen as the model organism for their similarities to human in terms of morphology and genotypes, while antibody labeling and lectins were utilized in order to label the muscles and nerves. Brain tissue sections are commonly used to analyze specific components of the eye and reconstruct the three-dimensional structure, but thanks to developments in tissue clearing it has become possible to also view transparent whole mount brains. Both techniques were used to construct a partial map of the mouse brain, with special attention given to the eye, for a range of developmental stages. The mice used were of the CD1 genotype. Future directions must be to image additional stages of development and testing both mice with single mutations of genotypes and combinations in order to discover their phenotypic consequences. The more complete the mapping of eye development is, the more possibilities there are for treatments of eye disorders to be developed.

Mateusz Podzorski

Title: One pot fabrication of PbS nanocrystal doped TiO2 nanotubes
Funding Source: NSF EPSCoR
Mentor: Dr. Vaidyanathan Subramanian
Department: Chemical and Materials Engineering
University of Nevada, Reno

Hetero-structured optoelectronic materials (HOMs) are prepared through the deposition of chalcogenide nanocrystals, which act as light harvesters, onto a high surface area substrate, often metallic oxides. A variety of methods have been utilized to deposit chalcogenides, among them the successive ionic layer adsorption and reaction (SILAR) process as well as chemical vapor deposition (CVD). However, these methods often involve complex equipment and procedures that grow in expense to prepare in the industrial scale. Here, we demonstrate a simple and scalable method of chalcogenide nanocrystal deposition through the use of a one-pot technique. To demonstrate this method, we immersed a TiO2 nanotube substrate in a solution of oleylamine and lead dithiocarbamate precursor, heated at 160 to 200 °C. We found that changing the concentration of the precursor allows for control of the size of the nanocrystals. This is more efficient than other methods, as SILAR requires immersing the substrate in multiple precursor solutions, with washing in-between, over many cycles, whereas the one-pot technique requires only a single immersion in a precursor solution. In turn, CVD requires vacuum chambers and other sophisticated instruments where the one-pot method can be conducted at atmospheric pressure with relatively simple tools. Ultimately, the one-pot technique is a cost-efficient and scalable alternative for the preparation of hetero-structured optoelectronic materials. In addition to their function in the production solar energy, HOMs can be used for a variety of other applications. They have shown potential in the processes of hydrogen generation, sensors for harmful gas, and the photo-degradation of toxic dye chemicals.
Research shows psychological variables affect taste ratings (Platte, Herbert, Pauli, & Breslin, 2013). Additionally, Yoshimura, Honjo, Sugai, Kawabe, Kaneyama, Segami, and Kato (2011) determined there was a relationship between the consumption of preferred foods and participant's experience of emotional pleasantness. The present study examined whether various flavors elicit affect in the form of pleasant and unpleasant emotional identification. Pleasant and unpleasant affect were collected using the Geneva Emotion Wheel (GEW; Scherer, Shuman, Fontaine, & Soriano, 2013). Participants (n = 90) were identified via convenience sampling and randomly assigned to one flavor condition (sweet, salty, and flavorless). A double-blind methodology was employed. After a baseline gustatory cleansing using drinking water, participants sampled their assigned flavor and indicated their emotional state via the GEW. The GEW was divided into halves categorized by pleasant and unpleasant emotions. By comparing expected participant emotional identification for each flavor condition, a Chi-Square test of independence showed a significant difference (p = .029) between flavor conditions and emotional identification. Results of the current study indicate consumption of specific flavors produce varying pleasant and unpleasant emotional states. The results of the present study may be applicable in future research exploring the relationship between taste and emotional affect.

Feedback is a powerful learning tool as information about one’s past performance can be used to improve future performance (Mory, 2004). Self-efficacy is also an important factor in both performance and motivational learning (Eccles & Wigfield, 2002). Bandura (1997) defines self-efficacy as an individual’s self-confidence in their own ability to learn or complete a given task. The current study examined the relationship between feedback, self-efficacy, and performance via the presence or absence of positive feedback. An index of performance and General Self Efficacy (GSE; Schwarzer & Jerusalem, 1993) scores were the dependent measures of interest. 60 undergraduates (aged 18 and over) were selected via convenience sampling and were randomly assigned to receive positive feedback (via a green card with encouraging text) or no feedback. Following informed consent, it was communicated that receiving a green card was indicative of desirable behavior (active listening, appropriate attention, etc.) during a video (5.02 min) about the benefits of bilingualism. After the video, Manila folders containing a video Content Quiz and the GSE were distributed. Half of these folders also contained a prominently displayed green card. After carefully viewing the contents of their folder, participants completed the Content Quiz and GSE. A Mann-Whitney U showed no significant difference in Content Quiz scores (p = .332) between feedback conditions. A two-sample t-test showed no significant difference in GSE scores (p = .585) between feedback conditions. Previous research shows different levels of feedback produce different effects on self-efficacy (Beattie, Woodman, Fakehy, & Dempsey, 2015). Given the current study examined the impact of general feedback on self-efficacy and performance, it is recommended future research examine the impact of more detailed feedback.
Brandon Rasmussen

Title: “A New Method of Geologic Spectral Analysis using Python”
Funding Source: NSF EPScoR
Mentor: Wendy Calvin
Department: Geological Sciences
University of Nevada, Reno

Studying mineral zonation at depth is key to understanding heat and fluid flow within a geothermal system. Reflectance spectroscopy of the .35 to 2.5 micrometer wavelength range can accurately identify most geothermal alteration minerals. Field spectrometers can acquire reflectance data from pre-existing cuttings or core samples cheaply, rapidly, and at high spatial resolution. Current analysis of these data uses inappropriately-specialized and time consuming methods often requiring visual verification from trained professionals. Creating a program specialized for automated identification of alteration minerals in a geothermal environment would make inclusion of alteration mineralogy in well data interpretation inexpensive and faster for both the industry and academia. A program has been written in the Python language based upon characterization of absorption features through a derivative approximation, coupled with depth and symmetry analysis of each individual absorption. With a limited library of minerals, it has proven effective at both identification of assemblages of important alteration minerals, and at qualitative approximations of relative abundances in geothermal core and cuttings. In addition, it shows potential promise for transfer to other related fields in which reflectance spectroscopy is useful, including the economic geology and hydrocarbon exploration. Further modification to the program will likely include considerations for intimate mixing, allowances for lithology input via a graphical user interface, and further work to make the program more user friendly and effective at removing false identification of bandcenters in spectral noise.

Josue Regalado

Title: Prolonged starvation induces sleep deprivation and sleep rebound in Drosophila
Funding Source: NSF EPScoR, Nevada INBRE, McNair
Mentor: Dr. Yong Zhang
Department: Biology
University of Nevada, Reno

Sleep remains one of the biggest mysteries of biology. Studies in Drosophila melanogaster, the fruit fly, have provided important insights into the sleep regulation. One of the most defining characteristics of sleep also present in fruit flies is sleep homeostasis, which is the ability to sleep rebound after sleep deprivation. However, the neural and molecular machinery regulating this homeostatic control of sleep remain a mystery. Temporary exposure to mechanical stimuli or high temperatures can induce sleep rebound (Keene et al 2010; Thimgan et al 2010). However, the mechanisms mediating this starvation-induced sleep homeostasis are still unknown. To answer this question, we developed a model to test for sleep changes after starvation. Our findings suggest that 24 hours of starvation is sufficient to evoke sleep rebound during the first 4 hours after starvation. To dissect the mechanisms allowing this sleep homeostasis to happen we tested circadian clock mutants. Clock mutants show a similar sleep rebound as controls, suggesting the circadian clock is dispensable to the metabolic regulation of sleep homeostasis. Future experiments seek will test translin, insulin, and leukokinin mutants for metabolic regulation of sleep homeostasis.
Jonathan Rhea

Title: Synthesis of a new series of tungsten complexes with trisubstituted 1,3,5-triaza-7-phosphaadamantane
Funding Source: Nevada Undergraduate Research Award
Mentor: Dr. Brian Frost
Department: Chemistry
University of Nevada, Reno

The first example of tungsten carbonyl PTAR3 complexes have been synthesized using PTA(Ph)3 (1), PTA(C6H4OM3)3 (2), and PTA(C6H4t-Bu)3 (3) ligands. The ligands 1, 2, and 3 were combined with Trimethylamine N-oxide and W(CO)6 while refluxing in an inert atmosphere to produce W(CO)5L (L=1, 2, 3). Refluxing 1 and 3 with cis-W(CO)4(pip)2 produced W(CO)4L2. Traces of W(CO)3L3 were produced as a byproduct when PTA(C6H5)3 was combined with cis-W(CO)4(pip)2. These complexes were fully characterized by IR, ESI-MS, 1H and 31P NMR, and single-crystal x-ray analysis. IR analysis allowed investigation of steric and electronic differences between these complexes and PTA.

Isabella Rodriguez

Title: Controlling the Electric Charge on an Optically Levitated Microsphere
Funding Source: Nevada Undergraduate Research Award
Mentor: Andrew Geraci
Department: Physics
University of Nevada, Reno

We are currently working on a method to trap and cool dielectric microspheres in vacuum to study the nature of gravity on the micro-scale. However, our data shows that some microspheres possess a charge. When there is no net electric charge on our trapped microsphere our sensitivity is improved because electromagnetic noise is decreased. The aim of this project is to control the electric charge on trapped microspheres by integrating a fiber coupled deuterium lamp into the vacuum chamber. Electrons are emitted from a surface, typically metal, under the right conditions when a UV ray of incident light comes in contact with it. Using a power supply and a hard drive shutter we have the capability to pulse light through the fiber and onto the levitated silica spheres, reducing the number of electrons bound to it. We anticipate this method to be compatible in other systems and have other applications. For example, while removing charge is essential for ultra precise measurements of gravity, applying an electric charge can be useful in calibrating our system. In this case we can utilize the photoelectric effect once again by taking the fiber-coupled light and shining it on metal near the levitated silica sphere. If enough energy is supplied to make the bound electrons discharge, they will travel through free space, thus giving the silica sphere the possibility of gaining an overall net charge.
Arran Rumbaugh

Title: Secondary metabolite variation as a function of circadian rhythm in Piper sp. and its impact on herbivore performance
Funding Source: Nevada Undergraduate Research Award
Mentor: Dr. Christopher Jeffrey
Department: Chemistry
University of Nevada, Reno

The presence of secondary metabolites in plants is a result of evolutionary adaptations mostly due to defense against herbivores and harmful pathogens. In this project, we analyzed the circadian cycle of Piper scheideanum, i.e., the changes that occur throughout the day in plant secondary metabolism. The results can support studies of herbivore feeding preferences, which are often modulated by these changes. Extractions and partitions were performed in order to isolate and characterize the metabolites in this plant species. In addition, mixtures of established natural products were studied using NMR spectroscopy to create a database that would allow us to relate the isolated metabolites. This database of complex mixtures will not only allow further examination of this specific species, but also aid in the research of natural products from different sources.

Lucia A. Sanchez

Title: Alternative Approaches to Antimicrobial Therapy: Intercepting Quorum Sensing in Streptococcus pneumoniae
Funding Source: Honors Undergraduate Research Award, Nevada INBRE
Mentor: Dr. Yftah Tal-Gan
Department: Chemistry
University of Nevada, Reno

Streptococcus pneumoniae is a Gram-positive, commensal bacterium that naturally colonizes in the nasopharynx of many humans. S. pneumoniae is also an opportunistic pathogen that can cause infections in young children, the elderly, and in immune-compromised hosts, resulting in over a million deaths per year worldwide. Current approaches to antimicrobial therapy used to curb the impact of microbial infections are designed to kill bacteria. However, the extensive use of such agents and the pressure they pose has resulted in the widespread emergence of antibiotic-resistant pathogens. In S. pneumoniae, this rapidly evolving mechanism of drug-resistance is due to horizontal gene transfer mediated by quorum sensing (QS), a cell-to-cell communication mechanism that enable bacteria to assess their population density. S. pneumoniae uses a 17-amino acid peptide pheromone called competence stimulating peptide (CSP) as its signal for this intraspecies communication that governs, among other phenotypes, the acquirement of genetic information through competence. S. pneumoniae strains can be divided into two sub-groups based on the CSP sequence used termed, CSP-1 and CSP-2. Our research is focused on the modulation of QS and QS-regulated phenotypes in S. pneumoniae by constructing CSP-1 mono-substituted alanine, D-amino acids, and N-methyl analogs that can bind to the sensory domain of the transmembrane histidine kinase receptor, ComD, and thus modulate the QS pathway. This research and its future results have the potential to generate new antimicrobial therapies that focus on the interception of intraspecies communication that govern infectivity, rather than kill the bacteria, thereby avoiding selective pressure for resistance development.
Title: Vowel Quality and Sound Context of Vocal Fry.
Mentors: Dr. Valerie Fridland and Dr. Ian Clayton
Department: English
University of Nevada, Reno

Vocal fry is a speech feature connected with voice quality. It is produced with a low pitch and “creaky voice” phonation. It is often compared to a murmured voice or a mix between a full voice and a whisper. In the field of linguistics, the feature vocal fry has garnered attention and press as a highly stigmatized speech feature in young women. Despite the fact that it is highly controversial, there is a distinct lack of research into the sound contexts that influence or generate vocal fry. Our research explores how vowel quality and sound contexts, such as voiced and voiceless codas, affect the rate of production of vocal fry in young western American speakers. We found that front vowels, in both voiced and voiceless context, produce the most production of vocal fry. Our results also showed a pattern that associated vocal fry with the lowness of vowels and voiceless codas. Our results demonstrate that vocal fry is phonologically motivated as well as the well-studied syntactic motivation. We anticipate that our approach, which examines vocal fry as a phonological feature will contribute to the discussion of this highly socially stigmatized feature.

Title: Electrochemical detection of analytes using a carbon fiber ultramicroelectrode: lateral flow approach
Funding Source: Nevada Undergraduate Research Award
Mentor: Dr. Mario Alpuche
Department: Chemistry
University of Nevada, Reno

Electrochemistry utilizes the relationship between electrical current and chemical reactions in a solution. The transfer of electrons towards an analyte can be measured in an electrochemical cell that provides an analytical signal for the substance of interest. Microelectrodes are useful for the detection of current due to the electrodes small surface area and ability to accurately detect and measure very low currents, which correspond to small amounts of analyte.

The detection of nanoparticles with microelectrodes has been an increasingly popular method for detection analysis. Nanoparticles are very versatile because of the many sizes and materials they can be composed of. Gold nanoparticles can be conjugated with antibodies and can be used for the detection of specific antigens.

This study uses a carbon fiber microelectrode with a diameter of 6 μm. The small carbon fiber surface provides a sensitive region for detection for the anodic and cathodic processes that will occur for the oxidation of hydrazine in solution. This study utilizes lateral flow techniques to detect 40 nm gold nanoparticles that are unconjugated and conjugated with antibodies specific for F. tularensis lipopolysaccharide (LPS). Antibody conjugated nanoparticles will allow us to view the differences in oxidation reactions when the antigen is present or absent. This use of detection mechanism has allowed for the successful detection of low concentrations of gold nanoparticles and the presence or absence of the F. tularensis.

I am modifying the methods available to develop a carbon fiber microelectrode for the application in a lateral flow technique. This mechanism allows for a precise and economical way to detect very low concentrations of biologically relevant analytes.
Carly Schleh

Title: A Creative Look at Self-Esteem
Mentor: Christina Frederick
Department: Psychology
Sierra Nevada College

Evidence suggests self-esteem contributes to mental well-being (Brehm & Kassin, 1989). Hui and Stickly (2010) designed an art kit and implemented its use in health facilities for treatment of mentally and physically disabled individuals. This art kit gave patients of all skill levels a chance to create a piece of work that was meaningful to them. Hui and Stickly (2010) found this artful process focused patients on their abilities rather than disabilities. The current study examined the immediate effectiveness of various levels of the artful process (drawing, coloring, and visualizing) for improving self-esteem. The artful process was defined as creating a meaningful piece of art. The dependent measure of interest was self-esteem as measured by the Rosenberg Self-Esteem Survey (RSES; Rosenberg, 1965). 90 undergraduates were randomly assigned to one of the three artful processing activities, each of which lasted 5 min. Participants in drawing and coloring conditions received white, blue, and grey oil pastels. Those in the drawing condition used the pastels to create a snowflake and those in the coloring condition used the pastels to color in the outline of a printed snowflake. Participants in the visualization condition were instructed to imagine a snowflake with the assistance of a visualization script. Following the artful activity, participants completed the RSES.  RSES scores were sorted by artful processing condition and analyzed. A one-way ANOVA revealed no significant difference (p = .312) in RSES scores across artful processing conditions. Results of the current study indicate artful processing does not impact self-esteem. Given the inconsistency of the current finding with those from previous research (e.g., Hui & Stickly 2010), it is suggested future studies examine the impact of the artful process on self-esteem over increased and variable lengths of time. It is possible engaging in artful processes produces more notable impact on self-esteem over time.

Michael Schmidt

Title: Does pH effect the survival of cancer cells differently from healthy cells? An Experimental analysis
Mentors: Brielle Bjorke, Any Rost and Suzanne Gollery
Department: Biology
Sierra Nevada College and University of Nevada, Reno

Cancer cells and non-cancerous cells primarily use two different metabolic pathways. Cancer cells utilize glycolysis, even in the presence of oxygen, producing a surplus of lactic acid and H+ outside of the cell. In contrast, non-cancerous cells utilize oxidative phosphorylation which does not alter extracellular H+ concentration. Previous work demonstrates that cancer cells are able to thrive in a pH around 6.0, while non-cancerous cells function optimally at the physiological pH of 7.4. Due to a difference in extracellular pH, we hypothesize cancer cells and non-cancerous cells will have different thresholds for stress-induced apoptosis. The aim of this study was to test the sensitivity of Hela (cancer) and COS (control) cells to low and high pH, and determine when each cell type reaches their apoptosis threshold. To determine how Hela and COS cells respond to changes in extracellular pH, cells will be placed in three different pH environments: 9, 7.4, and 4.0, and rates of apoptosis will be measured at four different time points: 30 minutes, one hour, two hours, and four hours. Rates will be analyzed using statistical analysis of the ratios of live to dead cells counted for each sample. We predict that there will be an exponential rate of cell death in cancer cells due to an initial rapid proliferation with elevated levels of glycolysis, while non-cancerous cells will display a more gradual rate of cell death. We expect the largest difference will be at the longest time point. Further research may lead treatments that manipulate pH to treat cancer.
Lauren Elisa Schultz

Title: Enhanced α7-integrin expression inhibits miR-124a expression and supports a contractile phenotype in airway smooth muscle

Funding Source: Nevada INBRE, Nevada Undergraduate Research Award

Mentors: Dr. Cherie Singer and Dr. Mariam Ba

Department: Pharmacology

University of Nevada, Reno

Asthma is characterized by airway inflammation, mucus production, and airway smooth muscle (ASM) hyperreactivity that result in more work for breathing. Asthmatic ASM has further been shown to have increased extracellular matrix deposition, which can lead to airway remodeling that results in hypertrophy and hyperplasia of ASM cells. There has been an increasing need to develop new treatments for asthma that target ASM in order to decrease this airway remodeling. Previous studies have shown that α7β1 integrin, a transmembrane protein complex, maintains a contractile ASM phenotype by promoting laminin binding to the extracellular matrix. However, the molecular mechanisms by which α7 integrin regulates ASM phenotype and function remain unknown. Our laboratory has previously determined that miR-124a binds to the 3'UTR of α7 integrin, which has led to the development of our hypothesis that α7 integrin alleviates asthmatic symptoms via miRNA-mediated gene silencing mechanisms that affect ASM phenotype. To examine this, non-asthmatic and asthmatic human ASM cells were treated with compounds known to modulate α7 integrin expression in skeletal muscle. Results showed an inverse relationship between the expression of α7 integrin and miR-124a. This supports the idea that miR-124a directly targets α7 integrin to regulate the phenotypic changes in ASM cells.

Andy Shao

Title: The Possibility of a Synergistic Relationship between 25-Hydroxycholesterol and Docosahexaenoic Acid in Inhibiting Growth and Initiating Apoptosis in Breast Cancer via Interruption of Fatty Acid Synthesis through an Akt-dependent Mechanism

Funding Source: Nevada INBRE, Nevada Undergraduate Research Award

Mentor: Dr. Ronald Pardini, Ph.D.

Department: Agriculture, Biotechnology, and Natural Resources

University of Nevada, Reno

Breast cancer has been a concern within the medical as the second most diagnosed cancer. In this study, we propose an evaluation of the relationship between 25-Hydroxycholesterol (25HC) and Docosahexaenoic acid (DHA) as a treatment of mammary carcinoma. Previously, 25HC has been shown to inhibit tumor cell growth via interactions with Sterol Regulatory Enhancement Binding Protein (SREBP) in an Epidermal Growth Factor Receptor-dependent (EGFR) mechanism. From previous research in our lab, DHA has been shown to interact with EGFR signaling. Given this information, we propose an exploration of 25HC and DHA within the EGFR/PI3K/Akt/SREBP pathway in inhibiting tumor cell growth. Currently, we have demonstrated that 25-HC and DHA do not play a significant role in the inhibition of MDA-MB-231 breast adenocarcinoma cells. This data is in line with our hypothesis that a 25-HC/DHA treatment is ineffective against wild-type phosphatase and tensin homolog (PTEN)-expressive cell lines, of which the 231's are. PTEN is a key regulator of Akt signaling given its capability attenuate Akt downstream signaling via Akt dephosphorylation. From here, we hope to finish our exploration of 25-HC/DHA synergism in the WIDr colonic adenocarcinoma, a cell line which is inexpressive of the PTEN gene.
Shiyuan “Annie” Zhu

Title: Dynamic Assessment of Oral Reading Fluency for Dual Language Learner Second Graders  
Mentor: Abbie Olszewski, PhD, CCC-SLP  
Department: Medicine  
University of Nevada, Reno

National Assessment of Educational Progress (NAEP) results from 2009 show a disparate gap between English language learners (ELL) and non-ELLS in academic performance. For example, in California and New York – two states with large proportions of ELLs – only a small percentage of fourth grade ELLs achieved at or above basic level in reading, which indicates performance far below proficient and grade level (Samson & Collins, 2012). One possibility for this discrepancy is that classroom instruction and modes of testing are unsuitable for ELLs and overall dual language learners (DLL), a term that includes ELLs. Another possibility is that there could be inadequate methods of distinguishing between language differences and language disorders present in DLLs who achieve below average academically. This study aims to discover if alternative methods of testing and instruction are more suitable for DLLs. Specifically, this study seeks to discover if dynamic assessment of oral reading fluency is feasible in identifying DLLs who are typically developing (TD) versus DLLs who have bilingual language impairment (LI). If dynamic assessment of oral reading fluency is in fact accurate in distinguishing between TD and LI in DLLs, this method can then measure a child’s learning potential and plan individualized intervention to ultimately improve academic performance. The implementation of this method could potentially close the gap between ELL/DLLs and non-ELL/DLLs in academic performance.

Melissa Sieffert

Title: Cannabinoid-mediated mitochondrial modulation in an induced model of Parkinson’s  
Funding Source: NSF EPSCoR  
Mentors: Jeffrey Angermann and Ruben Dagda  
Department: Community Health Science  
University of Nevada, Reno

Parkinson’s disease (PD) is a progressive neurodegenerative disease, which, in its final stages, renders a person completely paralyzed. No cure has been found for PD, but recent research has indicated that cannabinoids, such as Tetrahydrocannabinol (THC ∆9) and Cannabidiol (CB), may protect cells from degenerating. Mitochondria, which produces energy in a cell, has been shown to malfunction in cells affected by PD. The activation of the cell receptor CB1 by THC ∆9 and CB can help restore the function of the mitochondria by reducing oxidative stress. This experiment sets out to establish if cannabinoids are a potential therapy for PD patients by examining how pre-treatment of neurons, expressing a Parkinsonian phenotype, with cannabinoids changes metabolic activity. Expression analysis will be used to confirm the presence of CB1 in the neurons used for experimentation. Toxicity testing will determine the appropriate doses of cannabinoids used for experimentation. To measure the function of the mitochondria in treated and untreated neurons, Seahorse Mito Stress Tests will be performed, which allow one to measure, in real time, cells’ oxygen and glucose consumptions. By establishing how the activation of CB1 alters the metabolic activity of cells, and thus, the function of the mitochondria, it can be determined if cannabinoids exert a protective effect on degenerating cells.
Kevin So

Title: Mechanisms of Circular RNA accumulation in the aging Drosophila brain
Funding Source: Nevada INBRE, Nevada Undergraduate Research Award
Mentor: Pedro Miura
Department: Biology
University of Nevada, Reno

Circular RNAs (circRNAs) are a newly appreciated and pervasive class of non-coding RNAs that are most commonly produced by back-splicing of protein coding exons. The trans- functions of circRNAs are largely unknown, although several have been shown to function as microRNA sponges. Back-splicing to produce circRNAs competes with in-order splicing to form mRNAs; thus, circRNA production might function as a general mechanism to control mRNA levels of select genes. In Drosophila, thousands of circRNAs are expressed preferentially in neural tissue and hundreds of circRNAs are upregulated during aging. In many cases, the level of upregulation is dramatic, with some circRNAs increased >20fold between 1 and 50 days of age. This increased expression during aging might result from increased stability of circRNAs vs mRNAs, and/or alteration in linear back-splicing. Here we investigate the impact of age-related stresses on circRNA expression in flies, including high/low temperature, caloric restriction and altered neural activity. Increased circRNA expression was found to generally correlate with age-related stress. The splicing factor DX16 was found to regulate accumulation of a circRNA from the ankyrin2 locus, and DOA, the kinase that phosphorylates DX16, was increased during aging in Drosophila heads. These trends suggest circRNAs might have functional roles in the aging nervous system. In order to identify age-related functions of individual circRNAs, we have initiated approaches to modulate circRNA expression in vivo.

William Struble

Funding Source: NSF EPSCoR
Mentor: Dr. Scott McCoy
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The rapid and cost effective prediction of seismic hazard from normal faults has long been a goal of seismologists and geologists. Using a recently developed geometric model, lidar-derived measurements of facet slope angles in conjunction with known erosion rates and fault dip are used to quantitatively predict slip rate. The geometric model and its associated development of a quantitative method for calculating the slip rate of normal faults allows for rapid and inexpensive determination of seismic hazard along the length of the Wasatch Fault, Utah. Slip rate is relatively well constrained from paleoseismic studies along the Wasatch Fault Zone, which serves as a useful test case to which the geometric model-derived values are compared. The consistency of the geometric model's calculated slip rates with paleoseismically-determined slip rates confirms that facet slopes serve as a viable method for predicting slip rate and seismic hazard from normal faults. Future use of the geometric model in conjunction with geodesy and traditional paleoseismic methods including trenching will increase resolution of seismic hazard studies, particularly in regions dominated by normal faults, such as the Great Basin.
Ashley Tarchione

Title: An integrin enhancing small molecule alters the composition of the extracellular matrix to prevent muscle disease in a mouse model of Duchenne muscular dystrophy
Funding Source: Nevada INBRE, Nevada Undergraduate Research Award
Mentor: Dean Burkin, PhD
Department: Pharmacology
University of Nevada, Reno

Duchenne muscular dystrophy (DMD) is a fatal X-linked muscle wasting disease that affects approximately 1 in 3500 to 5000 males and for which there is no cure or effective treatment. In DMD, mutations within the dystrophin gene cause loss of the protein, which functions to link the cell cytoskeleton to the extracellular matrix (ECM) via the dystrophin-glycoprotein complex (DGC). Loss of this linkage leads to progressive muscle damage, fibrosis, and deterioration of strength. To compensate for the absence of dystrophin, the integrin α7β1 is upregulated in DMD. Integrins span the plasma membrane to connect ECM components with the intracellular actin cytoskeleton, in a manner similar to the DGC. Thus, an increase in integrin expression may be a major modifier of disease progression. Integrin enhancing compound-9 (IEC-9) is a novel small molecule that has been shown to increase α7β1 integrin and increase the amount of myoblasts fusing into myofibers in the mdx mouse (murine model of DMD); however, the process by which this happens is largely unknown. The ECM provides stability to myofibers and protects the sarcolemma from contraction-induced injury. Additionally, the ECM has the potential to change matrix stiffness and control the fate of muscle stem cells. The purpose of this study is to investigate myofiber fusion and ECM alterations in IEC-9 treated mdx mice, as compared to untreated mdx and wild-type mice. IEC-9 treatment of C2C12 myoblasts produced significant morphological changes and appeared to promote the differentiation of myogenic cells. The quadriceps of mice treated with IEC-9 was decellularized and stained in an indirect immunofluorescence assay for various extracellular matrix components. The results of this experiment indicate that IEC-9 treatment leads to changes in ECM components related to matrix stiffness and adhesion. This change may alter mechanical properties of the ECM and improve the engraftment potential of muscle stem cells to prevent muscle disease progression in DMD.

Jordan Tice

Title: Galectin-1: a novel biologic for the treatment of Duchenne muscular dystrophy
Funding Source: Honors Undergraduate Research Award, Nevada INBRE, Nevada Undergraduate Research Award
Mentors: Pam VanRy and Dean Burkin
Department: Pharmacology
University of Nevada, Reno

Duchenne Muscular Dystrophy (DMD) is a genetic disorder caused by a mutation in the dystrophin gene. Patients who present with this life-threatening disease usually suffer from respiratory failure due to irreversible effects on the diaphragm. There is no cure for this devastating disease. Mdx mice have the same dysfunctional dystrophin gene as patients and are the standard mouse model used for DMD. Systemic and intra muscular treatments with recombinant Galectin-1 protein have been shown in the Burkin lab to improve skeletal muscle viability. DMD patients and mdx mice suffer from debilitating muscle fiber degeneration over time. Injection of cardiotoxin from the Naja Naja cobra venom into the lower leg muscles of these mice provides a set severe injury time point. Galectin-1 has been shown in an arthritis model as playing a central role in decreasing inflammation. Histopathology and contractile performance data have provided evidence that Galectin-1 protein therapy reduces the damage of cardiotoxin.
Aaron Unger

Title: Galvanic Corrosion of Stainless Steel 316L and Inconel 625 in Molten LiCl-Li2O
Funding Source: Nevada Undergraduate Research Award
Mentor: Dev Chidambaram
Department: Materials Science and Engineering
University of Nevada, Reno

Pyroprocessing is a method of recovering uranium and plutonium from used nuclear fuel so that it can be recycled into a closed fuel cycle. However, one of the main inhibitors to the widespread implementation of these technologies is the corrosion of the structural materials to contain the molten salts that are used as electrolytes at various stages in the process. Such corrosion suppresses material longevity resulting in increased costs due to the degradation of salt-containing crucibles and increased concerns about system integrity. Furthermore, galvanic corrosion occurs inside the containers where differing materials are in contact, creating an accelerated rate of corrosion. It is currently unknown to what degree galvanic effects accelerate corrosion in molten salts relevant to pyroprocessing. The majority of research in this field covers static exposure testing which does not take into account galvanic effects at material junctions. The focus of the current work is to quantify the acceleration to material degradation that may occur during the electrolytic reduction of actinide oxides. Long exposure corrosion testing of Stainless Steel 316L and Inconel 625, two commonly used alloys in the field, resulted in a noticeably increased rate of corrosion in the harsh molten LiCl environment. These findings can be used to better predict material failure in molten salt conditions.

Jonathan Vivet

Title: Warming up to good food: do bees heat up for chemically altered pollen?
Funding Source: Nevada Undergraduate Research Award
Mentor: Anne Leonard
Department: Biology
University of Nevada, Reno

Bees forage for pollen and nectar, sources of protein and carbohydrates respectively. Each is imperative for bee survival and development; bees can sense the quality of these rewards, and expend more energy when foraging for higher quality rewards. When collecting nectar bees assess its nutritional quality and chemical composition on the flower. Alternatively, bees do not typically consume pollen on the flower, but rather carry it back to the colony where it is fed to developing larvae. This difference in collection led us to ask whether, and how, bees might assess the quality and chemical composition of pollen rewards while foraging. We tested the hypotheses that bees taste the pollen they collect, and change their foraging behavior based on its perceived quality. To test this hypothesis, we allowed bumblebee foragers (Bombus impatiens), to collect pollen on artificial flowers that offered pollen that had been chemically adulterated with cellulose (tasteless), sucrose (preferred by bees), or quinine (a bitter compound which is aversive to bees). We then measured thoracic temperature of individually foraging bees (a good proxy for foraging effort) with a thermal camera. We predicted that if bees taste the chemical composition of the pollen they collect, they would spend less energy collecting quinine-adulterated pollen and would have lower thoracic temperatures. We found that though bees became hotter when foraging, there was no difference in temperature change across our adulteration treatments. These results are part of a larger experiment that found that bees likely taste pollen; therefore, this experiment raises intriguing questions about how bumblebees’ assessment of pollen impacts foraging behavior.
Kyle Von Schimmelmann

Title: Entrance of Nitric Oxide into Human Myometrial Cells via S-nitrosoglutathione
Funding Source: Nevada Undergraduate Research Award
Mentors: Heather Burking Ph.D. and Craig Ulrich Ph.D.
Department: Pharmacology
University of Nevada, Reno

Nitric Oxide (NO) has been well established as an important signaling molecule for the mechanism of smooth muscle relaxation. Relaxation of the myometrium (human uterine smooth muscle) is essential during gestation. Previous experiments have shown that NO relaxes human myometrium in term patients, preterm myometrium does not relax sufficiently to NO suggesting a possible difference in the ability of NO to enter preterm muscle cells. Such a difference could underlie the mechanism of preterm labor. Preterm labor and the complications that arise from it are the leading cause of infant mortality rates within the United States (Callaghan et al., 2006). The mechanism for NO transfer across the human uterine smooth muscle (HUSM) cells is unique but has not been fully defined yet. In our project we used HUSM cells to determine how NO enters cells treated with S-nitrosoglutathione (GSNO). GSNO is thought to be the natural chemical form in which NO is present within the body. Cells were pretreated with 4-amino-5-methylamino-2',7'-difluorofluorescein diacetate (DAF-FM) and then a single dose of GSNO was applied to the cells. The reaction between DAF-FM and GSNO produce fluorescence and signal the entrance of GSNO into the cell. In our experiments we determined that NO enters the HUSM cells following treatment with GSNO. Treatment of the cells with acivicin (a gamma glutamyl transpeptidase inhibitor) prior to GSNO application reduced the ability of GSNO to enter the cells. These data suggest GSNO crosses the myometrial membrane and that gamma glutamyl transpeptidase mediates GSNO uptake in myometrium.

Laura Wozniak

Title: Potential Biomarkers for Lyme Disease Diagnostic
Funding Source: Nevada INBRE
Mentor: Kathryn Pflughoeft
Department: Molecular Microbiology and Immunology
University of Nevada, Reno

Borrelia burgdorferi is the causative agent of Lyme disease, the most common tick borne disease in both the U.S and Europe and accounts for around 300,000 new cases in the U.S per year (CDC). While treatment options are available, ease of treatment is related to stage of infection, making early diagnosis desirable. Current diagnostics rely on the detection of antibodies, which is a delayed host response that can extend the time until treatment. The direct detection of an antigen from the host would allow for an earlier diagnosis. Our overall hypothesis is that proteins expressed in the host can be used as antigens for the diagnostic for Lyme disease.

The outer surface of Borrelia burgdorferi is populated by an array of proteins, a subset of these bacterial surface proteins is up-regulated upon transmission to the host, thereby marking these proteins as potential biomarkers. Some of these proteins include Outer Surface Protein C (OspC), decorin-binding proteins (DbpA), VlsE, and the complement regulator acquiring surface proteins. All are expressed at different levels throughout the course of infection and elicit an antibody response. To study this, we took a two-pronged approach 1. Selected candidate targets and probed in vivo lysates and supernatants using Western Blot and ELISA analysis 2. Mass spectrometer analysis to determine potential candidates in infected host sera. We have found that antigen X is detectible in both in vivo lysate and supernatant, making this a good candidate target for an early diagnostic.
Camelina sativa is a drought-tolerant oilseed crop used for biofuel production. Camelina cake (CC) is the by-product of oil production that has residual oil and protein that can be used by ruminants as an alternative feedstuff rich in AA and PUFA. The objective of this study was to assess whether CC could partially replace a protein source at two different dietary fat levels and its effects on ruminal fermentation and nutrient digestibility in a dual-flow continuous culture system. Diets were randomly assigned to eight fermenters in a 2x2 factorial arrangement of treatments (CC and fat level) in a 4x4 Latin square design with four 10-d experimental periods. Treatments were: A) 7.7% CC inclusion at 5% EE (CC5); B) no CC at 5% EE (NCC5); C) 17.7% CC at 8% EE (CC8); and D) no CC at 8% EE (NCC8). Fermenters were fed 72 g of DM/d twice daily. On d 8, 9, and 10 of each period, 10 mL digesta effluent samples were filtered through four layers of cheesecloth, acidified, and centrifuged for ruminal NH₃ and VFA analyses. Results are presented in Table 1. Ruminal pH and NH₃-N were not affected by CC supplementation or dietary fat levels. Total VFA concentration decreased when CC was fed and was not affected by dietary fat. Molar proportions of propionate, valerate, isovalerate and total concentration of BCVFA were greater in CC diets. Molar proportion of Isobutyrate was greater when 8% fat was fed. These results indicate that dietary CC reduces total VFA and acetate while increases propionate, valerate, isovalerate, and total BCVFA. Reduction in total VFA concentration may be a consequence of reduced digestibility, which could be due to the presence of glucosinolates in CC. The shift from acetate to propionate observed when CC was fed may be advantageous from an energetic standpoint.