Summer
Undergraduate Research
Symposium

Research | Scholarship | Creative Activity

University of Nevada, Reno
Research & Innovation
Where big ideas ignite.℠

August 9, 2018

SUMMER UNDERGRADUATE RESEARCH SYMPOSIUM

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SYMPOSIUM SCHEDULE

Thursday, August 9, 2018

Lawlor Events Center, Silver & Blue Room Lobby
12:30 - 1 p.m. Participant Sign-in and Poster Hanging

Lawlor Events Center, Silver & Blue Room
1:30 – 3:30 p.m. Poster Symposium and Reception

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 at **unr.edu/undergradresearch**

PROGRAM SPONSORS

Experimental Program for the Stimulation of Competitive Research (NSF EPSCoR)

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

Associated Students of the University of Nevada (ASUN)

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

If you have any questions about ASUN, please visit the website at http://www.nevadaASUN.com , call 784-6589, or visit our offices on the 3rd floor of The Joe Crowley Student Union in the Center for Student Engagement.

Undergraduate Research, University of Nevada, Reno

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.

University of Nevada, Reno

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

ABSTRACTS - POSTER PRESENTATIONS

Brett Allen

Title: CRISPR Cas9 Base Editing in Yeast
Funding Source(s): Nevada IDeA Network of Biomedical Research Excellence (INBRE)
Mentor: Professor Ian Wallace
Department: Biochemistry and Molecular Biology
Institution: University of Nevada, Reno

Clustered Regularly Interspaced Palindromic Repeat (CRISPR) technology has made huge advances in recent years, for its programmable endonuclease activity and use as a gene-editing tool. CRISPR Associated Protein 9 (Cas9) native to Streptococcus pyogenes has been heavily focused on. Wildtype Cas9 is a part of prokaryotic immune defense system that induces double stranded breaks (DSBs) in DNA. The cut site is determined by a single strand guide RNA (sgRNA) with a complementary 20 base pair recognition sequence next to a protospacer adjacent motif (PAM) sequence. A proof of concept was developed using wild-type Cas9 to knockout GFP fluorescence in yeast. Cas9 Variants have been coupled to an adenine deaminase resulting in a construct that makes specific A to G mutations. The mutations induced by these A-base editors can be used to identify and remove key phosphorylation sites by mutating threonine residues to alanine. The available A-base editors are currently being sub-cloned from mammalian expression vectors into a yeast expression cassette to identify key phosphorylation threonine residues in bio-medically relevant homologous genes.

Alexander Alvarado

Title: Identification of the competence-stimulating peptide in Streptococcus sinensis
Funding Source(s): Nevada IDeA Network of Biomedical Research Excellence (INBRE)
Mentor: Professor Yftah Tal-Gan
Department: Chemistry
Institution: The Davidson Academy of Nevada

Streptococcus sinensis is an emerging opportunistic pathogen that has been linked to infectious endocarditis, intestinal type gastric cancer, periodontitis, bacteremia, and post-operative maxillary cysts. Originally isolated from the heart of an infective endocarditis patient in 2002, this organism was later determined to be a common Streptococci found in the oral microbiome. Thus far, only limited information about this organism, its pathogenesis and communication mechanisms, is available. Quorum sensing (QS) is a bacterial communication mechanism used by bacteria to measure their population density in a given environment and synchronously activate genes associated with various physiological phenotypes that are beneficial to a species survival. QS-regulated phenotypes include the development of biofilms, change in motility, production of virulence factors, bacteriocin production, and competence. Our research focuses on uncovering QS signaling pathways in S. sinensis and the phenotypes regulated by these pathways.

Natalie Arnold

Title: Extracting Spatial Relations from Natural Language Instruction
Funding Source(s): REU Site Human-Robot Collaboration
Mentor: Professor Monica Nicolescu
Department: Computer Science and Engineering
Institution: University of Nevada, Reno

This paper addresses the problem of specifying spatial relations to a robot using prepositional phrases spoken in natural language. The goal is to increase the complexity of spoken instructions to include spatial relations such as over, under, next to, etc. with respect to objects within the robot's vision. These relations will be used to identify destination locations for behaviors in order to give users more control over the robot's actions. To do this, prepositions will be identified in the speech of the user, the noun phrases following the prepositions will be identified, and the prepositions will be translated to offsets in space with respect to the objects found in the noun phrases. This method will be integrated into a preexisting architecture capable of handling non-sequential instructions with ordering constraints and optional paths of execution. The new capabilities will be demonstrated by a human giving spoken instructions to a humanoid PR2 robot which will then execute a building task on a piece of IKEA furniture.

Marco Balboa

Title: Optical Tweezing and Adaptive Optics
Funding Source(s): Nevada Undergraduate Research Award, International Undergraduate Research Award, ASUN
Mentor: Professor Thomas Kidd
Department: Biology
Institution: University of Nevada, Reno

The primary focus our project was to utilize a liquid deformable mirror to manipulate the movement of biological molecules. The magnetic liquid deformable mirror is an adaptive optics device that utilizes the magnetic field generated from a small set of coils, in order to manipulate the surface of a ferromagnetic fluid with a mirror surface. The aim of this device is to correct for aberrations of light as it passes through a turbid or heterogenous media (such as human tissue) to obtain a clear image. Optical tweezing is a process in which beams of light are used to control the movement of micrometer sized particles. Normally the amount of pressure a beam of light exerts on an object is insignificant, but when dealing with smaller particles, that pressure can be used to create a trap for various molecules.

Daniel Barnes

Title: Measurement of exfoliated cells in urine for bladder cancer detection
Funding Source(s): International Undergraduate Research Award, Nevada Undergraduate Research Award
Mentor: Professor Christie Howard
Department: Biotechnology
Institution: University of Nevada, Reno

Current bladder cancer detection methods are time-consuming, invasive, sensitive, and expensive. The goal of our project is to create a new diagnostic technique that is rapid, inexpensive, and automatic. To accomplish this, the project has been attempting to clarify the relationship between the electrical properties of the cell and medical state of the cell establishing a relation model between the two. Once completed, this project aims to create a new diagnostic technique used in the screening of high-risk groups and prognostic monitoring. Currently, the program is focused on establishing the biophysical properties of cells that are compromised by the presence of cancer. The mechanical properties of compromised cells differ from healthy cells. Cancer progression will distinctly disrupt and reorganize the structural integrity of the cell. Therefore, establishing a correlation between mechanical properties and the electrical properties of a cell could lead to the quick and effective detection of bladder cancer in voided cells found in urine. The academic poster will focus on the introductory concepts regarding cellular mechanics and electrical properties of cancerous cells, the methodology behind the current testing to establish a correlation between the two to aid in the detection of cancer, the current status of ongoing research, and the final project goals and expectations.

Dominic Basile

Title: EZH2 inhibition affects the homeostasis of NFkB and NKILA in breast cells
Funding Source(s): Nevada IDeA Network of Biomedical Research Excellence (INBRE)
Mentor: Professor Cristiana Iosef
Department: Biotechnology
Institution: University of Nevada, Reno

We discovered a unique signaling loop based on the interaction among three molecules that can be pharmaceutically controlled in breast cancer. These molecules are: i) nuclear factor kB (NFkB) a transcription factor associated with inflammation and cancer, ii) NKILA, a long non-coding RNA (lncRNA) that regulates NFkB activity towards reducing cancer progression and iii) the EZH2 (enhancer of zeste homologue-2) protein, a chromatin repressor that can activate NFkB transcription through non-canonic mechanisms, potentially altering the anti-tumoral role of NKILA. To prove its functionality, we depleted one component of the "EZH2-NFkB-NIKILA" signaling loop at a time and observed significant fluctuation of the other two partners in both normal breast cells (HMEC) and cancer cells, estrogen receptor (ER) negative ER-/MDA-231 and ER+/MCF-7. a) Inhibition of EZH2 led to a significant increase in NKILA in all cells types with the highest peak (>45%) in ER+ cells. As expected, the excess of NKILA produced a proportional decrease in NFkB. b) In contrast, inhibition of NFkB restricted NKILA in all cell lines, but interestingly, augmented EZH2/H3K27me3 expression in the normal breast cells. Also in these cells insulin and insulin-like growth factors receptors (IGF-IR) were dysregulated and this is important because it upregulates ER functions in these cells. c) Finally, a moderate rate of 30%-inhibition of NKILA dramatically increased (>5x) the expression of nuclear EZH2 and NFkB in both cancer cell lines. Furthermore, cell invasion and migration were significantly reduced by the partial loss of EZH2, but only in the ER- cells, while proliferation was substantially decreased only after NFkB inhibition. This suggests that EZH2 inhibitors should be associated with NFkB depletion in order for their action to be fully effective in breast cancer and thus we are currently evaluating this hypothesis in a mouse model.

Jessica Bisbee

Title: The Effects of Reward Value and Retro Cueing on Working Memory
Funding Source(s): NSF EPSCoR UROP
Mentor: Professor Marian Berryhill
Department: Psychology
Institution: University of Nevada, Reno

You are looking for your keys and walking around your house trying to recall where you left them. Your significant other says they are on the coffee table in the room you just exited. This information serves as a retrospective attentional cue directing your attention to your mental representation of coffee table items. In laboratory settings, a visual retro cueing supports superior performanace at later working memory recognition, even though no new information is provided. The comparison is between a neutral and a valid retro-cue such that one provides no hint as to what will be tested and the second provides a spatial cue. Here, we are extending our previous robust to add a second feature: trial reward value. In other words, finding your keys is more important than recalling the pencil on the same table. Here, each trial will be associated with a different reward value. Two hypotheses seem likely: first, that the retro-cue benefit will shrink because performance on valid and neutral cue trials will be equivalent. Alternatively, the retro-cue benefit may be enhanced by encouraging greater attention to the valide cue trials. Prior to each task, one, two or three dollar signs will indicate the value of the upcoming trial. Each trial will present two brief, rapid streams of letters. Half of trials will include a valid retro-cue indicating the stream that will be probed, and half will present a neutral cue. Participants will be asked to report whether a probe letter was on the indicated letter stream. This will test the benefit of the retro cue and help increase understanding surrounding the working memory process.

Nicholas Bolden

Title: GrgA as a Target of Novel Selective Antichlamydials Benzylidene Acylhydrazides
Funding Source(s): RiSE Scholars, New Jersey Space Grant Consortium, McNair Scholars Program
Mentor: Professor Huizhou Fan
Department: School of Medicine
Institution: University of Nevada, Reno

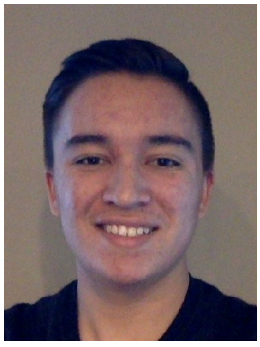
Chlamydia is one of the most prevalent sexually transmitted infections in today's society. If left untreated, chlamydial infection can lead to pelvic inflammatory disease (PID), infertility, and ectopic pregnancy. It is caused by the bacterium, Chlamydia trachomatis, which requires a host cell for replication. Broad-spectrum antibiotics are used for treatment; however, they also kill normal gut and vaginal microbiota which are required to maintain our body's health. Since there is a need for more specific treatments, researchers from our lab have developed potential therapeutics in the class of benzylidene acylhydrazides "BAs" which specifically target chlamydial cells. However, the mechanism behind how the BAs inhibit chlamydial growth is unknown. Previous research in the lab identified four potential SNPs which allowed a mutant, designated MCR, to confer resistance against the BAs. Through genome recombination and clonal populations, we suggest that the fourth SNP, designated grgA R51G, is required for resistance against the BAs. Here, we report our attempt to generate a grgA R51G mutant C. trachomatis using fluorescent-reported allelic exchange mutagenesis (FRAEM) methods to determine if the mutant confers resistance to the benzylidene acylhydrazides, as we expect that the grgA R51G mutant C. trachomatis will grow on plates containing one of the BA compounds as well as express green fluorescence under a fluorescent microscope. These expected results will firmly establish grgA as a potential target for therapeutic and prophylactic intervention of Chlamydia.

Alec Brennan

Title: Use of Multivalent Peptides in Selectively Trapping Dimeric Vancomycin to Prevent Colonic Bacterial Stress
Funding Source(s): Nevada IDeA Network of Biomedical Research Excellence (INBRE)
Mentor: Professor Yftah Tal-Gan
Department: Chemistry
Institution: University of Nevada, Reno

Vancomycin acts as a last resort antibiotic used to treat infections caused by bacteria that are resistant to routine antibiotics, such as methicillin resistant Staphylococcus aureus (MRSA) and Clostridium difficile. Vancomycin acts by strongly binding to a peptidic precursor terminating in acetyl-L-Lysine-D-Alanyl-D-Alanine of the bacterial cell wall. This binding inhibits activity of the bacterial transpeptidase, preventing normal cross-linking of the bacterial cell wall and causing cell lysis or bacteriostasis. During treatment, vancomycin is administered intravenously, allowing it to travel via the human blood stream to reach the site of infection. Previous studies indicated that once administered, vancomycin has the tendency to naturally dimerize and subsequently bind to a peptidoglycan precursor with increased affinity. Furthermore, following IV administration vancomycin is subject to biliary excretion, which allows for accumulation of high concentrations of the antibiotic in the colon for several weeks to several months. This accumulation of vancomycin in the colon facilitates the selection for vancomycin-resistance amongst colonic Enterococci species-these resistant genes can then be transferred to other species of bacteria, thus immensely diminishing the effectiveness of vancomycin. In this project we propose a method to mitigate Enterococcal resistance to vancomycin by designing an orally administered peptide analog that will accumulate in the colon and chemically trap dimeric vancomycin and inhibit its activity in the colon. To this end, a new library is being created that combines a multivalent scaffold with tripeptide-Lysine Nα,ε functional group modifications previously found to have high affinity for vancomycin. This library of multivalent peptides will be used to further investigate how to increase inhibition of vancomycin when exposed to vancomycin-susceptible strains of Enterococci (VSE) in vitro.

Tristan Brodeur



Title: Search and Rescue Operations with Mesh Networked Robots
Funding Source(s): NSF REU
Mentor: Professor Shamik Sengupta
Department: Computer Science and Engineering
Institution: University of Nevada, Reno

Efficient path planning and communication of multi-robot systems in the case of a search and rescue operation is a critical issue facing robotics disaster relief efforts. Ensuring all the nodes of a specialized robotic search team are within range, while also covering as much area as possible to guarantee efficient response time, is the goal of this paper. We propose a specialized search-and-rescue model based on a mesh network topology of aerial and ground robots. The proposed model is based on several methods. First, each robot determines its position relative to other robots within the system, using the received signal strength indicator (RSSI) of each node. Packets are then communicated to other robots in the system, providing information regarding system status, status of the mission, and identification number. After the subject is found, extraction via a rubber-band RSSI approach is then coordinated.

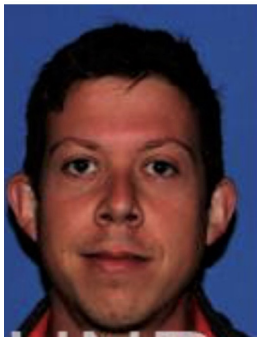
Maya Cratsley

Title: Understanding Role-Appropriate Capacities for Robots
Funding Source(s): REU Site: Collaborative Human-Robot Interaction, National Science Foundation, award #CNS:1757929
Mentor: Professor Dave Feil-Seifer
Department: Computer Science and Engineering
Institution: Brown University
This study explores which capacities humans expect from advanced robots depending on the role that they are performing. The capacities in question fall into one of five groups: positive social affect, negative affect, moral, social cognitive, and real intelligence. We distributed a survey to professionals from four domains: medicine, education, fire and rescue, and military. The roles we examined were selected based on relevance in the above-mentioned domains as well as the social nature and subservience of the role. We explored the relationship between the domain of the role, social nature of a role, subservience of a role, and capacity ratings.

Stacey Grace Cubos

Title: Eddy Current Flaw Detector Inspection Robot Simulation in Virtual Reality
Funding Source(s): NSF Grant No. CNS-1757929
Mentor: Professor Huy Pham
Department: Electrical and Biomedical Engineering
Institution: University of Nevada, Las Vegas
Aiming to prevent the percentage of human casualties in manual bridge inspections, we propose a novel approach using a virtual reality (VR) system simulation. A simulated inspection robot will conduct an inspection with an eddy current flaw detector (ECFD) device. The ECFD will be evaluating the thickness and improper welding on the steel metal joints of the bridge structure. In the VR system, a bridge inspection simulated environment is replicated for the robot to gather information with the ECFD. The environment is conducted inside the video game engine called Unity and any additional designs will be made in the graphic software, Blender. The operating system we will be using to gather our data is in the robot operating system (ROS). There will be communication between ROS and Unity through a ROS Bridge Library for the Windows and Linux based systems. The simulation will provide a robot substitute for the human operator but, there will be a human-based system through the VR system. Thus, the simulation will decrease the number of human lives that are affected by dangerous labor.

Heinrich Mario Umberto di Santo



Title: Effects of multiwall carbon nanotube in lateral root growth of tomato and lettuce
Funding Source(s): International Undergraduate Research Award
Mentor: Professor Felipe H. Barrios Masias
Department: Agriculture, Nutrition and Veterinary Sciences
Institution: University of Nevada, Reno, Universita' degli studi della Tuscia

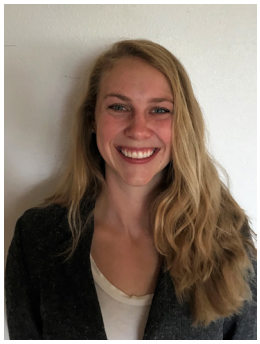
Multiwall carbon nanotubes (MWCNT) are a nanomaterial a lot used in engineer products, in cosmetics, for producing enzymes, and special clothes; they consist of multiple rolled layers (concentric tubes) of graphene of size ranging from XX to XX nanometers, diameter of 9.5 nm and average length of <1.0 µm. During the work of Kamol Das et al. (2018) they observed changes in root architecture of lettuce. In this experiment, lettuce (Lactuca sativa, cv. Black Seeded Simpson), and tomato (Solanum licopersicum) were exposed to different concentrations of MWCNT in the growing solution. A hydroponic suspension of two different concentration of MWCNT 10mg/l and 20mg/l and a control without MWCNT were used. The hydroponic solutions were composed of 10% Hoagland solution for control, and 10% Hoagland solution plus 10mg/l or 20mg/l of MWCNT (total of three treatments; 8 plants of each species per treatment; 48 plants total). Measurement of daily transpiration, leaf area, root length, dry biomass of shoots and roots were done. The results showed differences in term of lateral roots growth, transpiration and quantity of biomass. The plants with the MWCNT showed an increase of lateral roots of biomass and transpiration. That could have an important implication for future study of the interaction between MWCNT and horticultural plants. MWCNT perhaps could help plants to develop better their roots systems in hard environments like cold soil in Nevada.

Kaitlyn Duvall

Title: Creating a tree ring chronology for Fonte Regna beech (Fagus sylvatica L) in Central Italy
Funding Source(s): International Undergraduate Research Award
Mentor: Professor Julie Stoughton
Department: Natural Resources and Environmental Science
Institution: University of Nevada, Reno

This project focused on the use of tree ring data to create a chronology for Fonte Regna beech (Fagus sylvatica L), located in central Italy. Chronologies are helpful in the analysis of ecosystem responses to changes over time and can be useful in predicting future changes. The chronology was correlated with monthly climate data to assess that impact local climate had on tree growth. The Fonte Regna site showed steady growth until the 1970's when changing climate conditions, specifically temperature and water availability, began to impact the rate of growth. This site was impacted most by higher temperatures and reduced water availability in June, July and August of each year. This research is useful in the application of different management and harvesting techniques to ensure the longevity of the site.

Elizabeth Everest



Title: Benthic Meiofauna Community Composition in the Elkhorn Slough Estuary
Funding Source(s): Nevada Undergraduate Research Award, Mead Undergraduate Research Award
Mentor: Professor Jeffery Baguley
Department: Biology
Institution: University of Nevada, Reno

Benthic meiofauna are multicellular organisms that live in sediments in a wide range of aquatic ecosystems from alpine lakes to deep sea environments. The term "meio" is a size classification for organisms that can pass through a 500µm sieve and are captured by a 20µm sieve. Nematodes and harpacticoids are the dominant taxa, usually composing up to 95% and 5% of community abundance respectively, while other taxa account for <1%. While extensive research has been conducted on meiofauna in estuaries all over the world, very little research has been conducted on meiofauna in the Elkhorn Slough National Estuarine Research Reserve (ESNERR) of Monterey Bay, California. In estuaries, meiofauna play a critical role in nutrient regeneration and serve as important food sources for juvenile fish. Without meiofauna, marine ecosystem function would be dramatically altered, so it is critical to understand benthic meiofauna community composition, in relation to changes in environmental factors over time. This study investigates the meiofauna community structure, characterized by abundance and diversity, in the Elkhorn Slough estuary and how it may be affected by environmental factors such as sediment grain size and water quality. Samples of sediments containing meiobenthic fauna collected throughout 2017 are being analyzed using standard methods to determine the abundance and diversity of meiobenthic organisms. Statistical analysis of community structure in relation to water quality data over the course of one year in the Elkhorn Slough will contribute valuable data to similar studies on meiofauna being conducted in estuaries around the world.

Ryan Fite

Title: Free Space Detection for Autonomous Exploration of Subterranean Environments
Funding Source(s): National Science Foundation Research Experience for Undergraduates Site Grant
Mentor: Professor Kostas Alexis
Department: Computer Science and Engineering
Institution: University of Nevada, Reno

In visually degraded subterranean environments such as mines and caves the ends of long corridors can easily exceed the range of a drone's sensors. This makes it difficult to navigate these types of environments because the robot's navigation is only based on sensor returns which will cause it to navigate in a serpentine motion from wall to wall instead of traveling down the corridor's center. This reduces the drone's capability to explore and navigate efficiently in unknown environments as well as the ability to navigate mines during search and rescue operations. This project approached this problem by finding areas near the end of the robot's perception where there are sparse sensor returns around an area without sensor returns. The algorithm finds these area using a sliding window of sensor measurements and converting the sensor data to a spherical coordinate matrix able to describe trajectories that lead towards the centroid of free space areas in the robot's recent memory.

Brooke Gantman

Title: Development of Modulators of the fsr Quorum Sensing Circuit in Enterococcus faecalis based on the Gelatinase Biosynthesis-Activating Pheromone
Funding Source(s): Nevada IDeA Network of Biomedical Research Excellence (INBRE)
Mentor: Professor Yftah Tal-Gan
Department: Chemistry
Institution: University of Nevada, Reno

Enterococcus faecalis is present in the gut biome of humans and accounts for more than half of all enterococci infections. E. faecalis can cause nosocomial endocarditis, neonatal infections, and urinary tract infections, and is intrinsically resistant to some antibiotics. E. faecalis can transfer its resistance to other bacteria or acquire new antibiotic resistance via genetic exchange. There is an urgent need to develop an alternative treatment to E. faecalis infections as antibiotic resistance spreads. Targeted attacks against bacteria's group-beneficial trait, like quorum sensing (QS), may alter the bacteria's ability to communicate, thus allowing for the attenuation of its pathogenicity without death. This project used structure-activity data to produce potent activators and inhibitors of QS in E. faecalis. These QS modulators can be used as lead scaffolds for the development of novel anti-infective therapeutics.

Eleonora Garozzo Zannini Quirini

Title: Effects of multiwall carbon nanotube in lateral root growth of tomato and lettuce
Funding Source(s): International Undergraduate Research Award
Mentor: Professor Felipe H. Barrios Masias
Department: Agriculture, Nutrition and Veterinary Sciences
Institution: University of Nevada, Reno, Universita' degli studi della Tuscia

Multiwall carbon nanotubes (MWCNT) are a nanomaterial a lot used in engineer products, in cosmetics, for producing enzymes, and special clothes; they consist of multiple rolled layers (concentric tubes) of graphene of diameter of 9.5 nm and average length of <1.0 µm. During the work of Kamol Das et al. (2018) they observed changes in root architecture of lettuce. In this experiment, lettuce (Lactuca sativa, cv. Black Seeded Simpson), and tomato (Solanum licopersicum) were exposed to different concentrations of MWCNT in the growing solution. A hydroponic suspension of two different concentration of MWCNT 10mg/l and 20mg/l and a control without MWCNT were used. The hydroponic solutions were composed of 10% Hoagland solution for control, and 10% Hoagland solution plus 10mg/l or 20mg/l of MWCNT (total of three treatments; 8 plants of each species per treatment; 48 plants total). Measurement of daily transpiration, leaf area, root length, dry biomass of shoots and roots were done. The results showed differences in term of lateral roots growth, transpiration and quantity of biomass. The plants with the MWCNT showed an increase of lateral roots of biomass and transpiration. That could have an important implication for future study of the interaction between MWCNT and horticultural plants. MWCNT perhaps could help plants to develop better their roots systems in hard environments like cold soil in Nevada.

Ariana Julia Gayban

Title: The (Pro)renin Receptor Antagonist, PRO20, attenuates High-Fat Diet-Induced Non-alcoholic fatty liver disease
Funding Source(s): Nevada IDeA Network of Biomedical Research Excellence (INBRE)
Mentor: Professor Yumei Feng
Department: School of Medicine
Institution: University of Nevada, Reno

Non-alcoholic fatty liver disease (NAFLD) represents a diverse array of liver damage linked to obesity, metabolic syndrome, and diabetes. The mechanisms and the treatment for NAFLD remains lacking; however, recent evidence suggests a critical importance of the PRR and the renin-angiotensin system (RAS) in NAFLD. Our laboratory reported previously that the (pro)renin receptor (PRR) plays a critical role in the brain RAS and the onset of hypertension. More recently, the novel PRR antagonistic peptide PRO20 was developed in our laboratory and functions by specifically blocking prorenin from binding to the PRR. We hypothesize that PRR antagonism using PRO20 prevents NAFLD development. To test this hypothesis, wild-type mice in C57Bl/6J background (n=4/group) were fed with either HFD (60% calories from fat) or normal fat chow (NFD, 10% calories from fat) with matching calories for 6 weeks. Two weeks following diet modification, HFD mice were implanted with subcutaneous osmotic pump (4 weeks release model) containing either PRO20 (27ug/kg/d) or saline. At the end of the 6 week treatment, liver tissues were harvested and processed for Oil Red O (ORO) histology staining for lipid accumulation. The presence of lipids indicative of NAFLD was quantified using ImageJ/FIJI software and presented as % of ORO staining to the total area. We found that 6 weeks of HFD (17.57 $\pm$ 3.23 %) induced a significant elevation on liver ORO staining compared with the liver from mice fed with NFD (3.51 $\pm$ 0.86 %, $p = 0.005$). More importantly, PRO20 treatment (7.34 $\pm$1.96 %; $p = 0.03$) significantly reduced the ORO staining in mice treated with HFD. In summary, our findings suggest the potential of PRO20 for the treatment of high-fat diet related NAFLD.

Shannon Harger

Title: Effect of ORF59 degradation during lytic KSHV replication
Funding Source(s): NSF EPSCoR UROP, Nevada IDeA Network of Biomedical Research Excellence (INBRE)
Mentor: Professor Cyprian Rossetto
Department: School of Medicine
Institution: University of Nevada, Reno

Kaposi's sarcoma-associated herpesvirus (KSHV) is a human pathogen and the causative agent of a number of tumor diseases including Kaposi's sarcoma, Multicentric Castleman's disease, and primary effusion lymphoma. KSHV has a large double-stranded genome, approximately 165 kb long, consisting of 87 open reading frames. A characteristic conserved among all herpesviruses is their ability to establish lifelong infections. After an initial infection, the virus persists, and the genome is harbored as an episome within host cells, with periodic episodes of lytic reactivation. During lytic replication viral encoded factors that participate in viral gene expression and DNA synthesis are required for the production of new infectious virions. One of the viral proteins expressed during lytic replications is open reading frame 59 (ORF59), which is the polymerase processivity factor required for DNA synthesis. ORF59 has also been proposed to be involved in lytic gene expression at late time points during infection.

The exact molecular mechanisms involved in KSHV lytic replication are still unknown. To better understand the viral factors recruited during viral lytic replication and the interactions of ORF59 with such factors, we applied the auxin-induced protein degradation (AID) system to specifically target ORF59 for degradation at specific time points during viral reactivation and replication. We introduced an AID tag in-frame of an ORF59 expression plasmid and in a recombinant KSHV BACmid. Cells were harvested at 2, 4, 6, 24 and 48 hours post treatment for western blot analysis of ORF59. Preliminary studies indicate that ORF59 can be degraded as early as 2 hours post treatment and is maintained for up to 24 hours of auxin treatment. Using the AID system will help to determine functions of ORF59 as it plays an essential role in lytic viral DNA synthesis and gene expression during reactivation.

Krymsen Hernandez

Title: If conservation areas target charismatic species, are we losing areas of high biodiversity?
Funding Source(s): Student Research Opportunity Program-Michigan State University
Mentor: Professor Beth Gerstner
Department: Natural Resources and Environmental Science
Institution: University of Nevada, Reno

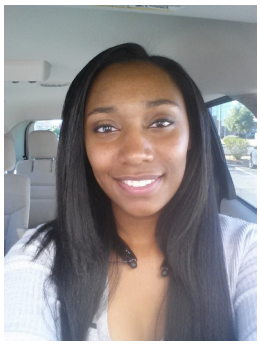
Due to rapid global change, especially in biodiversity hotspots, there is a need to set more realistic conservation goals that maximize conservation efforts for a specific area. Identifying geographic distributions of species by utilizing species distribution models (SDMs) is a key tool for establishing protected areas. Currently, many conservation initiatives and plans for new protected areas are focused on societal preferences for charismatic species, particularly in biodiversity hotspots such as the Northern Andes. This 'umbrella species' approach, though effective at raising funds and bringing attention to conservation issues, has the potential to leave out select regions of high biodiversity and some species that have important ecological functions. To address this issue, we will generate a species distribution model for a charismatic species in the Northern Andes, the spectacled bear (Tremarctos ornatus), and assess how much of the range is covered by protected areas. In comparison, we will generate a species richness map of frugivores, which are important species for seed dispersal in the same region, and quantify the areas of high species richness also protected by national parks and private reserves. By contrasting both maps, we will observe if protected areas are focused on the Andean bear, and by design, if their locations leave out areas of high biodiversity, which could potentially lead to loss of biodiversity in the future.

AnaLisa Honour

Title: The Impact of Robot Criticism on Human Robot Interaction: Self-efficacy and Perceived Intelligence
Funding Source(s): REU Site: Collaborative Human-Robot Interaction
Mentor: Professor David Feil-Seifer
Department: Computer Science and Engineering
Institution: University of Nevada, Reno

People desire interactions that are genuine and personal; therefore, emotions play a vital role in this social transaction. Genuine interactions involve both praise and criticism, for this reason robots may be able to fulfill this desire. The social applications robots have requires strong communication between human-robot partners and allows the robot to act as a coach when delivering both praise and criticism. To determine how robot criticism impacts a person's perception of themself and of the robot, we asked participants to interpret an image in which the robot provided positive, negative, or neutral feedback. We anticipate that positive feedback will cause participants to like the robot more, but that criticism will cause participants to rate the robot as more intelligent. Additionally, participants who receive criticism will feel less competent than those encouraged. Communication is a large component of human-human interaction and understanding how this translates into human-robot interaction improves their social applications. We isolate the effects of criticism and measure a person's perception of their partner robot's humanity, intelligence, and perception of themselves.

Geneva Jones



Title: Acceptability of Empirically-Supported Treatments Across Cultures: A Clinical Sample
Funding Source(s): Nevada Undergraduate Research Award
Mentor: Professor Lorraine Benuto
Department: Psychology
Institution: University of Nevada, Reno

The purpose of the study is to assess the reality that minority clients access mental health services at lower rate. It examines why, once in treatment these groups show poorer outcomes and high dropout rates, by surveying the relationship between perceptions of treatment and the acceptability of certain treatments among ethnic minority clients. The purpose of this study is to have individuals rate three different therapeutic modalities in regard to acceptability of principles and implementation. Results from this study may guide efforts towards culturally adapting treatments so that they fit effectively with the client's expectations.

Omar Kamal

Title: Predicting Pediatric Traumatic Brain Injury Mortality with the National Trauma Data Bank
Funding Source(s): Nevada IDeA Network of Biomedical Research Excellence (INBRE)
Mentor: Professor So Young Ryu (Mihye Ahn)
Department: Mathematics and Statistics
Institution: University of Nevada, Reno

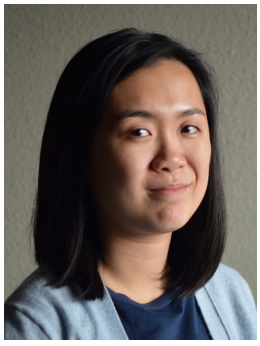
Traumatic Brain Injury (TBI) is a widespread public health issue which affects thousands of individuals each year. These injuries are especially problematic for children whose brains are not yet fully developed, but despite popular concern there currently exist few TBI outcome prediction and triage methods that can be used with this demographic. Common practices used to evaluate TBIs in adults are often difficult to implement (e.g. trauma center exit interviews) or even potentially harmful (e.g. computed tomography scans) for children, and prominent outcome prediction tools such as the Trauma and Injury Severity Score (TRISS) and the Corticosteroid Randomization After Significant Head Injury (CRASH) model are often not specifically designed for head injuries or use within the pediatric cohort. Using pediatric patients entered into the National Trauma Data Bank with head injuries indicated by their abbreviated injury scale ($N = 147,452$), we constructed a new TBI mortality predictive model via multiple logistic regression built specially for pediatric patients. Backward elimination with the Bayesian Information Criterion (BIC) were used for final model variable specification, and cost-sensitive techniques with additional cost placed on false negative misclassifications were used to account for a severely imbalanced dataset. Model performance was evaluated with a variety of measurements including the area under the receiver operating characteristic curve (AUC), accuracy, sensitivity, specificity, false positive rate, false negative rate, and diagnostic odds ratio, and was further compared with the current standard for general trauma injury outcome prediction TRISS. Results showed our model had higher sensitivity (0.990 vs 0.491), AUC (0.987 vs 0.983), false positive rate (0.081 vs 0.008), and diagnostic odds ratio (1213.218 vs 107.475), and lower specificity (0.918 vs 0.991), accuracy (0.920 vs 0.979), and false negative rate (0.009 vs 0.508) when compared with TRISS.

Chuong Le

Title: Multi-agent System for Autonomous Cleaning Robots
Funding Source(s): NSF EPSCoR UROP
Mentor: Professor Hung La
Department: Computer Science and Engineering
Institution: University of Nevada, Reno

There is a lot of harmful waste in an industrial environment that could cause harmful effects to both the products and the worker like product defects, itchy eyes, chronic obstructive pulmonary disease (COPD), etc. We present a multi-agent system for multiple automatic iRobot Create to clean an environment. The reason for multiple robots is one does not have adequate dirt capacity. Moreover, the environment is often too big for one to clean alone. We will first map the environment using Hokuyo lasers and localize itself using Monte Carlos Localization (AMCL). Then we will divide the environment between the iRobots to clean the it several times to collect data and using the Poisson cell-wise process by Hess et al to create a dirt map that estimates the location and amount of dirt in the environment. After that we will using the Voronoi partition to divide the dirt map evenly between the iRobots (the space with more dirt will be smaller than the space with less dirt to ensure even cleaning time). Lastly, we will apply the traveling salesman problem (TSP) to each robot for efficient pathing.

Yi Teng Lee



Title: Copper (I) Oxide as an Electrocatalyst for the Oxygen Evolution Reaction
Funding Source(s): Self-funded
Mentor: Professor Christopher Barile
Department: Chemistry
Institution: University of Nevada, Reno

The electrolysis of water is a well-studied electrochemical reaction that can be used to produce hydrogen gas in a renewable manner. The hydrogen gas can serve as an alternative fuel source to fossil fuels. However, this reaction is limited by the thermodynamically unfavorable oxygen evolution reaction (OER). In this process, the O-H bonds of water molecules need to broken to form O-O bonds for the production of oxygen, thus needing a large amount of driving force. In our work, we construct inexpensive copper (I) oxide thin films that can catalyze the reaction at a low OER overpotential. We further improve the electrocatalytic behavior of the electrocatalyst by decorating it with Ni and using carbon nanotubes (CNT).

Emily MacDiarmid

Title: The Rejuvenation of Rap: A Qualitative Analysis of the Rise of LGBTQ+ Rap Artists
Funding Source(s): Travel Award, Reynolds School of Journalism
Mentor: Professor Ezequiel Korin
Department: Journalism
Institution: University of Nevada, Reno

Following the recent rise of openly LGBTQ+ rap artists, the character of the genre has evolved since its former interpretation of rap as strictly heteronormative music. This investigation offers a broader analysis of LGBTQ+ issues within mainstream rap labels, smaller emerging labels, and independent artists. The recent commercial upgrades of the music industry, due to technical advancements, has allowed for an expansive acceptance of cultural goods. Through a textual analysis of a representative sample of lyrics by Kevin Abstract, Mykki Blanco, and Tyler, the Creator, this study aims to examine the incorporation of LGBTQ+ issues in rap as a form of the growing expression of marginalized groups. Furthermore, by investigating the growing acceptance of LGBTQ+ issues in rap, this study posits that the inclusion of the LGBTQ+ community and their struggles represents a rejuvenation of rap as an area of social norm contestation.

Emily McKenzie

Title: Sorption-Enhanced Power to Gas Reaction
Funding Source(s): Nevada Undergraduate Research Award, ASUN
Mentor: Professor Ion Agirre Arisketa
Department: Civil and Environmental Engineering
Institution: University of Nevada, Reno

Power to Gas technology has the potential to change the world energy market forever; however, the technology has not been perfected. The purpose of this poster is to demonstrate how adding in an adsorbent in the reactor can increase the production of methane. This is done by explaining the theory behind adding an adsorbent to the reaction, comparing the results of an experimental production of biomethane with and without an adsorbent, and looking at the specific limitations of the adsorbent chosen in this work. These features were highly emphasized, as well as the explanations of data to understand more behind how the adsorbent works and if it is a viable option on a larger scale.

Josette Medicielo

Title: A mobile region of DNA influences serotype-specific associations of the group A Streptococcus with specific disease manifestations
Funding Source(s): Nevada IDeA Network of Biomedical Research Excellence (INBRE), McNair Scholars Program
Mentor: Professor Paul Sumby
Department: Microbiology and Immunology
Institution: University of Nevada, Reno

Clinical manifestations of the group A Streptococcus (GAS; also known as Streptococcus pyogenes) are among the most diverse of any human bacterial pathogen, causing infections that range from the mild (e.g. acute pharyngitis; a.k.a. "strep throat") to the severe (e.g. necrotizing fasciitis; a.k.a. the "flesh-eating" infection). GAS isolates are divided into more than 200 serotypes based upon the sequence of a cell wall-anchored virulence factor known as the M protein. Certain GAS serotypes, namely M2 and M28 isolates, have been shown to be non-randomly associated with lethal cases of puerperal sepsis, an infection that can originate at the female urogenital tract following childbirth. The genomes of these serotypes harbor a foreign genetic element designated as Region of Difference 2, or "RD2" - a 36.3 kilobase region seemingly acquired via horizontal gene transfer from Streptococcus agalactiae (the group B Streptococcus; GBS), a common constituent of the normal vaginal microflora, and also a causative agent of neonatal infections. To test the hypothesis that RD2 contributes to the association of serotype M28 GAS isolates with cases of puerperal sepsis, we compared a parental M28 strain with an RD2 knockout mutant derivative, and a complemented mutant derivative in which RD2 had been restored. By using a tissue culture-based adherence assay with human vaginal epithelial cells, we determined the relative adherence of the knockout mutant is significantly lower than the parental or complemented strains. Therefore, RD2 appears to enhance the ability of serotype M28 GAS isolates to adhere to vaginal epithelial cells. While the ability of GAS to colonize the female genital tract has been studied previously, our data are the first with regard to the contribution of RD2 to this process. In conclusion, our data are consistent with gain of RD2 being behind the serotype-specific association of select GAS isolates with cases of puerperal sepsis.

Nikesh Mishra

Title: Utilizing the Brélaz Heuristic to Produce Efficient Four-Colorings of Historical Geopolitical Maps
Funding Source(s): Self-funded
Mentor: Professor Gregory Hurst
Department: Mathematics and Statistics
Institution: University of Nevada, Reno

The four-color theorem (proven first in 1976 by Appel and Haken) is a mathematical theorem that states that any map drawn on a plane with contiguous, non-overlapping regions can always be colored completely using only four colors such that no two bordering regions have the same color. In an attempt to use the theorem in a real-world scenario, this project set out to develop a system that provides a four-coloring of historical geopolitical maps, utilizing minimum cycle completion algorithms and the Brélaz coloring heuristic implemented in the Wolfram language and the Mathematica software program. The choice to use the Wolfram tools for this project was an important one - the functional paradigm of the Wolfram language lends itself quite nicely to implementing a four-coloring of a map, and the magnitude of data available from the Wolfram Knowledge Base allowed a very nice application of this mathematical theorem to a real-world example. In the end, a satisfactory map-coloring algorithm was obtained and incorporated into a Wolfram Cloud-hosted microsite that allowed users to see the world's geopolitical map for a given historical year input.

Ohidul Mojumder

Title: Calculations and Optimization for Hybridization of Ultra-thin Nano-materials
Funding Source(s): International Undergraduate Research Award
Mentor: Professor Andrew Geraci
Department: Physics
Institution: University of Nevada, Reno

In the area of nanomaterials, the use of ultrathin materials has been of significant interest. This is due to the ability to functionally hybridize materials using this method. This means that one can take the benefits of one material and add on the benefits of another material to make up for the downsides of the original material. One such downside exists in the use of supercapacitor batteries. For supercapacitor materials, CoO2 is a very conductive and faradic material that is used in 90% of commercial batteries. The problem is that it has a low capacitance. However, if we look to MnO2, it is a material with a high specific capacitance, good stability, and good cyclablility. The problem with MnO2 is that it has a low electronic conductivity. If we were to hybridize these two compounds by using ultrathin nanomaterials, we could make current batteries more efficient. My research with Dr. Germain Vallverdu in Pau, France dealt with calculating and and finding the optimal magnetic moments, lattice/bond lengths, and hubbard corrections for these two compounds and their H2 bonded counterparts using vasp and VESTA software. This data and research will then be used for future endeavors and research on the best way to hybridize these two materials.

Valeria Nava

Title: Quantification of Carboxyl-Functionalized Carbon Nanotubes in Lettuce Tissues
Funding Source(s): McNair Scholars Program
Mentor: Professor Yu Yang
Department: Civil and Environmental Engineering
Institution: University of Nevada, Reno

Carbon nanotubes (CNTs) have been widely applied in industrial, consumer, and agricultural products based on their unique properties. Consequently, widespread use of CNTs leads to their accumulation in the natural environment, such as agricultural soils. The CNT-contaminated soil can eventually be taken up by agricultural plants, which will result in concerns for food safety. By means of a double digestion method, carboxyl functionalized CNTs (c-CNTs) will be quantitatively analyzed in plant (lettuce) tissues with ultraviolet-visible (UV-Vis) spectroscopic analysis. MWCNT-bound carbon is linearly correlated with the absorbance at 800 nm. UV-Vis is useful for rapid quantification of CNTs in plant tissues but, background interferences from residue plant tissues or nanotube functional groups may obstruct unambiguous detection of c-CNTs. Therefore, a programmed thermal analysis (PTA) will be used to determine a relationship between carbon-bound CNTs and elemental carbon (EC, evolved at 580 °C and 740 °C) detected. This study optimizes the digestion method that will improve current detection limits of c-CNT without compromising their unique thermal stability. Ultimately, to analyze low concentrations of CNT in plant tissues, this method yielded a definite detection and quantification of CNTs. This study offers further understanding of the fate of different types of CNTs and possible implied hazards imparted through their introduction into agricultural landscapes.

Carl Old Person III

Title: A Modern Study of Wetland Soil Carbon Along a North-South Gradient in the Great Basin
Funding Source(s): National Science Foundation GSS Award 1636519
Mentor: Professor Scott Mensing
Department: Hydrology
Institution: University of Nevada, Reno, Salish Kootenai College

Carbon is thought to be produced more in wetland environments and get less as you move through the transition to the upland shrub environments. Percent organic can be used to tell if an area is more productive than other areas. The Great Basin is a very dry environment; we hypothesized that the wetlands will have more soil carbon (percent organics) than the transition and upland areas. We have taken soil samples from three different sites and compared them to test our hypothesis. This study is a contribution to a larger NSF funded project examining long term (century length) dry periods along a south to north latitudinal gradient throughout the Great Basin. These changes can be reflected in records of loss on ignition (LOI), pollen, and various other proxies. The surface sample can be used to compare against core samples to see if the percent organic changes throughout the core. We have found that our hypothesis was right because we are seeing the results of more percent organic in the wetland areas compared to the transition and upland areas. The Potts site wetland sample was three times higher in percent organic than the dry grass meadow transition area sample. The Gund wetland area sample had approximately two times more percent organic than the grassland transition sample. The Timmons site sample didn't have quite the same results but still produced the trend we thought would be there. With these LOI data in conjunction with the pollen and other proxies we are hoping to find or understand more about the century long droughts we are examining. If we understand more about the century long droughts we will be able to better understand the potential impacts if we experience such droughts in the future.

Jordan Palli

Title: 1000 years of envirenmental change in Southern Italy: A preliminary analysis of pollen data from Lago del Pesce.
Funding Source(s): International Undergraduate Research Award
Mentor: Professor Scott Mensing
Department: Geography
Institution: University of Nevada, Reno, Universita' degli studi della Tuscia

This study seeks to understand the vegetation composition changes during the last thousand years in southern Italy and the potential causes for these changes. I analyzed pollen from a 260 cm long sediment core from Lago del Pesce (Monte Pollino, Calabria) in Pollino National Park. The core provides well-preserved pollen and organic materials for 14C dating to create a chronological framework. We dated three wood samples which show a timespan that reaches to 830 AD. The purpose is to understand the vegetation dynamics in the recent past to build a detailed local natural history. Here I present preliminary pollen data. The modern forest is dominated by beech woods (Fagus sylvatica), however, in the early part of the record, during Medieval time (1000 - 1300 AD) beech was much less common. I will examine the vegetation change in relation to known human and climate history to see what factors are controlling forest change. This natural history can then be used to help guide forest restoration management decisions.

Guglielmo Panelli

Title: Data Analysis in the Search For Dark Matter Using the GPS Network
Funding Source(s): McNair Scholars Program, NSF REU
Mentor: Professor Andrei Derevianko
Department: Physics
Institution: University of Nevada, Reno

Describing the essence of dark matter (DM) which permeates throughout the Milky Way and galaxies alike remains among the most extraordinary problems in modern physics. Current estimates indicate that baryonic (ordinary) matter comprises only 5% of the energy of the universe, the rest belonging to dark matter and dark energy. Although the evidence for dark matter through galactic scale gravitational effects is widely accepted, evidence beyond this gravitational interaction remains to be observed, and the microscopic composition of dark matter also remains a mystery. The network of atomic clocks aboard the Global Positioning System (GPS) satellites provides us with the luxury of a 50,000km aperture sensor. With over a decade of archival GPS atomic clock data from NASA's Jet Propulsion Laboratory (JPL), we seek to detect DM at the terrestrial level and describe the potential non-gravitational interactions with baryonic matter through analyzing years of archival high accuracy timing data of the network of satellite and Earth-based atomic clocks. Here we discuss developments of a new signal to noise ratio (SNR) technique based on the Bayesian statistical approach and the "matched filter" technique incorporated by the Laser Interferometer Gravitational Wave Observatory (LIGO). This technique has been tested on the thin domain wall DM signal template with simulated GPS data and has proven to be effective at detecting such injected events. However, cross-clock correlations were neglected in these initial tests and must be considered in future work with more complex DM signals such as thick domain walls, strings and monopoles.

Nicholas Patapoff

Title: EGFR
Funding Source(s): Nevada Undergraduate Research Award
Mentor: Professor Thomas Kidd
Department: Biology
Institution: University of Nevada, Reno

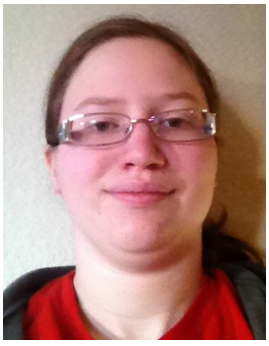
Hirschsprung's disease is a neurological condition in the large intestine found in one in every 5000 newborns which causes a multitude of problems. It is a mutation in the gene RET which leads to a lack of neurons diffusing down the large intestine. This can lead to the symptoms of: growth failure, swelling of abdomen, unexplained fever, and the vomiting of fecal matter. EGFR (epidermal growth factor receptor) is a growth factor for neurons which can be found to play a large role in early stages of development. In Drosophila Melanogaster (common fruit fly), RET and EGFR share biological, peak expression times, and expression locations in the gut. This is a strong indication that EGFR may also play a role in hirschsprung's disease. A drosophila model of hirschsprung's disease utilizing Ret as the primary mutation was used to showcase a possible relation between EGFR and hirschsprung's disease. The method used to find the relation was to cross Ret egfr to Ret so as there are two missing copies of Ret and only one missing copy of egfr in desired flies genotype. The results were then compared to flies with only two missing copies of Ret and no missing copies of egfr to see if there were any clear differences in phenotypes, viability, and frequency. When compared to the Ret mutants with only two missing copies of Ret, the Ret mutants with two missing copies of Ret and only one missing copy of egfr had the same feeding defects during larval stages except the frequency of occurrence was higher and severity of the defects was worse. This showcases the a potential relation between EGFR and hirschsprung's disease since the phenotypes did not differ from the control group. There are more steps to be done and which are currently being done to solidify this relationship. The results clearly show that RET and egfr play critical roles in similar ways, especially during larval phases.

Destany Pete

Title: A Modern Study of Wetland Soil Carbon Along a North-South Gradient in the Great Basin
Funding Source(s): National Science Foundation GSS Award 1636519
Mentor: Professor Scott Mensing
Department: Geography
Institution: University of Nevada, Reno

Carbon is thought to be produced more in wetland environments and get less as you move through the transition to the upland shrub environments. Percent organic can be used to tell if an area is more productive than other areas. The Great Basin is a very dry environment; we hypothesized that the wetlands will have more soil carbon (percent organics) than the transition and upland areas. We have taken soil samples from three different sites and compared them to test our hypothesis. This study is a contribution to a larger NSF funded project examining long term (century length) dry periods along a south to north latitudinal gradient throughout the Great Basin. These changes can be reflected in records of loss on ignition (LOI), pollen, and various other proxies. The surface sample can be used to compare against core samples to see if the percent organic changes throughout the core. We have found that our hypothesis was right because we are seeing the results of more percent organic in the wetland areas compared to the transition and upland areas. The Potts site wetland sample was three times higher in percent organic than the dry grass meadow transition area sample. The Gund wetland area sample had approximately two times more percent organic than the grassland transition sample. The Timmons site sample didn't have quite the same results but still produced the trend we thought would be there. With these LOI data in conjunction with the pollen and other proxies, we are hoping to find or understand more about the century long droughts we are examining. If we understand more about the century long droughts we will be able to better understand the potential impacts if we experience such droughts in the future.

Anastasia Porter



Title: Generalized Search Program to Find Correlations Between Medium Chain Acyl-Coenzyme A Dehydrogenase Deficiency and Other Conditions
Funding Source(s): Self-funded
Institution: University of Nevada, Reno, The Davidson Academy of Nevada

This project, written in the coding language Julia, is aimed at finding articles in a database associated with the eutils functions that are linked to two or more imputed queries. A list of databases compatible with eutils is provided and the user queries are obtained. The program then runs the search and links to similar articles. The output of the program is the ids of articles that appeared in more than one search, which are returned to the user as a text file. Because it is generalized, this program not only helps find possible correlations between Medium Chain Acyl-CoA Dehydrogenase Deficiency (MCADD), it also can serve to find articles of interest for different studies.

Jenny Purdue

Title: Determining the Most Effective Catalyst in Transformation From 5-HMF to 2,5-DMF
Funding Source(s): International Undergraduate Research Award
Mentor: Professor Pedro Miura
Department: Biology
Institution: University of Nevada, Reno

Replacements to crude oil as the world's leading energy source is a topic of interest to many in the scientific community right now. Biomass is a promising substitute with various environmental benefits. This experiment aims to find the best pathway between 5-Hydroxylmethylfurfural (HMF), a platform molecule of second generation biomass, and 2,5-Dimethylfuran (DMF), a promising fuel alternative or addition. This is done using various catalysts of nickel and copper allowed to react in a continuous system. Measured by chromatography, the best ratio of nickel and copper in the catalyst is determined by the yield of each product. This reveals which catalyst allows for the greatest production of desired product. These experiments found that 15Cu-30NiZr provides for the highest rate of conversion as well as the most consistent rate of conversion, making it the best catalyst to assist in this pathway.

Monique Ramirez

Title: Gait Analysis for Pre-Clinical Testing of FSHD-like Mice
Funding Source(s): Nevada Undergraduate Research Award
Mentor: Professor Peter Jones
Department: Pharmacology
Institution: University of Nevada, Reno

Facioscapulohumeral muscular dystrophy (FSHD) affects females and males of all ages and there currently is no therapy. This is an autosomal dominant disease characterized by the progressive weakness of specific muscle groups. About 20% of individuals affected by FSHD eventually become wheelchair bound. The Jones Lab recently created the first phenotypic mouse model for FSHD that is suitable for pre-clinical testing of potential therapeutics, however, non-invasive quantitative metrics of muscle function are needed. Here, treadmill running and gait analysis were performed on FSHD-like mice of varying severity to form baseline data and assess the utility of these analyses. The Digi-Gait is novel technology that uses a high-speed camera with Ventral Plane Imaging technology creating digital paw prints to measure the manor of walking for laboratory animals, simultaneously analyzing over 70 parameters per run, proposed to allow detection of subtle differences in the gait as their muscles progressively weaken with onset of pathology. Surprisingly, the moderate FSHD-like mouse model showed no significant gait differences despite significant differences in treadmill running compared with control. Additionally, analysis of the skeletal muscles showed increased histopathology, including centralized nuclei shown via H&E stain, and increased fibrosis visualized using Sirius Red staining in the FSHD-like mouse. Thus, since the Digi-Gait analysis did not identify any differences between control and moderately affected FSHD-like mice despite there being drastic differences found when using standard techniques, we conclude it is a poor metric for analyzing this particular model.

Erin Kristin Ramos

Title: The Effect of Stratification and Seed Manipulation on Milkweed Germination and Growth
Funding Source(s): Nevada IDeA Network of Biomedical Research Excellence (INBRE)
Mentor: Professor Megan Lahti
Department: Biology
Institution: Truckee Meadows Community College

The objective of our research is to investigate riparian milkweed germination, survivorship, and growth rate by manipulating seed stratification and seed coats from Asclepias fascicularis (narrowleaf milkweed) and A. speciosa (show milkweed). This information will improve milkweed restoration efforts for native habitat, monarch butterflies, and other pollinating insects; monarch butterflies have an obligate symbiotic relationship with milkweed and their populations are in decline. First, we will locate populations of A. fascicularis and A speciosa, from which we will collect 1,000 seeds from 5 study sites. Then, we will experimentally manipulate the seeds using chemical, mechanical, and thermal variables to determine the effects on germination, survivorship, and growth rate. This information will be used to facilitate restoration efforts of riparian milkweed species.

Kyle Respicio

Title: KaliGreen
Funding Source(s): International Undergraduate Research Award
Mentor: Professor Philippe Roose
Department: Mathematics and Statistics
Institution: University of Nevada, Reno

A commonplace issue with portable technology is battery efficiency. While many industries are trying their best to improve battery life without sacrificing a product's quality and efficiency, further can be done to improve battery consumption on one's mobile device-from tablets to smartphones to laptops to everything else. These mobile devices depend on a variety of applications to fulfill the user's needs such as providing directions to work or video chatting with friends and family; moreover, many of today's applications are based on a microservice architecture. We introduce a new algorithm-KaliGreen-that can maneuver the microservices within a network of devices in order to maximize the run-time of a microservice-based application; additionally, KaliGreen allows a increase in the run-time of an application by shifting microservices from devices with low battery or inefficient processing ratios to devices in better conditions. To achieve this, KaliGreen utilizes KaliMucho middleware, which is able manipulate microservices in run-time. This algorithm provides a plausible solution to maximizing energy consumption within a network of devices.

Frank Robertson

Title: Genomic Analysis and Biological Characterization of Novel Bacteriophages BrutonGaster and Schmidt
Funding Source(s): Truckee Meadows Community College
Mentor: Professor Tina Slowan Pomeroy
Department: Biology
Institution: Truckee Meadows Community College

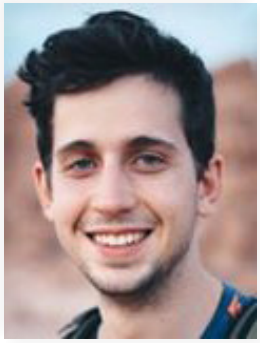
The genus Gordonia has piqued interest in recent years due to its diverse metabolic characteristics and increased frequency in clinical isolates. These bacteria tend to inhabit soil, but several members have been found in activated sludge, oil spills, and other toxic atmospheres, capable of rapidly degrading many pollutants. Gordonia spp. are frequently foam-forming bacteria that can be particularly problematic in wastewater treatment. Advancements in species identification via 16S rRNA sequence have led to proper classification of once misidentified pathogens to the taxon. For these reasons, interest has been building to establish better medical and environmental control tactics. Bacteriophages are re-emerging as alternatives to chemical control methods due to their highly selective nature and less destructive impact on fragile ecosystems. The purpose of this research was to study genetic characteristics and host specificity of two Gordoniaphages isolated in fall of 2017; BrutonGaster and Schmidt were purified from soil in Northern Nevada and further categorized. BrutonGaster and Schmidt belong to the subclusters CQ2 and CU4, respectively. The genomes have been annotated and compared to closely related members of similar subclusters. BrutonGaster (91,510 bp) has considerable genetic homology with OneUp, Toniann, and ClubL (90%, 81%, and 81%, respectively), while Schmidt (43,099 bp) has modest genetic homology with Gsput1 and DinoDaryn (74% each). Preliminary data suggest the possibility of temperate lifecycles for BrutonGaster and Schmidt, putative integrase and immunity repressor genes have been identified for both. While Schmidt exhibits classic bullseye plaques indicative of a temperate phage, BrutonGaster results in predominately lytic plaques when cultured with Gordonia terrae. While both phage genomes are characteristically modular, BrutonGaster had significantly higher synteny with compared species. Host range was examined using several Gordonia species with specific metabolic capabilities or medical significance. Future research will investigate the temperate nature of these two Gordoniaphage.

Kimberly Rodriguez

Title: The Effect of Stratification and Seed Manipulation on Milkweed Germination and Growth
Funding Source(s): Nevada IDeA Network of Biomedical Research Excellence (INBRE)
Mentor: Professor Megan Lahti
Department: Biology
Institution: Truckee Meadows Community College

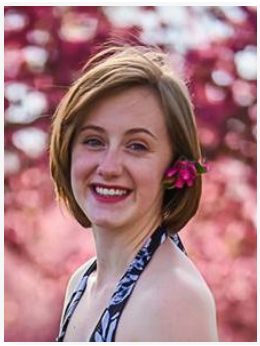
The objective of our research is to investigate riparian milkweed germination, survivorship, and growth rate by manipulating seed stratification and seed coats from Asclepias fascicularis (narrowleaf milkweed) and A. speciosa (showy milkweed). This information will improve milkweed restoration efforts for native habitat, monarch butterflies, and other pollinating insects; monarch butterflies have an obligate symbiotic relationship with milkweed and their populations are in decline. First, we will locate populations of A. fascicularis and A. speciosa, from which we will collect ~1,000 seeds from ~5 study sites. Then, we will experimentally manipulate the seeds using chemical, mechanical, and thermal variables to determine the effects on germination, survivorship, and growth rate. This information will be used to facilitate restoration efforts of riparian milkweed species.

Stephen Simmons



Title: Mutli-Robot Systems Overcoming the Unexpected through Dialogue
Funding Source(s): REU: Collaborative Human-Robot Interaction
Mentor: Professor Monica Nicolescu
Department: Computer Science and Engineering
Institution: Brigham Young University
Multi-Robot systems (MRSs) typically follow a rigid approach to task execution, where robots mostly follow the necessary steps but do not have the capability to cope with unexpected situations. To address this issue we propose an architecture that allows for seamless handling of such cases, through interactions with other teammates via dialogue. Unexpected situations include those where a robot is unable to perform a task, fails to execute a task, or there is a high degree of uncertainty in completing a task. Through, dialogue robots and humans can overcome unexpected situations together, resulting in a more robust collaborative MRS.

Isabella Sloane



Title: Synthesis and Characterization of Silver Nanorods
Funding Source(s): Nevada Undergraduate Research Award
Mentor: Professor Amit Saini
Department: Biology
Institution: University of Nevada, Reno
Unique optical and electrical properties of silver nanoparticles (AgNPs) have become of interest to various scientific fields for use in biomedic, electronic, and antimicrobial applications. It is due to this that there has been a rise in the production of these materials and its consequent environmental and public exposure. A methodology on the AgNPs of different shapes was defined, as well as their characterization.

Eric Soto-Harrison

Title: A study of the synthesis and photoactivity of tantalum oxides and their nitrogen derivatives: Improving performance of visible-spectrum solar fuel photocataylists with novel carbon modification techniques
Funding Source(s): NSF EPSCoR UROP, Nevada Undergraduate Research Award, McNair Scholars Program
Mentor: Professor Ravi Subramanian
Department: Chemical and Materials Engineering
Institution: University of Nevada, Reno

The practicality of a hydrogen-based energy economy has generated significant interest in a commercially viable process to split water. Research has recently focused on several materials which are capable of this using a wide range of solar spectrum radiation to generate hydrogen, and the challenges are now increasing stability and performance. This project aims to study the viability of increasing catalytic performance of tantalum oxide based photo-catalysts by creating a hetero-junction catalyst through the wrapping of nanoparticles with a reduced graphene oxide (RGO) layer. From these structures, numerous new and unstudied multi-junction structures are to be produced. It is thought RGO may be able to increase charge pair recombination time, facilitating efficient charge transportation owing to its exceptional conductive properties. Experimental results support improvement of photo current response using wet chemical synthesis methods and high development of highly crystalline microstructure. This study will focus on the ability of RGO modified tantalum nanoparticles to photo-catalyze redox reaction in solar radiation compared to control samples in a variety of tantalum based oxides and oxynitrides. Continuing preliminary studies on pure tantalum-oxide nano-particles, this study extends general techniques to improve photocatalytic performance in many of the systems being studied today. Presented methods demonstrate experimentally that many materials previously studied in the literature can have their catalytic performance improved many fold through introduction of a charge carrier such as graphene. In addition, we also seek to utilize corrected DFT methods (DFT+u) to model the effect of carbon and nitrogen doping for further justification of the argument. Synthesis methods for these hetero-junction catalysts and the performance effects of the modification are reported, and experimental methods to further improve performance performance are discussed.

Ange-Amour Soupplian

Title: Seismic optimization of refractions for reflection imaging
Funding Source(s): International Undergraduate Research Award
Mentor: Professor John Louie
Department: Geological Sciences and Engineering
Institution: University of Nevada, Reno, Universite de Pau et des Pays de L'Adour

From seismic survey recordings, we pick first arrivals and make a velocity model in a two dimensional earth section. For arrival picking and velocity-model construction we use software like Louie's Viewmat and Optim Earth's SeisOpt®. With this velocity model section, we can generate wave travel times, and perform an industry-standard prestack depth migration (PSDM) of the reflection data. We use Linux codes and Louie's RG software to make the PSDM section. Part of the experience was learning how to run Linux on my Windows laptop with the Cygwin interface. The PSDM arranges the reflection waves into an earth cross section, allowing geological or engineering interpretations of the seismic survey. These methods allow locating faults, discontinuities, buried tanks, and other seismic contrasts. I am applying the method to the location of a suspected earthquake fault on the lands of the Walker River Paiute Nation near Schurz, Nevada. Louie's 2013 Applied Geophysics class collected three seismic surveys that may cross this candidate fault. The class noticed fault-like discontinuities in preliminary sections, but did not attempt PSDM imaging. I will complete the PSDM of three Schurz reflection sections, to verify the fault interpretations.

Jared Stimac

Title: Aromatic Nitro Compound Reduction via Transition Metal Catalysis and Carbon Monoxide
Funding Source(s): Nevada Undergraduate Research Award, NSF EPSCoR UROP
Mentor: Professor Laina Geary
Department: Chemistry
Institution: University of Nevada, Reno
Methods to produce N-heterocycles are useful tools to synthesize new, and possibly biologically-active, chemicals and to ameliorate the chemical synthesis of already established pharmaceuticals. The aim of this work was to improve upon a methodology for N-heterocycle generation with efficient reagents and higher selective yields. The research involved carbon monoxide to reduce nitro groups (R-NO2), which then form either nitroso groups (R-NO), or an amine group (R-NH2). These reactions were done in solution with transition metal catalysts. The ability of several catalysts and different methods of CO transfer to facilitate Nitro reduction were investigated.

Stephanie Sturgeon

Title: Perceived Social Intelligence and Expectations of Robot Cognitive Capacity
Funding Source(s): National Science Foundation (CNS:1757929), National Science Foundation (IIS-1719027)
Mentor: Professor David Feil-Seifer
Department: Computer Science and Engineering
Institution: University of Nevada, Reno
This study evaluates how a robot demonstrating Theory of Mind (ToM) impacts the way humans perceive social intelligence in human-robot interaction. Participation will be done through a Qualtrics online-survey. Participants will watch a video of a robot doing the Sally-Anne false belief task. There will be random assignment to one of two conditions where the robot either passes or fails the task. A Perceived Social Intelligence Survey and the Perceived Intelligence and Animacy subsections of the Godspeed Questionnaire Series (GQS) will be used as measures. The GQS will be given both before viewing the task to measure participant expectations, and again after to test changes in opinion. We expect the ToM robot to have higher overall Perceived Social Intelligence scores than the control robot. We also expect to see a decrease in GQS scores for the robot which fails the false belief task.

Joshua Thomas

Title: Cybersecurity and Robotics, Implementing Encryption with Perfect Forward Secrecy in ROS
Funding Source(s): REU in Collaborative Human Robot Interaction, National Science Foundation Grant No. CNS-1757929
Mentor: Professor Paulo Regis
Department: Computer Science and Engineering
Institution: University of Nevada, Reno

Cybersecurity in robotics is severely lacking and will become a greater and greater issue as robots continue to occupy more spaces in our everyday world. One such deficiency in robotic security is the lack of encryption in ROS (Robot Operating System) communication. This allows hackers to not only be able to intercept potentially sensitive information from communication between robots but also makes certain attacks such as man-in-the-middle easier to execute. This paper investigates ways to integrate encryption into ROS communication with as little network overhead and CPU consumption as possible to help curtail some of these security concerns.

Jacob Trzaska

Title: Progress Towards Dissociative Electron Attachment of Ammonia
Funding Source(s): McNair Scholars Program
Mentor: Professor Joshua Williams
Department: Physics
Institution: University of Nevada, Reno

Dissociative Electron Attachment occurs when low energy electrons are able to attach themselves to stable molecules; once attached the molecule enters an excited state and, in an effort to shed this excess energy, the molecule can dissociate into multiple fragments. Over the past few years this phenomenon has become an increasingly important subject of research due to its involvement in biological, astrophysical, and materials science, in addition to other fields. Because of the presence of these dissociation events in a wide range of other fields the applicability of the research studying these events is wide and warrants closer investigation. Using the Cold Target Recoil Ion Momentum Spectrometry (COLTRIMS) method, we plan to study the energetics, as well as the angular distribution of ion production, of the Ammonia molecule's dissociation due to low energy electron attachment. To this end we have designed a novel electron gun which utilizes a high current Lanthanum Hexaboride cathode. My work involves designing the control circuitry to regulate the voltage and current levels to provide protection for cathode inside of our electron gun. My poster will detail our work on Dissociative Electron Attachment in addition to my work on the control circuitry and the greater goals of the experiment.

David Viramontes

Title: Testing the Physiological Contractile Characteristics of Synthesized Human Myometrial Tissue
Funding Source(s): National Institute of Health grants, R25ES020721 and R01ES021800, American Society of Pharmacy and Experimental Therapeutics Intern Program, Society of Toxicology Intern Program
Mentor: Professor Lauren Aleksunes
Department: Biotechnology
Institution: University of Nevada, Reno

Organophosphate-containing molecules are a diverse group of chemicals that have been used in pesticides and nerve agents and more recently, as flame retardants in clothing, plastics, building materials, electronics, and furniture. As the use of organophosphate flame retardants becomes more widespread, the exposure of humans also increases. Emerging data suggest organophosphate flame retardants are toxic to the reproductive, endocrine, and nervous systems. One mechanism to reduce the toxicity of chemicals is active efflux that prevents accumulation in tissues. Efflux transporters are a class of proteins that excrete substrates from the cell using energy generated from ATP hydrolysis. In this study, we sought to determine whether the flame retardants tricresyl phosphate and triphenyl phosphate are substrates for the efflux transporter multidrug resistance protein 1 (MDR1). To test this hypothesis, the cytotoxicity of both chemicals was tested in HEK293 cells expressing an empty vector or the human MDR1 gene. Cytotoxicity (LC50) was determined using the Alamar Blue assay. The positive control MDR1 substrate doxorubicin exhibited a 5-fold increase in LC50 in cells expressing MDR1. By comparison, the cytotoxicity of tricresyl phosphate and triphenyl phosphate were similar between the control and MDR1-expressing cell lines. While additional tests need to be performed, these data suggest that these flame retardants are not substrates for MDR1. Understanding which transporters interact with a chemical enables the prediction of tissues in the human body that may not be protected by efflux transport and are potentially at greater risk of toxicity.

Jiavanna Wong-Fortunato

Title: Testing the Physiological Contractile Characteristics of Synthesized Human Myometrial Tissue
Funding Source(s): Nevada IDeA Network of Biomedical Research Excellence (INBRE)
Mentor: Professor Heather Burkin
Department: Pharmacology
Institution: University of Nevada, Reno

In the United States, the leading cause of infant mortality is preterm birth. This is mainly due to the health problems that are associated with an infant being born prematurely. Preterm labor and premature births are due to the early contraction of the myometrium that cannot be stopped once they begin. The myometrium consists of the smooth muscle component of the uterus. Previous studies have utilized human myometrial tissues to begin to determine the specific molecular pathways that lead to preterm labor. This is very difficult; however, due to the very limited availability of human myometrial tissue. The mission of my research is to test the ability of synthesized myometrial tissue to replicate the physiological contractile characteristics of human myometrial tissue. This is part of a larger project by Dr. Heather Burkin in understanding the causes of preterm births. This project focuses on testing the ability of the synthesized myometrial tissue to contract when exposed to KCl and oxytocin and relax when exposed to nitric oxide. The goal is to validate the use of these synthesized tissues in order to study agents to regulate contraction in human myometrial tissue.

Vivek Yanamadula

Title: A Stochastic Mathematical Model for Protein Glycosylation in the ER
Funding Source(s): Simons Summer Research Program Fellowship
Mentor: Professor David Green
Department: Mathematics and Statistics
Institution: University of Nevada, Reno

Protein glycosylation is a cellular process that has a profound impact on the proper folding and transport of glycoproteins. This process, in particular N-linked glycosylation, has become highly relevant in recent years due to the discovery of highly-glycosylated envelope proteins in the HIV/AIDS virus. Envelope proteins such as these have been the target of various experimental pharmaceutical drugs due to their highly conserved glycosylation structure, leading to an increased importance in deciphering the glycosylation process to understand the outcomes this process may have for viral proteins with unusually high amounts of glycosylation sites. This project aims to model glycosylation within the ER to better understand this problem.