THE UNIVERSITY OF ARIZONA
GRADUATE COLLEGE

Undergraduate Research Opportunities Consortium

2022 Abstract Review

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UROC Introduction and Acknowledgements

The Undergraduate Research Opportunities Consortium (UROC) is managed by the University of Arizona Graduate College is comprised of 10 undergraduate research programs. Six of the programs are managed by the Graduate College and four are affiliated programs sponsored by the National Science Foundation Research Experience for Undergraduates (NSF REU) Program. The objective of the consortium is to increase the number of underrepresented students who apply to graduate school. UROC Scholars engage in faculty-supervised research and participate in a comprehensive graduate school preparation program that includes the Graduate Record Examination (GRE) test preparation, graduate admission and funding workshops, presentation skills seminars and a professional research conference experience. We invite you to enjoy the UROC Student Abstract Review and share in our students' success.

The UROC 2022 Abstract Journal was

Edited by: UROC Staff & Students

Designed by: Tianna MacMeans, UROC Program Coordinator and

Victoria Juvera, McNair Administrative Assistant

Photographed by: UROC Students

Undergraduate Research Opportunities Consortium

Located at the University of Arizona

Graduate Center

1600 E. 1st St.

Tucson, AZ 85719

2022 UROC Programs and Sponsors

UROC Graduate College Programs

Access, Wellness, And Relational Determinants of Student Success (UROC-PREP/AWARDSS)
PI: Michelle Perfect, PhD,
Co-PI: Brandy Brown Perkl, PhD
Program Coordinator: Stephanie Moreno, MBA
Assistant Professor: Andrew Huerta, PhD
Sponsors: U.S. Department of Education - Institute of Education Sciences (Award: #R305B160003 and #R305B210019), University of Arizona, University of Arizona College of Applied Science and Technology, University of Arizona Graduate College

Minimizing Health Disparities (MHD)
Program Coordinators: Tianna MacMeans and Holly Lopez
Sponsors: University of Arizona Graduate College, Western Alliance to Expand Student Opportunities (WAESO)

Ronald E. McNair Achievement Program (McNair)
PI/Program Director: Andrew Huerta, PhD
Program Coordinator: Holly Lopez
Administrative Assistant: Victoria Juvera
Graduate Teaching Assistants: Jacqueline Larriva, ABD and Fernando Paredes
Sponsors: U.S. Department of Education, Federal TRIO Program, Ronald E. McNair Postbaccalaureate Achievement Program (Award: #P217A170284), University of Arizona Graduate College

Summer Research Institute (SRI)
Program Coordinators: Tianna MacMeans and Donna Treloar, MA
Teaching Supervisor: Andrew Huerta, PhD
Graduate Teaching Assistants: Melinda Willett, MA
Sponsors: University of Arizona Graduate College and Western Alliance to Expand Student Opportunities (WAESO)

UROC-PREP
Program Director: Andrew Huerta, PhD
Administrative Assistant: Victoria Juvera
Graduate Teaching Assistants: Joanna Sanchez Avila, ABD and Mary L. Bankhead
Sponsors: University of Arizona Graduate College, Western Alliance to Expand Student Opportunities (WAESO)

UROC Affiliate Programs

Research Experiences for Undergraduates Site: Environmental and Earth Systems Research at Biosphere 2 (B2 REU)
PI: Katerina Dontsova, PhD
Co-PI: Kevin Bonine, PhD
Sponsors: National Science Foundation Research Experiences for Undergraduates (NSF REU) Program and University of Arizona Graduate College

Scholar Training Academy for Research in STEM (STARS)
PIs: Nura Dualeh, MA and Rebecca Gomez, PhD
Program Director: Nura Dualeh, MA
Coordinator: Leah Callovini
Graduate Teaching Assistants: Joanna Sanchez-Avila, ABD and Mary Bankhead
Sponsors: The Gordon and Betty Moore Foundation, Arizona's Science, Engineering, and Math Scholars Program (ASEMS), University of Arizona Graduate College

RESEARCH EXPERIENCES FOR UNDERGRADUATES SITE: Environmental and Earth Systems Research at Biosphere 2 (B2 REU)

PI: Katerina Dontsova, PhD

Co-PI: Kevin Bonine, PhD

Sponsors: National Science Foundation Research Experiences for Undergraduates (NSF REU) Program and University of Arizona Graduate College

Ingrid Aosved

"Does microbial colonization of basaltic rock influence seed germination relevant to terraformation? "

ABSTRACT: Microbial colonization of rock substrates has occurred since microorganisms first evolved ca. 3.7 billion years ago. Yet, it is unclear how microbes establish on previously lifeless rock and then initiate primary succession culminating in plant establishment. The Landscape Evolution Observatory (LEO) at Biosphere 2 contains three identical enclosed slopes, each containing 330m3 of crushed basaltic tephra ideal for studying the movement of water and nutrients in a soil-like system. Since the creation of the slopes in 2012, three successional life stages have become visible on LEO: (i) the original bare surface, consisting of basalt tephra alone; (ii) biotic crust, containing crust matrices formed by microbial communities, including cyanobacteria; and (iii) moss, where non -vascular plants (*Funaria hygrometica,* Bryophyta) now dominate the basaltic surface. We anticipate terraformation activity associated with these primary successional stages sets the stage for vascular plant establishment. In particular we propose that microbial communities associated with each successional stage may differ in their impacts on seed germination, and microbes typical of the moss stage will be more likely to support seed germination, reflecting the progression to a more plant-symbiotic microbial assemblage. Here, we cultured bacteria and fungi from 18 soil samples associated with each surface type at LEO. We then measured how the most common morphotypes from crust and moss impact germination and growth of the model vascular plant, alfalfa, *in vitro*. We found that though alfalfa grew longer in size in soils containing only microbial crust compared to soils where moss is also present, the germination rate and average leaves per sprout were comparable between moss, crust, and control conditions. We were not able to include microbes from the bare basaltic tephra as they did not grow readily in our experimental setup. Our results indicate that alfalfa should be able to establish well on LEO in areas with either crust and moss, but our challenge in working with microbes from bare basalt may indicate reduced germination in the bare areas of LEO slopes. We anticipate that a key element of terraformation is the establishment of biotic crusts on previously bare rock substrates, a natural process captured by the LEO experiment at Biosphere 2.

Hozhoo Emerson

“Creating a two-rain model to represent the CRQ project”

ABSTRACT: The Concentration ©-Ratio (R) -Discharge (Q) project takes place on the largest earth science model hillslope that has been ever constructed, called the Landscape Evolution Observatory (LEO). The CRQ project is watching how rain events break down the basalt in the LEO to form life-sustaining soil. This analysis is done through looking at the discharge amount and chemistry, with a particular focus on the ratio of silicon isotopes. Now in Diné culture, there is a concept of two rains: male and female rain. The LEO and CRQ project are closer to the more consistent and softer rains of the winter, also known as the female rain. The male rain is the much harsher summer monsoon. We use a model as a much more aggressive weathering process. We analyze the water over different time steps, and a range in discharge value, to get the concentration of each element as a function of discharge. A parallel experiment was conducted in the laboratory to examine the change in the concentration of elements in initially ultrapure water that was placed into contact with the basalt. In this experiment, we studied the change in water chemistry with time. We found that the pH goes down while electrical conductivity goes up. This means that the basalt is breaking down into more salts and elements.

Luis Cortes

“Mineral weathering, soil formation and carbon sequestration as influenced by water flow and biota”

ABSTRACT: It is of the utmost importance to understand the interaction and feedback amongst water, porous geological media, microbes, and vascular / nonvascular plants in order to improve our predictions for the Earth's critical zone response to future climate conditions. An important sink of C02 from the atmosphere is the accumulation of organic and inorganic carbon in soil. To study this, surface soil samples from the West, Central, and East slopes of the Landscape Evolution Observatory (LEO) at Biosphere 2 are analyzed after exposure to periods of rainfall over a timespan of approximately 10 years, starting in 2013. To distinguish differences brought about by microorganisms and nonvascular plants, three different types of soil conditions are studied: bare, crust, and moss. Total C was analyzed by Cobalt Oxide/Platinum catalytic combustion, 980 °C in 02 atmosphere in SSM-SOOOA Shimadzu C and N analyzer for solid samples. Total N was determined by catalytic thermal decomposition/chemiluminescence. Surface sample results demonstrate a significant increase in organic carbon, inorganic carbon, and total nitrogen content across all samples. Further analysis will elucidate if exuded organic carbon from moss and crust organisms help sequester inorganic carbon into LEO soil.

Jordan

“Heat-Stress Response of Turban Snails in a Multi-Year Giant Mesocosm Resembles Wild Counterparts ”

ABSTRACT: The ocean mesocosm at Biosphere 2, a 2.6 million liter ocean mesocosm maintained at year-round temperatures of 25 degrees Celsius, is the largest of its kind in the world, and emulates realistic seasonal dynamics and macroalgal conditions. From April 2014 to September 2020, Wavy turban snails (Megastraea undosa) were relocated from their natural intertidal habitat of Southern California to inhabit the Biosphere 2 ocean biome. Growth lines suggest that they initially maintained growth rates consistent with their wild counterparts, though they were living in temperatures near the maximum of their natural range. However, these snails experienced a mortality event following the introduction of a heat exchanger in September 2019, with heat stress believed to be comparable to an El Niño event. Using a inductively coupled plasma-mass spectrometer we analyzed dremel-collected powder samples from two wild type shells and two captive Biosphere 2 shells, looking specifically at magnesium, boron, strontium, uranium, barium, manganese, and lithium relative to calcium. We found specific geochemical markers in similar life history patterns across both wild shells affected by El Niño events and captive biosphere 2 shells affected by the heat exchanger. Our analysis shows terminal stress in captive snail shells consistent with those of wild snails, indicating that the heat exchanger event replicated realistic El Niño conditions for these organisms. This study demonstrates that the cultured mollusks behave similarly to their wild counterparts under heat-stress conditions, and as El Niño events intensify due to climate change, mesocosms such as the Biosphere 2 ocean can therefore provide critical insights into the impact of prolonged heat stress on organisms.

Starlivia Kaska

“Storage-discharge relationships in saturated and unsaturated zones in the Landscape Evolution Observatory”

ABSTRACT: This study was conducted to determine the storage and discharge relationships in saturated and unsaturated zones in the Landscape Evolution Observatory (LEO). To do this we tested a previous method established in 2017, in which soil water content sensors (5TM) in the LEO were used to estimated storage. We tested the method by comparing 5TM spatial patterns produced from sensors available in 2017 and those available in 2022. We determined that the number of soil water content sensors available in 2022 are not enough to reproduce the water content results from 2017. Therefore, an alternative method for analyzing storage was necessary. As a result of this study, we determined that saturated storage can be estimated using pressure transducer data and total storage can be estimated using load cell data. Unfortunately, we were unable to analyze the discharge data in conjunction with storage. Additional work on the relationships between our established storage values and the corresponding discharge will be required in the future.

Malena Lacque

"Flooding Increases Methane Emissions from Rainforest Tree Stems in the Biosphere 2 Rainforest"

ABSTRACT: Methane (CH_4) is a critical climate-forcing trace gas rising sharply in the atmosphere. Methanogenic microbes produce methane in soil through anaerobic respiration. Methane in soil can be transported up tree stems and emitted from the trees. Flooding produces a low oxygen environment and may result in more methanogens, as microbes that require oxygen die. In this study, I explore the question: How does flooding affect methane emissions from rainforest tree stems? I hypothesized that: flooding in the Biosphere 2 rainforest increases methane emissions from tree stems due to an increase in methane concentrations in submerged soil. To address this question, I conducted measurements of methane emissions from tree stems on five different rainforest tree species in the Biosphere 2 rainforest mesocosm. I completed four campaigns of measurements, two under dry conditions, and two under flooded conditions. I found that methane emissions increased significantly in the early flooding campaign for most species. Emissions increased even more in the late flooding campaign. These results showed that for some species there is a delayed response in emissions to flooding and when flooding conditions remain for a prolonged period, the emissions continue to rise. There was also a clear difference in response between species, likely due to species traits. This research applies to methane emissions research in seasonal floodplains, such as varzéa forests in the Amazon, and a wider hypothesis that methane emissions from ecosystems during flood seasons may help us to fill in gaps of the global methane budget.

Emily Launderville

“Carbon sequestration by alfalfa in basalt corrected arid agricultural soil”

ABSTRACT: Greenhouse gas emission reducing agricultural practices are necessary for a sustainable future. Amending agricultural soils with powdered silicate rocks has the potential to increase atmospheric carbon dioxide sequestration and provide co-benefits of enhanced soil health and crop production, especially applicable to arid and nutrient depleted regions such as Arizona. Compared to other arid tolerant regional crops, alfalfa requires high irrigation and is known to increase the acidity of the soil through nitrogen fixation, creating ideal conditions to enhance the weathering of the basalt and thus removal of atmospheric carbon dioxide as a climate-smart strategy for agriculture in arid regions. Soil was collected from the alfalfa field at UA Red Rock Agricultural Center forty miles north of Tucson, Arizona. Four soil treatments were made, one with no amendment, one with 0.5% compost, 1.5% basalt, and 1.5% basalt with 0.5% compost. In a small greenhouse mesocosm experiment conducted in the Biosphere 2 savannah, alfalfa was planted in six pots of each treatment and an additional six pots served as a control with no plants. Samples of each soil composition were tested for soil water holding capacity. Pots were leached to collect drainage, which was then analyzed for pH, electroconductivity, and organic and inorganic carbon and nitrogen. Gas flux was measured after watering, and showed significantly reduced rates of carbon dioxide emissions for treatments with basalt. More research into how the basalt affects plant growth is necessary.

Brielle Martin

“Biosphere 2: leaf cooling capacity and gas exchange suggest high thermal tolerance amongst Theobroma cacao and Coffea arabica in the rainforest biome”

ABSTRACT: As climate change intensifies, plants are increasingly threatened by rising temperatures, which threaten to impede key plant functions such as photosynthesis. The maximum temperatures plants can tolerate vary by species and climate. Understanding the thermal tolerance of commercially important species such as *Theobroma cacao* and *Coffea arabica* will be critical to maintaining sufficient crop production in the future. In order to assess thermal tolerance, leaf and air temperature, CO_2 assimilation, and stomatal conductance were measured from multiple leaves of both *T. cacao* and *C. arabica* across a temperature gradient within the Biosphere 2 tropical rainforest biome. Average difference between leaf and air temperature was not statistically significant across either species and CO_2 assimilation declined as temperature increased. Additionally, stomatal conductance peaked by 12:00 PM then steadily declined despite rises in temperature in the afternoon, suggesting that prolonged exposure to high temperatures may impact gas exchange and cooling capacity of *T. cacao* and *C. arabica.* Statistically insignificant mean difference between leaf and air temperatures suggests low cooling capacity amongst both *T. cacao* and *C. arabica*, while decreased assimilation indicates lowered rate of photosynthesis at higher temperatures. Declining stomatal conductance and assimilation as temperatures rise, in addition to low cooling capacity, suggest limited adaptability amongst *T. cacao* and *C. arabica* given prolonged exposure to high temperatures within a tropical rainforest. However, measurements do not take into account the effects of water loss due to evapotranspiration on overall plant health and productivity, and more research is needed to more accurately assess the thermal tolerance of *T. cacao* and *C. arabica.*

Dylan Moran

“Resource Allocation and stress responses in high and low densities of Alfalfa (*Medicago sativa*) during secondary succession ”

ABSTRACT: The Stress Gradient Hypothesis (SGH) posits that under conditions of high environmental stress will tend to favor facilitative plant-plant interactions, while less stressful conditions favor competitive interactions. I tested the predictions of the SGH by planting Alfalfa (*Medicago sativa*) on the surface of the mini-LEO at the Biosphere 2. The mini-LEO is a small simulated hillslope filled with nutrient poor crushed basalt debris that has variable soil moisture across its surface. This experiment examined the effects of environmental stress caused by a lack of nutrients in the soil, variation amongst soil moisture and plant-plant interactions. I predicted that seedlings at high density would develop higher biomass and germinate successfully less as compared to seedlings at low density, in agreement with the SGH. To test this prediction, I sowed Alfalfa planted at high and low densities in 16 paired plots distributed across the mini-LEO surface to capture the range of soil moisture created by the mini-LEO’s slope. The alfalfa grew for four weeks and we measured germination, survival and death, final biomass and soil moisture content at each plot to determine whether the effect of growing at high vs. low density was affected by water availability. Overall, I did not find a relationship between moisture and plant-plant interactions, however density was important. I found that seeds were sixty percent more likely to germinate when sown at low density vs high density, suggesting that seeds may compete for resources prior to germination. Additionally, seedlings growing at high densities were smaller than those growing at low density, again indicating the presence of competition between individuals. This experiment does not support the predictions made by the SGH, showing instead that plots under higher stresses caused by limited resources in the soil behaved in a more competitive manner rather than facilitative. Moving forward with this work, it would be beneficial to further investigate the effects of limited water, and multiple generations in the same plots, under the same conditions.

J'Hrenara Rios

"Spiders, Mites, and Springtails OH MY!
Characterization of Arthropods on the LEO in Response to Rain Experiments "

ABSTRACT: The Landscape Evolution Observatory (LEO) consists of three artificial landscapes that mimic watersheds in the natural world and in previous years has been used by the works of hydrologists, geologists, and physicists. Nevertheless thanks to a $3.5 million dollar grant by the NSF, scientists will be allowed to study the roles plants and microbes play in the process of primary succession and how rain moves through landscapes. However, the role that has not been taken into consideration is other biotic factors such as soil arthropods and whether there are any currently inhabiting the LEO. Using a field ecology approach, I constructed an experiment where I haphazardly observed five divots on each LEO slope for soil arthropods and collected them by the use of an aspirator. Additionally, I compared my observations made before the addition of moisture in the soil from the rain experiments versus with moisture. My observations revealed there are three orders of arthropods on LEO soil and there is no impact of soil moisture increase on the arthropod communities. I observed a total of 520 specimens and of those observed I was able to identify the family Entomobryidae under the order Collembola, the order Acarina (mites), and the order Araneae (spiders). Moreover, I was given a short period of time to conduct this study, so while my findings on the moisture impact were statistically insignificant, I noted that I observed an increase in Collembola offspring due to moisture increase. Ultimately, my results suggest that LEO is supporting life and soil arthropods are crucial for improving soil health for future plant cultivation on this artificial landscape.

RONALD E. MCNAIR ACHIEVEMENT PROGRAM

PI/Program Director: Andrew Huerta, PhD

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Sponsors: U.S. Department of Education, Federal TRIO Program, Ronald E. McNair Postbaccalaureate Achievement Program (Award: #P217A170284), University of Arizona Graduate College

Anay Amaro

Pharmaceutical Sciences at University of Arizona

Mentored by Dr. Paul R. Langlais (Medicine)

"Microtubule-Associated Proteins in Insulin-Stimulated Glucose Uptake"

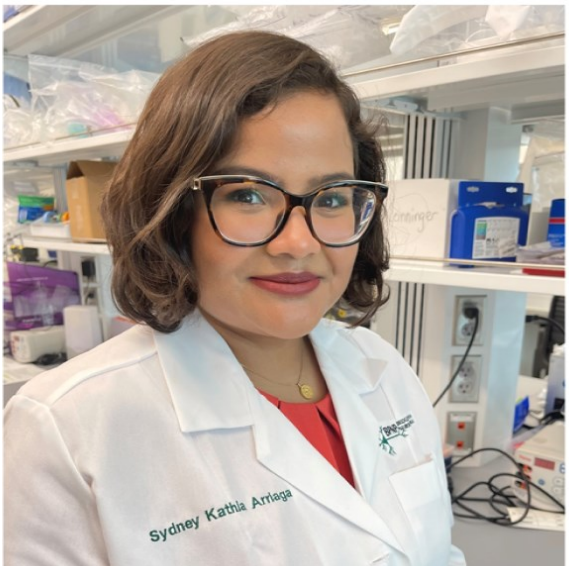
ABSTRACT: Microtubules (MTs) are a major element of the cytoskeleton; the dynamic network of interlinking protein filaments present in the cytoplasm of all cells. MTs are active arrangements that experience constant construction and deconstruction within the cell. MT's role is both to establish cell shape and a diversity of cell activity. This involves certain elements of cell motion, the intracellular transfer of cell organs, and the detachment of genetic material in the course of mitosis. Microtubule-associated proteins (MAPs) control the building and balance of microtubules. The purpose of this paper is to recognize which MAPs control microtubule dynamics in insulin-stimulated glucose uptake. This work also seeks to evaluate how MAPs expression changes the more they progress into the differentiation process, which involves going from wildtype fibroblast cell to a wildtype 3T3-L1 adipocyte cell. Utilizing spectroscopy, this work compares the proteome of the cell, as well as the protein interactome present on each stage of cell development. Finding the MAPs controlling microtubule dynamics in insulin-stimulated glucose uptake will help originate future approaches to prevent the development of complications in medical disorders such as type II diabetes.

Sydney Kathia Arriaga

Neuroscience and Cognitive Science at

University of Arizona

Mentored by Dr. Christopher Banek (Physiology)



"The Role of Afferent Renal Nerves in Polycystic Kidney Disease Progression"

ABSTRACT: Polycystic kidney disease (PKD), both autosomal dominant (AD) and autosomal recessive (AR) forms, remains the leading cause of inherited renal (i.e. kidney) disease in adults and children, respectively. PKD is defined principally by the gradual growth of fluid-filled cysts in the kidney that eventually leads to decrease renal filtration function and inevitably renal failure. There is no cure beyond a renal transplantation. Current treatment options are extremely limited and associated with a poor quality of life. One major contribution to cyst growth is vasopressin (AVP) signaling through the vasopressin type-2 receptor (V2R). One understudied mediator of AVP activity is through renal afferent (i.e. sensory) nerves. We have recently reported afferent renal nerve activity (ARNA) is elevated in a preclinical model of PKD, and surgical ablation of afferent nerves stunts the cystogenesis. It remains unclear how ARNA directly mediates cyst progression. We hypothesize that renal cystogenesis is mediated by elevated ARNA and its direct activation of AVP release and AVP-V2R-mediated renal cell proliferation. To test this hypothesis, we will use an animal model of PKD (PCK rat). We will perform afferent targeted renal denervation (ARDNx) in adult PCK rats, and assess the circulating AVP by ELISA and renal cell proliferation by 24-hour urinary cyclic adenosine monophosphate (cAMP) excretion before and two weeks after surgical intervention. We expect circulating AVP and urinary cAMP to decrease following ARDNx, supporting a direct role for ARNA on AVP regulation and renal cystogenic/proliferative signaling. These studies are underway and will be completed by Spring 2023.

Laura Beaman

1. Psychological Science 2. Anthropology: Human Biology emphasis at University of Arizona

Mentored by Dr. John Allen (Psychology)

"Enhancing Mindfulness with Various Ultrasonic Neuromodulation Pulse Repetition Frequencies"

ABSTRACT: Transcranial focused ultrasound is an emerging technology that may be a useful tool for enhancing mindfulness meditation by reducing activity in brain systems that may prevent people from achieving meditation goals. Sonication with different parameters has been shown to have varying effects on many brain regions, including the target for this study, the posterior cingulate cortex (PCC). Here, we took experienced meditators and sonicated the PCC at two distinct pulse repetition frequencies (PRF), 6.37 Hz and 909.09 Hz. Additionally, there was a placebo condition where the ultrasound transducer was placed to the head, but no energy was emitted. Our aim was to observe how PRF differentially affects both brain activity and conscious experience that may support a deeper meditation practice. These were measured using electroencephalographic activity (EEG), heart rate variability, and self-report surveys. Research continues into fall 2022 with the goal of working with at least 20 participants. We hypothesize that the 909.09 Hz PRF will provide the best condition for a deeper meditation practice exemplified by data such as increased EEG alpha waves and higher scores on self-reported mindfulness scales.

Nathaniel Benavidez

1. Psychology 2. Spanish at University of Arizona

Mentored by Dr. Jessica Andrews-Hanna (Psychology)

"Event Boundaries: The Possible Key to Cognition and Age-Related Illnesses"

ABSTRACT: Our world and how individuals perceive the space around them depend on their cognitive state, primarily through the memories and thought processes we form. Within thought processes are event boundaries, which serve as separations between thoughts based on the main focus or theme of one or multiple thoughts. Transitions between thoughts can either be associational, where one thought leads to a new thought, or strong, where there is no connection between thoughts as shifting. We suggest that older adults will experience a difference in thought transitions, determined as higher levels of freely moving thought, than the young adult group, and that there will be a difference in transition type between both groups as well. We will also investigate possible differences in transition type between APoE positive and APoE negative groups to determine if older adults who are APoE positive experience the highest levels of strong transitions, which may serve as a very early sign of the forgetfulness symptoms seen in Alzheimer's disease. We will be analyzing previous research data collected from the Neuroscience of Emotion and Thought Lab for this project. After completing independent samples t-tests, we found that older adults reported less thought and strong transition frequencies compared to younger adults. There was no significant difference between APoE status groups, meaning that APoE status does not seemingly influence event boundaries. One limitation I have in my project is interrater reliability, and I would like to remove this limitation in the future by having more coders.

Bryan Castillo

Mathematics at University of Arizona

Mentored by Dr. Christopher Henderson (Mathematics)

"Traveling Waves in Reaction-Diffusion Equations"

ABSTRACT: Reaction-diffusion equations have been used extensively to model phenomena arising in the physical sciences. Examples include modeling the population density of a given species over time and modeling the temperature of reacting fluids. An important part of the study of reaction-diffusion equations is understanding the behavior of traveling wave solutions. In this research, we focus on evaluating the properties of a function η, which is closely related to the behavior of traveling waves for a large class of reaction-diffusion equations. The η function arises from a non-linear differential equation, and while it is known that the function exists, many properties of the function are currently unknown. Using implementations of standard numerical approximation techniques as a guideline, we simplify an important overdetermined system and provide a lower bound that helps characterize the behavior of η for different choices of initial values at the endpoints. We also examine the effect this behavior has on numerical approximations to provide a starting point for the further study of this function.

Ivana Danielle De La Rosa

1. Neuroscience & Cognitive Science 2. Spanish at University of Arizona

Mentored by Dr. Helena Morrison (Nursing)

"Documenting Immune Cell Populations and Locations in Male and Female Mice with Ischemic Stroke"

ABSTRACT: Ischemic stroke is an acquired brain injury with sex dependent outcomes and the influence of sex on neuroinflammatory responses to ischemic brain injury remains unclear. Systemic (e.g., B cell and T cell) and resident (e.g., microglia) immune cell response to post-stroke ischemic injury and the extent of these responses extending beyond the acute phase to 30-days post injury, are not well documented in male and female mice undergoing the traditional filament method to induce ischemia. In this descriptive study we document the presence of brain immune cells using immunohistochemistry methods 30-days post-stroke and assess the relationship between immune cell response/presence to infarct size in male and female mice. Male and female mice underwent middle cerebral artery occlusion for 45 minutes followed by reperfusion. MRIs were taken at 48hrs and 30-days post-stroke after which brain tissue was collected for fluorescence immunohistochemistry methods. Immune cell populations were identified using immunohistochemical staining using antibodies to target: B cell (CD45/B220); T cell (CD3ε); microglia (IBA1 and TMEM119); Phagocytosis marker (CD68). Following confocal or widefield microscopy for image acquisition, ImageJ software was used to quantify the area of positive staining using consistent thresholding parameters. To assess microglia morphologic responses in relation to the residual infarct or "scar" remaining at 30-days, microglia confocal images were obtained in 3 regions: contralateral and ipsilateral regions that were distal and adjacent to "scar". An ImageJ based skeleton analysis method was used to quantify indicators of microglia ramified morphology: endpoints/cell and process length/cell. All evaluators were blinded to the experimental/biologic condition, sex. Data collection is ongoing. Descriptive statistics will be used to summarize finalized data; sex and region differences (microglia morphology) will be tested using two-way ANOVA with Tuckey's post-hoc. Pearson's correlation will be used to describe relationships between immune cell presence and infarct volume.

Anett Garcia

Biomedical Engineering at University of Arizona

Mentored by Dr. Shang Song (Biomedical Engineering)

"Using Computational Methods to Understand Electrical Properties on Conductive Hydrogels"

ABSTRACT: Conductive hydrogels have attracted tremendous interests in tissue engineering and regenerative medicine. These hydrogels are three-dimensional cross-linked polymer networks that are saturated with water to mimic material characteristics of the extracellular matrix in the body. With the incorporation of conductive materials, conductive hydrogels allow delivery of electrical stimulation with significant implications in cell functions and tissue regeneration. In this study, we used computational methods to understand the electric characteristics of conductive hydrogels made of various structures and compositions. Specifically, we used ANSYS HFSS (*high-frequency structure simulator*) to analyze electrical potential and field direction on conductive hydrogels under simulated voltages. Three different hydrogel structures including a two-dimensional model, cylindrical model, as well as a three-dimensional model with parallel microgrooves were modeled. Additionally, we investigated changes in electrical properties while varying the concentration of conductive material in the hydrogel. This study enhances our understanding on the effects of hydrogel structures and compositions on electrical fields.

Zaine Gray

History at University of Arizona

Mentored by Dr. John Bauschatz (History)

"The Roman Empire: Adoption as an Imperial Tool and its Effect on Stability"

ABSTRACT: Examinations of ancient adoptions reveal that adopters had different intentions in antiquity than they do now. Scholars of ancient Roman social and familial connections have found that marriages, adoptions, friendships, and other social interactions were sometimes politically motivated. These studies have revealed much about the romantic, platonic, and political relationships of the time; but the literature on adoption as an imperial tool leaves much to be desired. While the Roman imperial practice of adoptive succession is noted in Roman scholarship, there has yet to be a comprehensive study of the effects of this practice. The purpose of this study is to determine whether or not the practice of direct adoptive succession promoted stability in the Roman Empire. To determine this, the study seeks to quantify stability in the Roman Empire through economic data, evidence of political unrest, and measurements of personal needs of the public being met, such as food, housing, medicine, and safety. Additionally, criteria are outlined to identify which Roman emperors are classified as "adopted" and not—and outside factors are considered in cases where appropriate. With equal samples of adopted and non-adopted emperors, and primary source data to determine stability, this study will find whether the Roman imperial practice of adoptive succession was ultimately better or worse for the Roman Empire. This limited research is the precursor to a larger study on classical 'philosopher-kings' as technocrats.

Angel Hernandez

Biomedical Engineering at University of Arizona

Mentored by Dr. Shang Song (Biomedical Engineering)

"Engineering Conductive Hydrogels"

ABSTRACT: Conductive polymers, as opposed to synthetic polymers, tend to have more biocompatible and conductive material properties, making them perfect for in-vivo implants such as scaffoldings for nerve regeneration or hydrogels for articular cartilage repair. However, the challenge with utilizing conductive polymers in in-vivo applications lies in that they lose their structural integrity and conductivity over time, especially in an aqueous environment such as a body. Hydrogels are a soft gelatinous material with a high-water content, able to retain their structural integrity even in aqueous environments. The challenge in using hydrogels in-vivo is that they are nonconductive and hard to electrically stimulate. The lack of literature that combines both conductive polymers and hydrogels into one product is primary reason why this study is warranted. Using poly(3, 4-ethyledimehpoly):polystyrene sulfonate (PEDOT:PSS) as the conductive polymer, and poly (vinyl) alcohol (PVA) as the nonconductive hydrogel-forming polymer, this study optimized the ratio of PVA to PEDOT:PSS in creating conductive water-based mediums. This study characterized these mediums for high conductivity, wettability, viscosity, and yield stress. The potential these conductive water-based mediums could have in studying stem cell interactions, behaviors, and in-vivo cell applications, is great because of the combined material properties of conductive polymers and hydrogels.

Emely Inzunza

Natural Resources: Wildlife Conservation and Management emphasis at University of Arizona

Mentored by Dr. Renee Duckworth (Ecology and Evolutionary Biology)

"Parental Care Trade-offs in Captive Zebra Finch Populations"

ABSTRACT: Animals are often faced with the dilemma of prioritizing individual survival for the benefit of future offspring or risking danger for the success of current offspring. These trade-offs can often be driven by the impact of stressors in early life, such as extreme weather and sibling competition. This study uses a captive colony of Zebra finches to determine how early life stress impacts parental provisioning behaviors and personality traits of parents. We hypothesize that birds who have been exposed to early life stressors will make decisions in parental provisioning strategies that differ of those who did not experience stress as fledglings due to the alteration of life history traits. Because high stress early in life may result in reduced lifespan, we predict that young birds with early life stress would invest more in reproduction, and be more aggressive and bolder in their parental strategies. Using social aggression and provisioning data collected from videos in the captive colony, we compared parents from high and low stress groups. With this study we hope to better understand how behaviors can vary with early life history tradeoffs between self-motivated and offspring-motivated behaviors.

Dominique Jordan

Neuroscience & Cognitive Science at

University of Arizona

Mentored by Dr. Cindy K. Miranti (Cellular and Molecular Medicine)

"Measuring Signaling of Integrin alpha-6 beta-1 in a Short Time Course with HYD-1"

ABSTRACT: Androgen receptor (AR) is the primary driver of prostate cancer. Patients with metastases are treated with androgen deprivation therapy (ADT). Currently, ADT is the only way to block AR signaling. However, some patients treated with ADT relapse, resulting in a more advanced metastatic castration-resistant prostate cancer (mCRPC). AR in mCRPC uses cell adhesion-mediated drug-resistant pathways (CAM-DR) to evade cell death. Laminin integrin alpha-6 beta-1 is a driver of CAM-DR and a direct transcriptional target of AR. Transcriptional targeting activates pro-survival signaling by alpha-6 beta-1. Alternative therapies are needed to target AR for mCRPC patients responding poorly to ADT. Alternative therapies could also be used in conjunction with existing therapies, providing more opportunities to patients and increasing efficacy of treatment. The survival mechanism of integrin alpha-6 beta-1 can be targeted by HYD1 (kikmviswkg), a synthetic D-amino acid tumor-adhesion peptide. It is hypothesized that HYD1 stabilizes and enriches integrin alpha-6 beta-1 at the cell surface and prevents normal protein internalization and signal transduction, thus impacting the normal function and activity of integrin alpha-6 beta-1. Despite this hypothesis, the time point in which HYD-1 binds to alpa-6-beta-1 the most and the effect of androgen stimulation on integrin expression is unknown. This present study utilizes immunoblotting to determine the effect of androgen treatment on the binding of integrin alpha-6 beta-1. Metastatic CRPC cell lines C4-2 and 22RVI will undergo HYD1 treatment and immunoblotting will be used to determine the peak binding time of HYD-1 and impact of androgen stimulation on integrin alpha-6 beta-1 expression.

Trisha Jean Lane

Environmental Engineering at University of Arizona

Mentored by Dr. Vasiliki (Vicky) Karanikola (Chemical and Environmental Engineering)

“Characterization of novel sorbents tailored for PFAS removal from water”

ABSTRACT: Per- and poly-fluoroalkyl substances (PFAS) are artificially created chemicals that pose risks to the environment and human health. PFAS are persistent, bio-accumulative, and can be found everywhere in the environment, including water, contaminating our already limited water sources. PFAS are manufactured by replacing the hydrogen atom on a carbon chain with a fluorine atom. The carbon-fluorine bonds of PFAS are strong, making it challenging to degrade or treat, which usually involves costly processes such as thermal distraction. The most common and effective treatment for PFAS is granulated activated carbon (GAC). Even though GAC is economical, it has become an unsustainable treatment due to its quick breakthrough of PFAS. In this project, we developed a cost-efficient and regenerative novel absorbent to remove PFAS from contaminated water. A critical part of the study is the molecular and surface characterization of the adsorption properties, kinetics, and strength. We use streaming zeta potential to characterize the material and correlate its properties with adsorption performance.

Alan Manuel Loreto Cornídez

Electrical and Computer Engineering at

University of Arizona

Mentored by Dr. Ali Akoglu (Electrical and Computer Engineering)

"Application Development and Pre-Silicon Design Analysis for a Heterogeneous Computing Platform"

ABSTRACT: As computing applications become increasingly complex and widespread, the demand for powerful and efficient computer designs has significantly increased. However, simply increasing raw processor speed renders major diminishing returns. The need to implement heterogeneous computing techniques – that is, utilizing specialized hardware that is optimized for the application at hand – is apparent. By using multiple computer architectures and hardware accelerators such as scalar processors, vector processors, and/or domain specific systems on a chip (DSSoCs) in a computer system, we can achieve performance gains beyond those that are possible with raw increases in processor speed. While execution time and power consumption characteristics are improved, this comes at the cost of a greater design complexity, requiring additional effort in hardware accelerator integration, resource management, and application development. These issues are addressed at the pre-silicon design stage in the Compiler-Integrated Extensible DSSoC Runtime (CEDR) framework. CEDR provides/combines many design features that help a hardware system designer conduct the cost-benefit analysis for different hardware implementations. The present study focuses on utilizing CEDR to implement multiple computer applications, such as a computer vision lane detection algorithm and a 5G protocol stack. This allows for analyzing how various hardware configurations affect the performance of the application. Power consumption, execution time, and scheduling characteristics are taken into consideration during the pre-silicon design stage to determine a cost-benefit analysis of implementing DSSoC hardware accelerators for these applications.

Sandra Cecilia Madrid

1. Criminal Justice 2. Latin American Studies at University of Arizona

Mentored by Dr. Elise Lopez (Consortium on Gender-Based Violence)

"Gender-Based Violence: Addressing the issue of Intersectionality within Survivor Advocacy"

ABSTRACT: An increasing collection of research studies indicate the importance of intersectionality-based framework in understanding how survivors of gender-based violence (GBV) are further victimized by survivor advocates. However, limited research considers intersectionality as a driving factor that limits survivors' help-seeking ability, especially marginalized and minority women as they are no stranger to discrimination.

This qualitative study uses a mixed-method approach to explore survivor advocacy support organizations. Examining 10-15 organizations in Tucson, Arizona, participating organizations are reviewed based on inclusion for survivors of gender-based violence. The goal of this study is to examine how organizations engage with different populations through an intersectionality-based framework, whether they can provide functional, accessible, and inclusive services for minority and marginalized survivors, and how they can overcome barriers encountered while helping survivors. This study measures inclusion with a series of questions based on specific criteria, encompassing marginalized and minority women in southern Arizona, such as:

- Citizenship Status (Undocumented, Asylee, Refugee)
- Gender Identity (Transgender Women, Individuals assigned female at birth that identify as nonbinary or gender non-conforming)
- Indigenous Ethnic Women (Native American)

Monserrath Navarro

Biology: Biomedical Sciences emphasis at

University of Arizona

Mentored by Dr. Nathan Ellis (Cellular and Molecular Medicine)

"BLM SUMO-acceptor site mutant replication stress phenotypes"

ABSTRACT: Bloom's syndrome (BS) is an inherited autosomal recessive disorder that causes an increased risk of developing multiple early onset cancers. Proportional small size and a photosensitive, facial skin rash are features exhibited by persons with Bloom's syndrome (BS). BS is caused by loss-of-function mutations in the BLM gene. BS cells exhibited increased chromosome breakage, hyper-recombination, and excessive mutation. BLM protein is modified by SUMO at lysine residue 331 and expression of a GFP-tagged BLM with a lysine to arginine mutation at this residue are complemented for the hyper-recombination phenotype but instead exhibit a striking replication defect and spontaneous phosphorylation of H2AX. This present study aims to determine whether or not these phenotypic effects are present in cells that carry the endogenous SUMO-acceptor site mutation K331R. This question is important as the result will show the extent to which the mutant phenotype is caused by over-expression of the mutant gene project, and potentially patients with SUMO acceptor-site mutations may have a phenotype different from BS. This study will also provide information on how these phenotypes and mutations may influence increased cancer risk.

Teresa Antoinette Noll

Pharmaceutical Sciences at University of Arizona

Mentored by Dr. Nathan Cherrington (Pharmacology and Toxicology)

"Adverse Drug Reactions and Cell Culture"

ABSTRACT: The blood-testis barrier (BTB) is a tight blood-tissue barrier that divides seminiferous epithelium in the testicles. Leukemia is a cancer of bone marrow cells that causes errors in DNA replication. Acute lymphoblastic leukemia is a common childhood cancer that rapidly progresses. There are chances of relapse when cancer is once again present in the body after it is determined to be cancer-free. Males are 40% more likely to experience a relapse due to the BTB. Leukemic cells will become trapped in the testicles when the BTB contracts and released when it relaxes. These released leukemic cells will then once again spread in the body. Transporter dynamics may affect results depending on the models used. Experiments conducted in vitro determined that human models provided more accurate transporter dynamics compared to Sprague-Dawley rat models. These xenobiotic transporters and further research will aid drug discovery regarding drugs that can pass through the BTB and target leukemic cells.

Abraham Ochoa

Aerospace Engineering at University of Arizona

Mentored by Dr. Mark T. Langhenry (Aerospace and Mechanical Engineering)

THE UNIVERSITY OF ARIZONA

"The Viability of Sustainable Propulsion Systems"

ABSTRACT: Currently the aviation industry is responsible for 3% of global carbon dioxide emissions. This is expected to increase by 4-5% per year. With the increasing climate regulations, the aviation industry needs to lean towards an aircraft propulsion system that is both efficient and sustainable. To address this, an investigation into the comparison of pure-electric, hybrid-electric and conventional propulsion systems is presented. Sustainable propulsion systems offer the potential for a decrease in emissions. However, current technological capabilities decrease the viability of these propulsion systems. A mass-energy balance has been conducted comparing a conventional Cessna 172, pure-electric Cessna 172 and hybrid-electric Cessna 172. The results found that the maximum range with the current battery specific energy density of 200 Wh/kg is 280 kilometers (154 nautical miles). In order to reach this maximum range, a pure-electric Cessna 172 would have a maximum take off weight of 44,848 kg. A conventional Cessna 172 has a maximum takeoff weight of 1,157 kg and a maximum range of 1,185 kilometers (640 nautical miles) with 53 gallons of aviation fuel. A hybrid-electric Cessna 172 offers a compromise between a conventional and pure-electric system but is still affected by the current battery specific energy density. For a pure-electric Cessna 172 to match the performance of a conventional Cessna 172, the battery specific energy density would have to be increased to 1,164 Wh/kg. These results are discussed and compared to previous work. Findings indicate that with current technology sustainable propulsion systems are most viable for small aircrafts whose mission profile consists of a short distance travel.

Elias Ortega

Literacy, Learning, and Leadership at

University of Arizona

Mentored by Dr. Scott Carvajal (Public Health)

“Community health: Identifying needs and resources for essential work”

ABSTRACT: Community health workers (CHW’s) are a bridge point for healthcare in underserved communities. Communities that face unmet needs in health, social, and financial needs are oftentimes categorized as underserved. CHWs connect with underserved communities and offer support in allocating resources as well as offering support in key areas such as health disparities, social barriers, and education. CHWs also participate in community based participatory research (CBPR) with health agencies and academic institutions. CHWs are on the front line of healthcare in prevention, treatment, and detection of diseases and health disparities. There are many factors that negatively impact CHWs, there are not many resources or coping mechanisms that are offered for CHWs. In this study there is an exploration in assessing needs of CHWs. This study takes a look into the work and practices of CHWs working for Campesinos sin Fronteras (CSF) in Yuma county, AZ. This study analyzes the experiences of CHWs from CSF and identifies themes of resource scarcity and self-care protocols. In this study five participants from CSF were interviewed and recorded using zoom technologies. Together with University of Arizona researchers and CSF we explored ideas in community health and how an academic institution can provide more support. The participants from CSF shared experiences relating to their work and the methods they employ to mitigate certain events. CHWs describe a rising level of mental health disparities and the pursuit of more viable options to offer their community.

Arianna Perea

Biology at University of Arizona

Mentored by Dr. Ron Heimark (Surgery)

"Understanding the Effects of Nitric Oxide Synthase 2 (NOS2) Derived Nitric Oxide (NO) on Invasion and Migration in the Progression of Triple-Negative Breast Cancer (TNBC)"

ABSTRACT: The primary cause of cancer-related deaths in triple-negative breast cancer (TNBC) is the progression to distant sites from the mammary gland. TNBC is an aggressive disease that lacks hormone and growth factor receptors; thus has no targeted therapies, is highly metastatic, and has a poor prognosis. Focal adhesion kinase (FAK) signaling promotes cell invasion and migration with overexpression correlating with metastatic breast cancer. High levels of inflammatory marker nitric oxide synthase 2 (NOS2) are found in TNBC tissue samples compared to normal mammary epithelial cells. Inflammation and the progression of TNBC and metastasis are critical characteristics of the TNBC tumor microenvironment (TME). Therefore, understanding how *NOS2* regulates cell invasion and migration will help elevate the progression of TNBC in metastasis. We will use 4T1, a syngeneic mouse model of TNBC cells, with wildtype (WT) *NOS2* or without the *NOS2* gene knocked out (KO) with CRISPR/Cas9. We hypothesize that NOS2-mediated NO in TNBC cells regulates FAKs for cell adhesion and migration. We will measure FAKs and invasion in our 4T1 cell lines (*NOS2* WT, KO1, and KO2) using microscopy techniques, scratch assays, and chamber invasion assays. These experiments aim to identify the role of NOS2-derived nitric oxide (NO) during the migration and progression of TNBC.

Mireya Pimentel

Biochemistry at University of Arizona

Mentored by Dr. Curtis A. Thorne (Cellular and Molecular Medicine)

"Colorectal Cancer and the Inhibition of Kinases within the CMGC Family"

ABSTRACT: Kinases are critical enzymes within biological chemistry that are habitually involved in the phosphorylation of proteins using adenosine triphosphate (ATP). Phosphorylation is a reaction that adds a phosphate group to a protein. In doing so, kinases aid in cell signaling allowing a series of chemical reactions to relay messages for cell function. Due to their role in signaling, dysregulation of kinase activity is most often observed in cancer progression. Therefore, there is a need to find specific small molecule inhibitors that inhibit their activity and act as therapeutic targets to treat cancer. Wnt signaling has a major role in colon tissue growth and homeostasis. Aberrant activation of this pathway can lead to the over proliferation of cells, increasing oncogenic signaling and the development and progression of colorectal cancer. Previous studies in our lab revealed that inhibition of the CLK3 kinase disrupted Wnt signaling. Therefore, the present study conducts a drug screen utilizing a particular subset of kinases, specifically the CLKs and DYRKs from the CMGC kinase family. Tests will be conducted regarding the specificity of the collection of pan-DYRK/pan-CLK inhibitors to each of the proteins; aiming to find inhibitors that solely bind to one of the aforementioned enzymes. Upon completion of this project, small molecules will be identified that target subsets of DYRKS and CLKS. If specified inhibitors for our families of kinases are found, then we may have the capacity to disrupt the Wnt pathway in cancer cells, further progressing cancer research.

Briana N. Pomales

Chemistry at University of Arizona

Mentored by Dr. Dennis L Lichtenberger (Chemistry and Biochemistry)

"Modification of Modern Electrolysis Cells to Produce H_2"

ABSTRACT: New fuel sources are in demand due to the increasing levels of carbon dioxide in the atmosphere. This study presents a developing renewable fuel, H_2 . The electrolytic production of H_2 from water in a flow cell offers the potential for H2 to replace current fuel sources with a cleaner alternative without carbon dioxide emission to the atmosphere. A flow cell allows for a larger capacity of a solution to be studied and demonstrates how well data transfers to a large scale. Platinum is currently the standard for use in electrolysis cells due to its ability to produce H_2 efficiently. Though, platinum is a scarce element. Thus, it is expensive. To produce H_2 cost-effectively, a comparable but less expensive catalyst than platinum is required. Metallopolymers used as catalysts to produce H_2 have multiple benefits, such as the ability to function at neutral pH and the use of earth-abundant elements. Metallopolymers and their comparison to platinum for clean hydrogen production using electrochemical methods will be presented.

Sofia Ragonese

Molecular and Cellular Biology at

University of Arizona

Mentored by Dr. Koenraad Van Doorslaer (Virology)

THE UNIVERSITY OF ARIZONA

"Inducing and Regulating the Late Expression of L1 in HPV"

ABSTRACT: High-risk human papillomaviruses (HPVs) are the cause of almost all cervical cancers and a substantial fraction of anogenital and oropharyngeal cancers. HPV16 is responsible for the growing number of oral cancers. HPV infects epithelial tissues and its viral lifecycle exhibits both an early and late stage that coincides with host cell differentiation from basal layer epithelial cells to upper layer differentiated cells. To explore the switch that ensures the completion of HPV's lifecycle, viral L1 (the major capsid protein) was chosen as a marker. L1 expression is differentiation-dependent. The early stage of the viral cycle modifies signaling pathways, including epidermal growth factor and immune response, which further enables the proliferative state of the cell followed by a signal for late gene expression L1. TheL1 marker is expressed in only a subset of infected cells, which poses a significant challenge for exploring HPVs full lifecycle. My research focuses on establishing methods to induce the L1 late viral production in monolayer keratinocytes. According to previous research, transforming growth factor beta (TGF-β1) activates differentiation. I am testing the effect of TGF-β1 on HPV16-positive oral cells to see if it activates L1 as a method to consistently increase late expression in HPV-positive cells. The expression of L1 marker will be measured at the RNA-level using RT-qPCR and western blot will be used to confirm protein-level expression. Successful induction of L1 in monolayer allows us to test viral lifecycle by indicating which cells have entered the productive stage of infection.

Victoria Ramos

Animal Sciences: Animal Industry emphasis at University of Arizona

Mentored by Dr. Duarte Diaz (Animal and Comparative Biomedical Sciences)

"Effects of Heat Stress on Ewe Pregnancy and Offspring Performance: Milk Production, Growth Performance and Mammary Gland Development"

ABSTRACT: Heat stress (HS) has a negative impact during the final third gestation of ewe's (female sheep) pregnancy. Studies also demonstrate that HS affects the fetus due to placental insufficiency causing adeficiency of nutrients and oxygen in the fetus. Studies consistently show that ewes exposed to HS during pregnancy present a decrease in milk production, protein and lactase concentration. However, the effect on colostrum production, milk production, and mammary gland development has not been reported effectively. Similarly, the progeny of these ewes present an increase in mortality, decrease in birth weight, decrease in survival rates. The impact of HS continues in different stages of the production of the offspring. The present study aims to determine the effect of HS during the last third of gestation in ewes' pregnancy on colostrum production, milk production, and mammary gland development. The study also seeks to understand the impact on the growth performance, colostrum and milk concentration and production, and mammary gland development of the offspring. Columbian-Rambouillet crossbred ewes with singleton pregnancy will be housed in two controlled environment chambers: 1) heat stress (HS: THI = 73 to 85) and 2) thermoneutral (TN: THI = 68). During the experiment, colostrum concentrations, milk composition, and milk production will be measured on the ewes. Mammary gland development will be determined using ultrasound and DNA samples. After lambing, colostrum absorption, growth performance, and milk performance in offspring will be studied. We expect to see, Offspring born of IUGR mothers will be, small, immune incompetent, and lower overall performance. *Keywords:* Gestation, colostrum, Placenta, mammary gland

Nebyate Seged

Chemical Engineering at University of Arizona

Mentored by Dr. Paul Blowers (Chemical and Environmental Engineering)

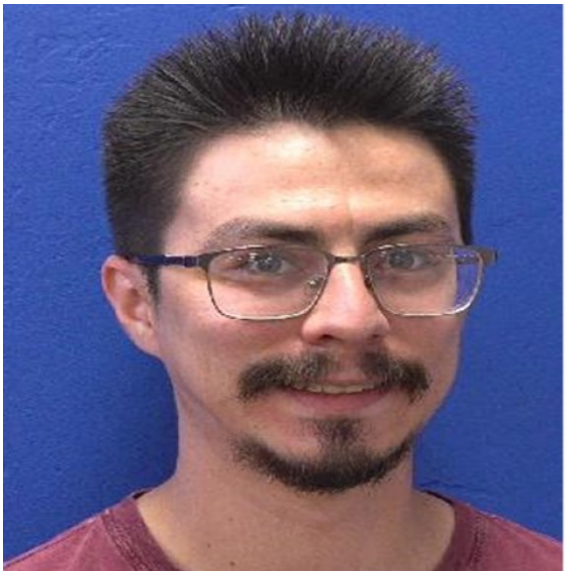
"Investigating the Global Warming Potential of Fluoroethylene Carbonate Using Computational Chemistry "

ABSTRACT: This study predicted the global warming potential (GWP) of fluoroethylene carbonate (FEC) through density functional computational chemistry methods. Our approach combined radiative forcing values derived from density functional theory with hydroxyl radical hydrogen abstraction rate constants derived from transition state theory to predict the GWP of FEC with no previous experimental data available. Molecular geometries were be obtained with Gaussian09 software along with the B3LYP/6-311g** basis set. These geometries were utilized to compute frequencies and infrared intensity calculations for radiative forcing estimates, while an adjusted CBS-RAD method was used to obtain accurate reaction energy barriers. The activation energies were used to estimate hydrogen abstraction rate constants using canonical variational transition state theory. Hindered rotor and quantum tunneling corrections were applied to increase the accuracy of reaction rate constants without previous experimental data. This methodology was also employed to estimate GWPs for two extensively researched species, propane (C_3H_8) and methanol (CH_3OH), which we predicted to be within 14-25% of experimental GWP values

Victor Villa

Physics at University of Arizona

Mentored by Dr. Brian LeRoy (Physics)



"Fabrication of Van der Waals Heterostructures for the investigation of the electrical properties of Twisted Tungsten Diselenide and Twisted Trilayer Graphene"

ABSTRACT: Research into two-dimensional materials has found them to have exotic electronic properties. One of these properties is the appearance of flat band electronic structures. Flat bands are a collection of energy states an electron can take combined into a single band. They form as a result of the periodic potential energy of a moiré superlattice, which is formed by offsetting the alignment of the 2D crystal lattice making up a device. Near these flat bands, there is high electron correlation which leads to interesting physics such as superconductivity, correlated states and other phenomena due to the high potential energy of a moiré superlattice and lower kinetic energy of the electronic bands. These flat bands have been found in twisted bilayer Tungsten Diselenide between a wider range of twist angles than twisted bilayer Graphene. One of the experimental techniques to study these materials and their electronic properties is scanning tunneling microscopy. In order to use scanning tunneling microscopy, we make stacked devices of twisted homobilayer Tungsten Diselenide with a Graphene sensing layer to prevent tip effects from affecting the sample. The Graphene sensing layer is made up of a layer of hexagonal Boron Nitride that is about 5 nm thick and a monolayer of Graphene that have been stacked on top of one another. The bilayer Tungsten Diselenide is twisted to a little over 0º, then placed between two Graphene sensing layers, surrounded by the hexagonal boron nitride layers. We also fabricated twisted trilayer Graphene for scanning tunneling microscopy measurements using the transfer technique used for the twisted homobilayer Tungsten Diselenide device.

MINIMIZING HEALTH DISPARITIES (MHD)

Coordinators: Tianna MacMeans and Holly Lopez

Sponsors: Western Alliance to Expand Student Opportunities (WAESO), Building Undergraduate Infrastructure Leading to Diversity: Southwest Consortium of Health-Oriented Education Leaders and Research Scholars (BUILDing SCHOLARS)-University of Texas, El Paso, University of Arizona Graduate College

Astrid Ardon Lopez

Biochemistry at California State Polytechnic University, Pomona

Mentored by Dr. Janko Nikolich-Žugich (Immunobiology)

"Use of Senolytics to Reduce Immunosenescence in Secondary Lymphoid Organs"

ABSTRACT: Aging leads to an increase in vulnerability to emerging infections and a lower response to vaccination. Consequently, viral infections such as influenza and COVID-19 cause higher mortality rates in adults over 65 years of age. Those aging phenotypes are likely due to age-related changes in the immune system, termed immunosenescence, which includes, a decrease in the number of naïve T cells in circulation and T cell function, and an increase in inflammatory cytokines. Recent studies revealed that secondary lymphoid organs (SLOs) play a critical role in the maintenance of naïve T cells and functional T cells. We focused on SLOs since they contribute the direct immune responses to where they are needed in response to pathogens. Cellular senescence is a phenomenon characterized by irreversible cell cycle arrest and apoptosis resistance. Senescence cells are present in different systems, including the immune system, and the number of these cells increases with age. Moreover, senescence cells secrete senescence associate phenotype (SASP) which may increase dysfunction in neighboring tissue. Drugs that selectively kill senescence cells are called senolytics. Some studies showed the treatment with senolytics improves aging phenotypes, including susceptibility to infection. However, senescence cells in SLOs and the effect of senolytics are not extensively studied. Our research goal is to figure out if senescence cells in SLOs are responsible for immunosenescence and if the removal of senescence cells by senolytics can reverse immunosenescence and improve immune response. We isolated stromal cells from the spleen and treated them with senolytics in vitro. Senescence cells, which are identified as Beta-gal positive and/or CD87-positive cells, were reduced after the treatment with senolytics. In conclusion, senolytics may be able to reduce immunosenescence by removing senescent stromal cells in SLOs.

Anika Arias

1. Biochemistry 2. Molecular & Cellular Biology

at University of Arizona

Mentored by Dr. Alfred Bothwell (Immunobiology)

"Categorizing Trogocytosis by Image Analysis in Kidney, Colon and Pancreatic Cancer"

ABSTRACT: Trogocytosis, or "cell nibbling", is the exchange of cell membrane and membrane proteins between two cells. Although this normally occurs in immune cells, microglia and others, our lab has recently established trogocytic interactions between immune cells and colorectal cancer cells (Shin JH 2021). This work has led to the hypothesis that cancer stem cells/ organoids can trogocytose with patient endogenous lymphocytes to initiate tumor formation. When in contact with CD4 T cells, trogocytic colorectal cancer cells were able to uptake CD4 T cell markers such as CD4 and CD45 and immunosuppressive markers such as CTLA4 and PD1. However, visualization of this phenomenon has been limited to flow cytometry and its prevalence in other cancer types has been largely unexplored. To determine if trogocytosis between cancer and immune cells is present in other cancer types, kidney tumor, and colon and pancreatic organoids derived from resected patient tumor were stained, imaged, and analyzed. Using immunofluorescence staining, FFPE preserved kidney tumors from patients of White, Hispanic or Native American background were compared. Samples were stained with markers for NK cells (CD56), T cells (CD45RO) and monocytes/ macrophages (CD16, CD14), imaged using confocal microscopy and quantified using a novel method to detect trogocytosis in ImageJ. Additionally, colon and pancreatic organoids were stained with markers for NK cells (CD56) and T cells (CD45RO) then were imaged and analyzed similarly to kidney tissue. In kidney tumors, although there was no observable difference in memory T Cell counts between ethnicities, Hispanic patient samples contained elevated NK counts and both Hispanic and Native American samples showed increased monocyte/macrophage counts. It was also found that there was an increased CD56 expression in pancreatic organoids and decreased CD45RO expression in both pancreatic and colon organoids. While work has been done in defining immune cell types found within kidney, colon and pancreatic tumors, further analysis of images needs to be done to quantify the amount of trogocytic cells within these samples. Also, additional staining of organoids needs to be done to obtain a full understanding of the immune markers that may be expressed on their surface.

Reference

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Savannah Crow

Health Sciences at Idaho State University

Mentored by Dr. David Margolis and Gerardo Figueroa (Orthopedic Surgery)

"RT-qPCR Analysis of Human Adipose-Derived Stem Cells Cultured in Standard and Osteogenic Media"

ABSTRACT: Critical sized bone defects cannot heal properly without medical intervention and current treatments have only a moderate success rate, with significant risk of complications. Studies are experimenting with the use of 3D printed scaffolds to encourage bone growth for these critical sized bone defects. The 3D printed scaffolds are covered with cells that encourage bone growth. RT-qPCR can be used to determine if the cells are differentiating into the proper cell types. Stem cell expansion media (SCEM) was used for the standard media and osteogenic media (OSTEO) was used to culture the human adipose-derived stem cells (hADSCs). hADSCs were fed with each of the medias for a total of four weeks. Every week reverse transcription quantitative polymerase chain reaction (RT-qPCR) was performed to identify whether nine different genes were expressed or not based on the type of media. After RT-qPCR the genes were compared to each other by using the delta-delta C_T method. This method is known as $^{2-\Delta\Delta Ct}$ Livak method which is a formula that allows calculation of the relative fold gene expression within a sample. This was used to identify which of the nine genes were the most present over the four weeks within each of the media types. Our finding suggests that there is an increase in gene expression of eight of the genes from week one to week three of the hADSCs that were cultured in the osteogenic media. The most significant increases in gene expression were COL1A1 and RUNX2. Of the hADSCs that were cultured in osteogenic media only one gene, TBP, decreased in gene expression from week one to week three.

Tori Fulton

Biomedical Science at Diné College

Mentored by Dr. Michael Johnson (Immunobiology)

“Examining the copper toxicity and streptococcus pneumonia based on knockout genes”

ABSTRACT: The human body uses copper to fight pathogens as it is one of the micronutrients needed for survival. But due to an excessive production or misplacement of copper within the body it causes copper toxicity. While Streptococcus pneumoniae, a pathogenic bacterium, can withstand and fight the copper with a specific copper export system. The research purpose here is gaining insight into what additional genes in S. pneumoniae are responsible for helping overcome the copper stress. To determine this, I wanted to examine copper responsiveness by making mutants used in overcoming copper toxicity. Using the sequence of methodology, the number of systems help overcome the copper stress through individual knockout genes. Through the methodology of PCR testing, DNA gel electrophoresis testing, PCR purification cleanup, Nanodrop testing, Gibson cloning to make a 3kb piece, and making blood agar plates for growth transformation, the goal is to target the genes who help overcome copper stress from testing the mutants within the copper export system. The research I was able to conduct was to benefit the study of understanding copper toxicity to gain insight on which genes will overcome copper stress and make S. pneumoniae easier to kill within the body based on the methodology on individual knockouts.

Harvey Harvey

Molecular and Cellular Biology at University of Arizona

Mentored by Dr. Lisa Nagy (Molecular and Cellular Biology)

"Regulation of *eve* in *Tribolium castaneum*"

ABSTRACT: Arthropods segment bilaterally. The red-flour beetle segments by using an oscillator clock to generate segments sequentially, while Drosophila melanogaster uses a cascade of transcription factors to generate segments simultaneously. *Even-skipped*, a gene common to both modes of segmentation and generates stripes, has modular enhancers in *D. melanogaster*. *Hairy* in *Tribolium castaneum* has been found to have stripe enhancers, so we hypothesize that eve, a gene involved in segmentation (unlike *hairy*), should have stripe enhancers. Motif Cluster Assignment Search Tool (MCAST) finds potential transcription factor binding sites, which in turn predicts putative enhancer regions. These regions were cloned and integrated into PiggyGUM plasmids, and then integrated into transgenic *D. melanogaster* and *T. castaneum* organisms. Further MCAST analysis provides the basis that this tool is effective in providing a framework for predicting open chromatin regions. *in-situ* Hybridization Chain Reaction (HCR) was performed to characterize mCherry and GFP in transgenic organisms. In one analyzed enhancer region, it is likely we found enhancers for anal pad tissue and a shadow enhancer for stripes. When compared to *D. melanogaster* literature, this suggests that the positions of tissue specific enhancers have been dispersed throughout the *eve* locus and their position to the ORF are not conserved.

Funding provided by NSF IOS 1817485.

Mariah Leonard

Biology at New Mexico State University

Mentored by Dr. Stephen Cowen (Psychology)

"Effects of ketamine on the electrophysiological features of L-DOPA-induced dyskinesia in Parkinsonian rats"

ABSTRACT: Parkinson's disease is a neurodegenerative disorder that reduces dopamine production by mediating dopamine cell loss. Lack of dopamine production can cause symptoms such as uncontrollable movements, tremors, stiffness, and can overall cause abnormal nerve firing patterns. Levodopa (L-DOPA) is a drug commonly used to treat Parkinson's Disease. However, this treatment can lead to L-DOPA-induced dyskinesia (LID) which are uncontrollable and involuntary movements. LID has been found to be present with 80 Hz oscillations in previous studies. Ketamine, an N-methyl-D-aspartate (NMDA) receptor antagonist is used as a treatment for depression, anesthetic, chronic pain, and more. In recent studies, ketamine has been found to reduce LID and burst firing. The objective of this study was to explore how local field potential and single unit activity are altered when ketamine was injected into parkinsonian or naive rats. We hypothesized ketamine causes disruptions of 80 Hz Oscillation which are present during LID. This was studied by using the following methods. Each rat was surgically given 6-Hydroxydopamine to induce dopamine cell lesions in the right hemisphere to make the rats parkinsonian (sham rats were given vehicle injections as a control). The lesion was left to fully develop for 21 days post-surgery. After which an amphetamine test was performed to ensure the rats were parkinsonian. 12mg/kg dose of L-DOPA was given for ten days as priming to establish LID in the rats. Hyperdrives with sixteen gold-plated tetrodes were implanted into the rats bilaterally. Neural recordings with the hyperdrives included three categories of recording: 1) saline and ketamine (20 mg/kg) injections, 2) L-DOPA (12mg/kg) and saline injections, and 3) L-DOPA and ketamine injections. During these recordings, local field potential and single units were recorded and analyzed to look at how the drugs affected individual cell and population neural activity. It was found in preliminary data that ketamine disrupts 80Hz oscillations and replaces them with a slower 50Hz oscillation. The analysis of individual cell activity patterns is ongoing.

Victoria Lopez

Pre-Nutritional Sciences at University of Arizona

Mentored by Dr. Ann Skulas-Ray (Nutritional Sciences)

"Better Beef: Optimizing the Fatty Acid Profile of Beef: Grass-Finishing vs. Grain-Finishing"

ABSTRACT: Omega-3 (n-3) fatty acids, found mostly in oily fish and seafood, play important biological roles that reduce risk of cardiovascular and other inflammatory diseases. However, the American diet contains very little n-3 fatty acids with 8 in 10 US adults failing to meet the most conservative health recommendations for intake of eicosapentaenoic acid (EPA), docosapentaenoic acid (DPA), and docosahexaenoic acid (DHA). Prior work, mostly in other countries, has shown grass-finished beef is enriched in n-3 fatty acids and may have potential to increase US intakes, however the majority of beef consumed in the US is grain-finished, and little work has characterized the effects of grass finishing–particularly in the desert southwest. This study evaluated the fatty acid composition of grass-finished vs. conventional grain-finished beef products to determine the difference in n-3 fatty acid content, as well as monounsaturated and saturated fatty acids. The fat and lean tissue fatty acid composition of 30 animals (15 grass-finished and 15 grain-finished) were profiled in duplicate and averaged prior to analysis using the mixed models procedure in SAS. Briefly, lipids were extracted, methylated to form fatty acid methyl esters, and analyzed by gas chromatography. Grass finished beef had significantly higher concentrations of EPA, DPA, and DHA vs. grain finished beef ($p < 0.05$). DPA was the most abundant n-3 fatty acid, with grass-finished beef providing 23 mg/100 g raw serving (1.6% of total fat content) vs. 11 mg/100 g raw serving (0.4% of total fat content) in grass-finished beef ($p < 0.05$). Grass-finished beef produced in the desert southwest is enriched in n-3 fatty acids while providing less total fat vs. grain-finished beef. Therefore, substituting grain-finished beef with grass-finished beef would increase US n-3 intake and potentially contribute to health benefits throughout the population.

Jessica Nicte Ortega Guevara

Nutritional Science at University of Arizona

Mentored by Dr. Melissa Pentecost (Clinical Translational Sciences)

"Evaluating knowledge, attitudes and beliefs towards a traditional Mexican diet: Qualitative interviews among Mexican-Origin Hispanic adults at risk for obesity-related cancers."

ABSTRACT: **Background:** Mexican-origin Hispanic adults experience high rates of obesity-related cancers. A traditional Mexican diet may serve as a strategy to address cancer rates in this population. While epidemiologic evidence indicates a potential beneficial effect of this diet on health outcomes, limited research has been conducted to inform the development and delivery of an intervention. This project evaluated participants' knowledge, attitudes and beliefs towards a traditional Mexican diet and identified considerations for a future dietary intervention aimed at addressing obesity-related cancer risk.

Methods: Thirteen Mexican-origin Hispanic adults (N= 10 women, N= 3 men) that received a cancer diagnosis or were family members of an individual with a cancer diagnosis in the last 5 years, participated in the study. The semi-structured interview were conducted in the participant's language of preference (English or Spanish) over the phone or in person, and included 20 questions. Interviews explored attitudes and beliefs towards food practices in the US and Mexico, and towards a traditional Mexican diet upon receiving a description of this dietary pattern. The second part of the interview explored considerations for a future dietary intervention focused on consuming a more traditional Mexican diet. Interviews were analyzed using a thematic approach.

Results: When comparing food practices in the US vs Mexico, common themes included: 1) high access to junk food, particularly in poor neighborhoods in the US, 2) foods in Mexico described as more natural and nutrient dense, 3) foods in the US perceived as containing more chemicals and being more processed, 4) food preparation and enjoying meals as a family as a more common practice in Mexico, and 5) belief that a traditional Mexican diet is healthier. When asking about barriers for healthy eating, common themes included: 1) faster life pace and lack of time in the US, 2) the adverse effects of modernization on foods and food practices in both the US and Mexico. Considerations for a future dietary intervention included a desire for an education component about the relationship between traditional Mexican food and ingredients and health, interest in cooking demonstrations, and preference for the inclusion of friends and family who could also benefit from such a program.

Conclusions: All participants expressed interest in expanding knowledge and skills related to adopting a more traditional Mexican diet pattern. Findings from this study can inform a future dietary intervention to reduce obesity-related cancer rates in Mexican-origin Hispanic adults.

Keywords: Traditional Mexican Diet, Mexican-Origin Hispanic, Adults, Obesity-related Cancer.

Conflict of interest: The authors report no conflicts of interest.

Cole Paquin

Biochemistry at University of California, San Diego

Mentored by Dr. Elisa Tomat (Chemistry and Biochemistry)

"Antiproliferative Activity of Folate Conjugated Iron Prochelators"

ABSTRACT: Iron is an essential metal in biology and participates in many metabolic processes. Due to their increased metabolism, cancer cells require higher intracellular levels of iron. This makes them susceptible to iron chelation as removal of their iron results in the death of the cell. They are also susceptible to iron's inherent toxicity as iron can catalyze the formation of reactive oxygen species. The Tomat group focuses on the development of iron chelators that enhance iron's redox activity. This work studies the efficacy of one such iron chelator, PH1, in multiple cell lines. PH1 was found to be relatively insoluble in cellular media which necessitated the creation of a more soluble compound PH1-C2. Cellular toxicity was evaluated using the MTT assay in MDA-MB-231, a breast cancer cell line, A549, a lung cancer cell line, and MRC5, normal lung cell fibroblasts. Though PH1-C2 greatly improved solubility, the resulting change in toxicity was relatively minor. To explain the low toxicity we evaluated the intracellular redox activity using the DCF assay in MDA-MB-231. The DCF assay for the PH1 ligand did not show a significant increase in redox activity. Therefore a new compound PH4, which was found to form a redox active complex, warrants further study.

Nicole Anahí Peña

Nutritional Sciences: Dietetics emphasis at University of Arizona

Mentored by Dr. Richard Simpson (Nutritional Sciences)

"Cancer Immunology and Exercise Physiology"

ABSTRACT: Physical exercise is reported to positively impact the immune system by stimulating cellular immunity and increasing circulation of white blood cells, especially natural killer cells (NK cells) with cytotoxic profile. This increase in peripheral blood mononuclear cells (PBMC's), with higher cytotoxicity ability, could be used as an adjuvant in cancer immunotherapy treatments. The aim of this study was to investigate if the PBMCs collected during exercise would exert a better tumor control, prevent relapse, and improve survival in a xenogeneic mouse model. The donor lymphocyte infusion in this experiment is from voluntary healthy humans ranging from age ranges of 21-45 who cycle in the lab for 20 minutes reaching their personal VO2 max. Blood samples were taken at rest, and during exercise (5 minutes prior to exercise completion). The purpose of this study is to observe human lymphocyte mobilization with exercise to extend survival and decrease relapse percentage in xenogeneic mice. To review and evaluate relapse, mice were injected with PBMCs on day -1, on day 0 . All mice are given a human cell line tumor, K562-luc. Mice were imaged on day 1 and every 2-3 days after day 3 for 40 days. The control group is injected with K562-Luc + vehicle (saline); the second group is injected with K562-Luc + resting (R) PBMC's; the last group is injected with K562-Luc + exercising (E) PBMC's. The total number of PBMCs injected were the same for both testing groups, however the composition was different. Mice given exercise PBMCs received less CD4 T cells and more NK cells. The same group showed a reduced cancer burden and improved survival compared to PBMC- R and Vehicle. The conclusion of this study was that PBMCs collected during exercise improved cancer immunotherapy outcomes.

Keywords: cancer, exercise, leukemia, lymphocytes, NK cellls, xenogenic

Danny Ramos

1. Physiology 2. Medical Sciences at University of Arizona

"Covid-19 and Our Heart: An Emotional, Social, and Physical Killer"

ABSTRACT: Since 2019 we have had to endure the challenges of living in a society dictated by the impact of Covid-19. A viral respiratory disease that can infect any individual regardless of age or health. In the few years since the pandemic has begun we have started to observe and understand the adverse effects this pathogen has on our Cardiovascular health. The purpose of my work here is to analyze and update myself and others on the current research being done on heart health and the relationship it has with Covid-19. Following multiple studies from institutions around the world it has been discovered that the risk for acute Cardiac disease and events such as Myocardial Infarctions and ST- Elevation Myocardial Infarction becomes a prominent threat when an individual contracts Covid-19. Using studies such as the one published from the University of Pennsylvania, Philadelphia, where over 30,000 patients were observed, we can gain a better understanding of the exact implications that Covid-19 causes to our Cardiovascular system. This field of study is crucial to the advancement of medicine and can be utilized as a means to help us end this pandemic and provide high quality care to all Covid patients. Not only will Covid teach us how to be prepared should there be a next viral pandemic but it also provides us with a unique opportunity to familiarize ourselves with how organ systems in the body respond to respiratory diseases.

Alondra Ruiz

Biomedical Sciences at University of Arizona

Mentored by Dr. Patrick Ronaldson (Pharmacology)

"How Optimizing Transport of Neuroprotective Therapies at the Blood Brain Barrier is an Effective Delivery Mechanism to Treat Neurological Diseases"

ABSTRACT: The Ronaldson lab conducts a variety of translational experiments that utilize the transporters at the blood brain barrier as routes of delivery for clinically relevant drugs and novel compounds to treat neurological diseases. The purpose of the blood brain barrier is to protect the brain from harmful pathogens and substances while still allowing needed nutrients to go through. It is composed of tight junction protein complexes at the endothelial that make up the microvessels that innervate the brain. The tight junction complexes at the endothelial only allow small soluble molecules to pass freely via paracellular transport and into the brain, while most other molecules can gain entry to the brain through transporter proteins. These transporter proteins are selective; there are multiple classes that move a range of substrates with specific characteristics. Proper blood brain barrier physiology is important, and its breakdown is implemented in many disease states. The breakdown of the blood brain barrier in neurodegenerative diseases is not fully understood. A key feature of ischemic stroke is disruption of the blood brain barrier. An ischemic stroke causes damage to the blood brain barrier such as decreased expression and disorganization of tight junction proteins. A patient with Alzheimer's disease shows early breakdown of the blood brain barrier due in part to the accumulation of the amyloid protein which forms beta-pleated sheets. Due to selectivity of the blood brain barrier, drug uptake to the brain is very restricted. The Ronaldson lab studies how to optimize transporters for drug delivery, to treat stroke and Alzheimer's disease. One type of transporter protein primarily studied in the Ronaldson lab is organic anion transporting polypeptides (Oatp) which is responsible for transporting statins into the brain. On the stroke team, Sprague Dawley rats underwent a controlled stimulated stroke using the transient middle cerebral artery occlusion surgical technique (tMCAO). To test clinically relevant behavioral outcomes, motor function tests were conducted on the rotarod at 24 hours, 3 days, and 7 days post op. For the Alzheimer's disease team, transgenic mice underwent multiple day dosing with novel, neuroprotective compounds. After the multiple day dosing, cognitive testing was performed using the conditioned place preference (CPP) test. After behavioral tests were completed, brain microvessel isolations were conducted. Using the western blot protocol we were able to separate and identify certain proteins at the blood brain barrier in our brain samples. TTC staining allowed a visual representation on the damage inflicted on the brain during the induced ischemic stroke. The results show that transport of neuroprotective therapies at the blood brain barrier as an effective delivery mechanism to treat neurological diseases and these delivery mechanisms could be potentially used in future clinical trials.

Kimmy Smith

Collaborative Health and Human Services at California State University, Monterey Bay

Mentored by Dr. Celina Valencia (Family and Community Medicine)

"Food insecurity and gynecologic cancers: a scoping review"

ABSTRACT: **Introduction:** Food insecurity and food environments are proximal measures for access to high quality, nutrient-rich foods that have been associated with positive outcomes for gynecologic cancer patients.

This scoping review focuses on the extent to which food insecurity has been assessed in gynecologic cancer preventative care, how well minority and low socioeconomic status populations in the United States are represented, the methods used and whether they are sufficient in describing gynecologic cancer risk factors, the health outcomes associated with food insecurity and gynecologic cancers, and to identify existing gaps in the literature.

Methods: This scoping review followed the PROSPERO Scoping Review Protocol. Articles eligible for inclusion in this review must meet the following criteria: Peer reviewed journal papers published between the period of 2012–2022, focused on a U.S. study sample, written in English, measuring or focusing on food insecurity, food environment, or social determinants of health, and primary outcomes being gynecologic cancer or female genital disease. Article review was conducted independently by two members of the study team.

Results: In a preliminary search conducted by a research librarian, 33 articles were yielded by the search terms in PubMed for review. A total of seven articles were identified for inclusion in the review based on the inclusion and exclusion criteria.

Preliminary conclusions include a large gap in the literature on the potential association between lack of access to nutritious foods and gynecologic cancer outcomes. Future research is needed to address this gap in the literature.

Crystal Smith

Biology at Oakwood University

Mentored by Dr. Michael Johnson (Immunobiology)

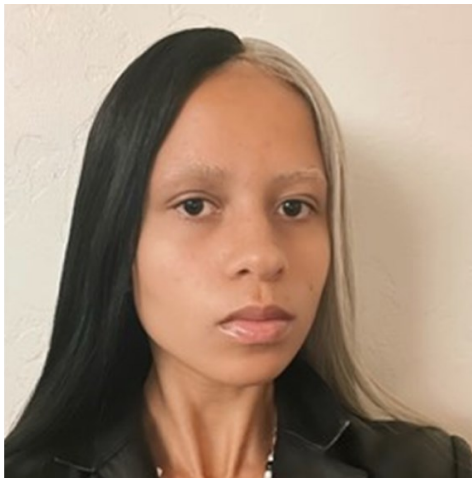
"*Streptococcus pneumoniae* and how knockout genes can affect copper toxicity"

ABSTRACT: *Streptococcus pneumoniae* is a Gram-positive bacteria that causes pneumonia. *S. pneumoniae* has begun to build antibiotic resistance. Therefore, new approaches will help reduce the concern of antibiotic resistance. Copper is a metal found in the body with an imperative role in beneficial immune function. Additionally, the metal copper is antimicrobial. Export systems in the bacteria, such as the copper export system, help counteract the antimicrobial effects of copper. This study aims to determine which additional bacterial systems in *S. pneumoniae* can be knocked out to affect copper toxicity. To uncover which bacterial system helps overcome copper toxicity, mutants of the bacteria were made. Polymerase chain reaction (PCR) amplifies small portions of DNA that helped create the mutants. Gibson Cloning helps attach pieces of DNA together. For the pieces to combine, the overhang sequences need to match the DNA of the DNA that will be added. During this process, nuclease chews back DNA, DNA polymerase fills in the gaps, and ligation is used to connect the pieces together. *S. pneumoniae* undergoes transformation when external DNA is taken up by the bacteria. After the transformation has occurred, the antibiotic gene can be imputed as it is switched with the gene that is wanted. This uses homologous recombination which flips DNA such as the antibiotic gene. The assembling of DNA fragments is when up and downstream are combined. Afterward, transformation introduces the mutant to foreign genetic material; the mutant will integrate the information into its cell. This process occurs on blood plates with a specific antibiotic present, such as erythromycin (erm) or spectinomycin (spec). Transformations of the various mutants occurred, but no growth was present. Future studies will focus on transformations and how copper can affect mutants.

Melody Weber

Biology at Colorado State University

Mentored by Dr. Melissa Furlong (Community Environment and Policy)



"Characterizing environmental pollutants within a marginalized community and the implications of altering agricultural practices on pesticide dispersion"

ABSTRACT: **Background:** Environmental racism sequesters marginalized community members to areas of high pollution as compared to those of their white counterparts: specifically, environmental pollutants that drift as a result of pesticide application from agricultural practices. Alternative application techniques may be available to reduce such drift.

Objective: Here, we model various methods to identify parameters that, if adjusted, have the potential to attenuate pesticide drift in neighboring communities.

Methods: Using CALPUFF as a modeling forum of atmospheric conditions with sulfur dioxide utilized to represent the dispersion of a given pesticide or amalgamation of them, we characterize the impact of volatility, spray diameter, and magnitude on pesticide dispersion in Maricopa, Arizona: a town bordered by two indigenous U.S. communities. Modeling was performed under the temporal confines of September 6, 2021 and September 8, 2021. Additionally, CALMET and CALPOST software were used in conjunction with CALPUFF to integrate the meteorological and processing data, respectively, essential for accurate modeling of the dynamic atmosphere of Earth.

Results: We found that the reduction of volatility and spray diameter as compared to a specified array of baseline parameter values do not influence pesticide dispersion. Indeed, CALPUFF plots of pesticide dispersion rendered with baseline settings, plots rendered with a lowered volatility value, and plots rendered with a lowered spray diameter appear almost identical. Such a finding can be attributed to the well-supported chemical law that both volatility and spray diameter are preponderantly associated with ground deposition as opposed to atmospheric dispersion. In contrast, we found pesticide magnitude to be positively correlated with atmospheric pesticide dispersion rates.

Conclusion: The findings of this study suggest that paradigm shifts in agricultural practices should concern the volume reduction of applied pesticides in efforts to achieve social justice.

Cynthia Zakayo

Molecular and Cellular Biology at University of Arizona

Mentored by Dr. Frans Tax (Molecular and Cellular Biology)

"Does the Leucine Rich repeat receptor kinase KIN7 positively or negatively affect the growth of plant roots in different nitrogen conditions?"

ABSTRACT: The length of roots in plants is dependent on several key factors, and one of them is nutrient distribution in the soil. Depending on the nitrogen levels in the soil, plants tend to either develop longer primary roots or more extended secondary roots, often called lateral roots. The higher the levels of nitrogen in the soil, the lower the total root length in comparison to when there is low nitrogen: this is due to the need for the plant to explore for nutrients when nutrients are limiting. C-terminally encoded peptides are a family of peptides of about 15 amino acids in length that are expressed under different conditions, including under nutrient stress. These peptides activate receptor kinase in other cell types. According to previous studies,receptors CEPR1 and CEPR 2 directly bind CEP peptides and are important in signal transduction of nitrogen sensing. A collaborator of ours has identified a third receptor, KIN7, that interacts with or is part of a complex with CEPR1. My project is to understand whether KIN7 is a positive or negative regulator of CEPR1.

SUMMER RESEARCH INSTITUTE (SRI)

Coordinator: Tianna MacMeans and Donna Treloar, MA

Teaching Supervisor: Andrew Huerta, PhD

Graduate Teaching Assistant: Melinda Willett, MA

Sponsors: University of Arizona Graduate College and Western Alliance to Expand Student Opportunities (WAESO)

Jessica Armstead

Child Development and Family Studies at

University of North Texas, Dallas

Mentored by Dr. Melissa Barnett (Family Studies and Human Development)

"Are there any differences in symptoms of depression with grandparents in skip-generation households and multigeneration households?"

ABSTRACT: This research aims to discover if there are any differences in signs of depression in skip-generation households and multigenerational households. This research hypothesizes that skip-generation households will yield more signs of depression than multigenerational households. Skip-generation households contain only the grandparent and grandchild generation in the household with the grandparent being the caretaker. Multigenerational households have all three generations in the household and the grandparents are the caretakers of the grandchild. 211 grandparents were provided a survey allowing them the opportunity to self-report their experience raising their grandchildren. The information yielded from the surveys was analyzed and converted into data using the Center for Epidemiologic Studies Depression Scale (CESD). The Center for Epidemiologic Studies Depression Scale (CESD) data allowed for the signs of depression to be compared between skip-generation households and multigenerational households. The results yielded no is no significant difference of symptoms of depression in skip-generation households and multigenerational households.

Jessica Begay

Biology at Diné College

Mentored by Dr. Luisa Ikner (Environmental Science)

"Exploration of Aquatic Endophytes and their Antimicrobial Metabolites in Navajo Lake"

ABSTRACT: Antibiotic resistant bacteria are a rising concern in global healthcare and the need for novel antibiotics is growing. Fungi found inside plant tissues, fungal endophytes, are producers of antimicrobial bioactive compounds. These bioactive compounds are the result of abiotic and biotic stressors found in the surrounding environment, explaining the need to isolate endophytes from a variety of locations and ecosystem. This is why we propose sampling 60 aquatic plants from Navajo Lake, New Mexico. From the 60 aquatic plants 180 plant tissue samples will be examined for endophytic fungi with antimicrobial properties. There will be 2 sample sites where 30 aquatic plants be sampled from as Navajo Lake is the 2nd largest lake in New Mexico, measuring 388 feet deep and 25 miles long. Navajo Lake is a man-made reservoir supplying irrigational, municipal, industrial, and recreational purposes to surrounding communities. It is visited year-round and contains 2 marinas. As an additional factor in the outcome of antimicrobial metabolite production of endophytic fungi, one sample site location will be near the higher traffic marina and the other location will be further away from human activity. Antimicrobial properties will be tested through the bioassay of the metabolites produced by pure fungal cultures isolated from plant tissue samples. Fungi will be harvested through standard inculcation and isolation techniques. DNA extraction, DNA molecular identification, and bioassay of metabolites will be conducted through standard protocols within the field of fungal endophyte research. Metabolite(s) extracted with antimicrobial properties will be noted and used for further study.

Isabelle Boyle

Mathematics: Comprehensive emphasis at

University of Arizona

Mentored by Dr. Christian Parkinson (Mathematics)

"Scalable and Efficient Algorithms for Optimal Path Planning in the Hamilton-Jacobi Formulation"

ABSTRACT: We present the application of a modified primal dual hybrid gradient (PDHG) algorithm to the Hamilton-Jacobi (HJ) formulation of optimal path planning for simple nonholonomic vehicles. This method avoids the "curse of dimensionality" arising from finite difference schemes which limits computational solutions for this problem. To our knowledge, this algorithm has not yet been applied to the HJ formulation of self-driving cars. The PDHG algorithm uses an alternating minimization technique to solve the HJ equation exactly at individual points via the Hopf-Lax formula without the use of grid discretization. Our model allows for moving obstacles, where obstacles are approximated by circles for ease of computation. We present several examples of optimal trajectories produced by the algorithm and demonstrate the algorithm's efficiency over standard finite difference schemes.

Noah Butler

Computer Engineering at University of Arizona

Mentored by Dr. Janet Roveda (Electrical and Computer Engineering)

"Improving LiDAR-Based Navigation For The Visually Impaired With Metasurfaces"

ABSTRACT: Modern light detection and ranging (LiDAR) navigation systems for the visually impaired are effective, but they struggle with issues regarding weight, comfort, and universality. To circumvent these issues, we introduce the haptic metasurface, which is a lightweight wearable device capable of providing sensory feedback via haptic pins. The user wears several metasurface rings and is alerted about nearby objects' positions when the haptic pins extrude. The metasurfaces are connected to a field programmable gate array (FPGA), which is a reconfigurable computer chip that can perform a specific task with high efficiency. This device is used to control the metasurfaces by converting LiDAR spatial data to haptic pin voltages. As a portion of a larger project, this paper focuses on designing the architecture of the FPGA. This is accomplished by designing an abstract model of the architecture, writing modules of code to build the model in Vivado software, and simulating the design to examine its performance. The design is tested against the metrics of accuracy, speed, and power consumption. The code is readjusted and optimized based on its evaluation. The metasurfaces and other materials necessary to continue the research have not yet been constructed, so only preliminary research can be conducted in the present time. Fully designing the FPGA after access to these materials is granted will take an estimate of one to three months to complete. This study seeks to signify the metasurface as a valuable asset for navigation as well as human enhancement as a whole.

Aimée Chávez

1. Political Science 2. Mexican American Studies at University of Arizona

Mentored by Dr. Maurice Magana (Mexican American Studies)

"School Choice Policy, Gentrification, and the Effects on Minority Student Success: A Review of Recent Research"

ABSTRACT: Charter schools have become the fastest-growing area of school choice policy expansions. The increase in the availability of charters and the number of students enrolled in these schools have increased, however there is very little research that examines this phenomenon through the lens of gentrification. This paper attempts to answer: how gentrification and school choice-policies impact Latinx student success, how existing school funding models promote or limit educational equity and what parents, educators, and policymakers do to ensure more equitable outcomes for Latinx students by examining what existing literature reveals about what these neighborhood changes mean for children's academic success. I conducted a systematic review of literature paying particular attention to the impacts of gentrification-induced changes to racial and socioeconomic segregation, parent utilization of choice, and school choice information deserts. The final section raises additional questions and areas of research for advancing the understanding of the impacts of gentrification in the field of education research to gain deeper understanding of how gentrification creates educational opportunity for some students, and adversity for others.

Elisabeth Diaz Hampshire

English at Texas A&M University

Mentored by Dr. Michelle Perfect (Disability and Psychoeducational Studies)

"Wellness and Academic Success in Primary Education Students"

ABSTRACT: The implementation of wellness programs in the workplace and in higher education has been shown to improve productivity and academic performance. In a culture that tends to prioritize productivity over health, social, and psychological wellbeing, corporations and universities have come to the recognition that programs that benefit employees and students also benefit a businesses' bottom line. Wellness programs, however, are not as thoroughly implemented in primary and secondary schools as they are in the professional and university settings. The absence of such programs in elementary schools seems to suggest that young students do not need a holistic consideration of their wellbeing in order to excel academically. In this preliminary study, we examined academic performance in relation to wellness variables in 4th grade students in Southwest elementary schools. We found that the academic performance of students who meet a number of wellness variables correlate strongly with positive emotional, social, physical, and occupation factors. Conversely, students who exhibit negative wellness traits tend to correlate with low academic performance. The findings of this study suggest that further research is needed to better understand how students may suffer academically from a lack of a balanced consideration of other aspects of their lives, from physical and occupation wellbeing to social and emotional wellbeing.

Nicolas Gross

Mechanical Engineering at University of Arizona

Mentored by Dr. Jekan Thanga (Aerospace and Mechanical Engineering)

"Development of a Hard Docking Mechanism for Small Spacecraft"

ABSTRACT: Over the last decade, small satellite technology has opened the door for both public and private institutions to conduct research in low-Earth orbit (LEO). CubeSats, a class of small satellites, are small and inexpensive to produce, making them ideal for technology demonstrations as well as sensing, communication and observation applications in space. However, the potential of small satellites is not fully realized due to a lack of development in docking technology that enables the trading of goods and services as well as assembly of CubeSats in space (Thangavelautham & Raj, 2021). While several one-stage docking solutions consisting of a soft capture phase have been explored, there has yet to be a focus on two-stage docking, including a hard capture phase that provides a seal for the transfer of material. This study aims to address this gap by developing a hard docking mechanism between CubeSats. An existing cone and probe system for soft docking developed by Raj, Sturgeon, and Thangavelautham (2022) was directly modified. 3D modeling and 3D printing methods were used to create a spring-loaded latch mechanism for hard docking. In its current state, the design is successful in allowing for the simple docking and locking between the cone and probe components. In future projects the design will be improved and validated through load testing, utilizing shape memory alloy (SMA) springs to actuate the release of the lock, response time testing of the SMA mechanism and fabricating the system in metal.

Myana Hibbert

1. Care, Health, and Society 2. Religious Studies at University of Arizona

Mentored by Dr. Carrie Langley (Sociology)

"Exploring the Relationship Between Incarceration Rates and Community Health Factors"

ABSTRACT: Community health factors of education and food insecurity are impacted by growing incarceration rates. By studying incarceration rates, food security, and institutional racism in education comprehensively we can begin identifying the true causation of these issues. Food insecurity may be affected by incarceration rates and poverty which could cause a community to be at a disadvantage when it comes to health. The second community factor we will look at in relation to incarceration is the role of institutional racism in education. Institutional racism manifests in education through zero tolerance policies which contribute to the school to prison pipeline. To conduct our research, we performed two excel statistical tests to establish a correlation between county incarceration, food insecurity and high school graduation rates as community health factors. Our tests use data from all 15 Arizona counties. We hypothesized that all three community health factors would be correlated, and p-value of our test would be less than or equal .05 proving statistically significance. Our test results showed that out data was significant to a p-value of .0728. Our research question tasked us in first identifying a correlation between incarceration rates, food insecurity rates and institutional racism in education. By demonstrating a correlation between multiple community health factors, we hope that the findings are used to look at the combined impact of institutional racism in education and food insecurity as they are impacted by incarceration rates.

Allyssa Joe

Biology at University of Arizona

Mentored by Dr. Melville Wohlgemuth (Neuroscience)

“Circuits for sensing and action in the natural environment”

ABSTRACT: TBA

Lelia Rhodes

Linguistics at University of Arizona

Mentored by Dr. Robert Henderson (Linguistics)

"An Analysis of Pluralia Tantum Nouns in Seri"

ABSTRACT: Seri and Hiaki, both languages spoken in Sonora, Mexico, have had large amounts of language contact. Hiaki's system of plurality, specifically its inventory of pluralia tantum nouns, has been studied extensively; however, this is not the case for Seri. This paper aims to determine whether the language contact between these two languages has resulted in a similar or shared system of pluralia tantum nouns. By scouring the Seri grammar (Marlett, 2016) for nouns that utilize the plural determiner *coi* as well as noun headwords listed as plural, we can sort and analyze these nouns into the classes both in Hiaki (Harley & Harvey, 2021; Harley, 2022) as well as the scale of individuation (Grimm, 2018). The nouns in Seri do map well into both these categorization systems, and we were able to discover five types of plural nouns in Seri along with their standard verbal agreements.

Darianne Sanchez

1. Applied Mathematics 2. Biomedical Engineering at University of Arizona

Mentored by Dr. Ali Bilgin (Biomedical Engineering)

"Utilizing T_1-weighted Magnetic Resonance Images to Construct Multi-Contrast Magnetic Resonance Images Through Convolutional Neural Networks (CNN)"

ABSTRACT: Acquiring multiple contrast images of the same anatomical area increases the amount of diagnostic information during a magnetic resonance imaging (MRI) examination. Unfortunately, the process of MR image acquisition is expensive and time consuming. Additionally, images can sometimes be corrupted or unacquired due to limited time. In such cases, artificially synthesizing unacquired or corrupted contrasts can improve diagnostic information as well as decrease examination time and cost. Machine learning through convolutional neural networks (CNN) has shown great promise in creating qualitative mappings to synthesize target image contrasts. In this paper, we propose utilizing a ResUNet model for synthesizing T_1-weighted, T_{1ce}-weighted, T_2-weighted, and fluid attenuated inversion recovery (FLAIR) MR images. The proposed approach facilitates the propagation of information between low levels and high levels of the network through skip connections without degradation. A second focus of this paper's research is creating a quantitative mapping between T1 and T2 values (contrasts that represent different relaxation times), which will provide a valuable tool for early detection of abnormalities. A modified version of the ResUNet model for image multi-contrast synthesis will be utilized to train the network in creating a quantitative mapping between T1 and T2 values. In both cases, mean squared error (MSE) and loss versus epochs will be utilized to determine the quality of image synthesis by comparing outputs from training and validation outputs. All results, observations and paper are scheduled to be completed and presented in a November conference.

Mikah Wesley Rosanova

Law at University of Arizona

Mentored by Dr. Suzanne Dovi (Government and Public Policy)

"A New Lens: Trans-Focused Praxis For Better Analysis"

ABSTRACT: Current sociopolitical analyses of rhetoric that directly encourages violence against marginalized communities, while more frequent than ever before, are lacking in both identity-focused considerations and multi-praxis understanding. With this acknowledgement, feminist-political scholars can improve their analyses of contemporary violence against marginalized communities by incorporating intersectional approaches to their research and discourse. Feminist theorists have discussed the efficacy and critical nature of intersectionality as an avenue to improved discourse; however, this methodology has struggled to take root in a broad way in the world of political theorists. This study seeks to reinforce this theoretical understanding through evidentiary findings from the very communities that are directly affected by the rhetoric academic communities analyze. This study seeks to generate findings related incorporating intersectionality into sociopolitical research frameworks by focusing on transgender populations and related concepts of oppression and marginalization. While most literature published within the last five to seven years concerning transgender rights and violence towards transgender communities has improved in its incorporation of trans-friendly rhetoric, there is still a major gap in understanding anti-transgender violence as more than a single-axis issue. Through conducting a pilot survey among a sample population of transgender young people, the sample population's definitions and relationship to concepts that directly affect their daily lives were recorded and analyzed with the intention of understanding the effects on and benefits of applying intersectional issues to trans-related violence. The structure, components, and data-collection methods from this preliminary research will support a future, large-scale study into similar research inquiries.

Darrell Yazzie Jr.

Agriculture: Plants emphasis at Diné College

Mentored by Dr. Elise Gornish (Natural Resources and the Environment)

"Contrast of Seed Ball Forms Used in Restoration"

ABSTRACT: There are many counter challenges for applying restoration efforts with seed balls, obstacles with nutrient deficiencies, poor soils for holding water long enough for seed germination, and geographical challenges with precipitation consistency. This study is aiming to give an overview of succession by modifying seed ball outcomes when comparing shape, and nutrient inclusion with different variations of clay with compost. A germination test was done indoors for a short two-week time frame and compared that germination succession to an outdoor test plot with silty soil in an arid region of Southwest Arizona. Finding currently are confirming that seed germination has a higher success with additional nutrient inclusion with seed ball's ability to absorb water for proper saturation compared to naked seed germination. Clay inclusion is to help determine if the different amount of clay has any additional success for seed germination aside from being known as the glue for the seed ball mix which with in-door sample testing has confirmed this theory but is yet to be compared to the outdoor test plots. Comparing a seed ball with flattened sides has shown to have a more stationary effect but has not been seen to have more of an increase in germination in the indoor germination test. Going forth, more data has yet to be compared with the indoor germination test and the outdoor germination succession with monsoon and irrigation inclusion to kick-start germination. The overall succession of germination to seedling growth has been observed thus far for the sub-arid regions.

Scholar Training Academy for Research in STEM (STARS)

PIs: Nura Dualeh, MA and Rebecca Gomez, PhD

Program Director: Nura Dualeh, MA

Coordinator: Leah Callovini

Graduate Teaching Assistants:

Joanna Sanchez-Avila, ABD and Mary Bankhead

Sponsors: The Gordon and Betty Moore Foundation, Arizona's Science, Engineering, and Math Scholars Program (ASEMS), University of Arizona Graduate College

Manuel Acosta

Pharmaceutical Sciences at University of Arizona

Mentored by Dr. Joyce Schroeder (Molecular and Cellular Biology)

"Assessing the impact of nuclear EGFR on the tumor microenvironment"

ABSTRACT: Epidermal growth factor receptor (EGFR) overexpression is a prevalent marker in most triple-negative breast cancer cases. Nuclear EGFR trafficking has become a topic of interest due to its ability to regulate the expression of genes involved in the tumor immune microenvironment. To observe if nuclear EGFR is resulting in immune modulation to impact the tumor microenvironment, we qualitatively compared the presence of MPO and CD8 (neutrophil and cytotoxic T-cell markers, respectively) in two different nuclear EGFR knockdown mouse tumor models - WAP-TGFK and cSNX1.3 - using immunohistochemistry. Results demonstrate greater MPO staining in WAP-TGFK tissue and greater CD8 staining in cSNX1.3 tissue. To assess if nuclear EGFR impacts the regulation of PDL-1 protein expression, MDA-MB 468 parental and MUC-1 knockdown cell lines were used and treated with different nuclear EGFR inhibitors. Via western blot analysis, all cells displayed a relatively similar presence of PDL-1, indicating blocking nuclear EGFR had little to no role in impacting the regulation of PDL-1 protein expression. The differences in immune cell infiltration could indicate the involvement of an alternative pathway other than nuclear EGFR in regulating the tumor microenvironment. PDL-1 protein expression may be affected by this alternative pathway, but further PDL-1 studies *in vivo* will have to be conducted to assess this. These results bring forth new perspectives on nuclear EGFR and its role in modulating the immune system to regulate disease progression, which could ultimately help in the development of more effective targeted therapies for patients with triple negative breast cancer.

Allison Bornhoft

Environmental Science at University of Arizona

Mentored by Dr. Luisa Ikner (Environmental Science)

"Exploration of Macroalgae as a Combative Resource in Municipal Wastewater"

ABSTRACT: Macroalgae (i.e. seaweed) are being researched as multi-purposeful resources for energy renewal, food stability, and ecosystem restoration. Exploring the versatility of seaweed under environmentally stressful conditions is relevant to improving global health as a result of constant human evolution and construction. The objectives of the study are: 1) to determine whether seaweed can contribute to the removal of pathogens in municipal wastewater, and 2) while measuring photosynthetic production properties of seaweed resulting from exposure to wastewater. *Sargassum muticum,* a species of macroalgae found in the Pacific Ocean, will be the primary species employed in this study. A multifaceted set of experiments will be performed by first determining baseline concentrations of indicator microorganisms typically associated with fecal matter including total coliforms, *Escherichia coli* or *E. coli*, and F-specific coliphage MS-2 in samples of raw sewage, primary sewage effluent, and reclaimed wastewater. The baseline data regarding for the sewage samples will indicate the potential for other pathogens that may be present, and will also guide schematics to be followed during subsequent scaled-up testing. Seaweed will eventually be treated with a range of municipal wastewater matrix types to determine survivable concentrations in a mimicked marine environment. Experimentation conducted is designed for presence of microorganisms in different stages of treated sewage, and test concentrations that may be found within a saltwater environment using seaweed as the independent variable. The goal is to determine the potential for seaweed to provide wastewater treatment to create universally accessible clean water, stabilize greenhouse gas emission levels via photosynthesis, and slowly restore polluted ecosystems. *Keywords:* seaweed, macroalgae, *Sargassum muticum*, municipal wastewater, treatment, *Escherichia coli*, *E. coli*, MS-2 bacteriophage, greenhouse gas, carbon dioxide, photosynthesis, microbiology, environmental science, sustainability

Adriana Bracamonte

Pre-Psychological Sciences at University of Arizona

Mentored by Dr. Jessica Andrews-Hanna (Psychology)

"The Impact of Depression on First-Person Pronoun Usage Within Romantic Couples"

ABSTRACT: Throughout the years, much has been discovered about Major Depressive Disorder (MDD), however, less is known about the way it interferes with romantic relationships. Depression is known to affect social relationships and can potentially harm them due to the self-focus and ruminating negative thoughts caused by it that drives their partner away (Mathews et al., 2016). One way to determine if depression is affecting a romantic relationship is through their connectedness or closeness since isolation and self-focus are two of the most common symptoms of MDD. The level of connectedness in a relationship can be characterized by many factors but this study analyzed connectedness through the use of first-person plural pronoun usage versus first-person singular pronoun usage when couples interacted with one another. In order to run a text analysis, transcribed interviews between couples were ran through the text analysis software LIWC, which reported the percentage of I-talk versus we-talk with each conversation. We initially hypothesized that the depressed group of individuals within the study would use more I-talk than we-talk when conversing with their partner. However, the results only demonstrated that depressed individuals used significantly less we-talk, but not significantly more I-talk.

Raymundo Buelna

1. Physiology 2. Medical Sciences at

University of Arizona

Mentored by Dr. Pascale Charest (Molecular and Cellular Biology)

"Cancerogenous Cells' Effect on Chemical Environment Inside the Human Body"

ABSTRACT: Metastasis is the mechanism a mature tumor utilizes to spread and grow into different organs away from the origin of growth. Cancerogenous cells utilize different chemical pathways that create various chemical environments to utilize the body's transport system. Current treatment, such as chemotherapy, is ineffective, because it targets rapidly dividing cells, such as hair. By understanding how external factors affect the human body's chemical environment, new pathways that growing cancer undergoes may facilitate the process of developing an efficient treatment for diagnosed patients. The laboratory utilized BRET (Bioluminescence Resonance Energy Transfer) analysis to understand the interactions between g-proteins found in G protein coupled receptor (GPCR). The GPCR complex enables cells to distribute the signaling molecule 'cAMP' as means for cells to communicate with each other. Thus, generating a response to the present chemical environment. The BRET analysis demonstrated how the interaction between g-proteins is necessary for the release of cAMP. For the release of cAMP, g-proteins interact closely which when monitored through the BRET analysis demonstrates a high bioluminescence. A decrease in BRET ratio is observed over time since g-proteins dissociate as the signaling molecule that activated the GPCR complex leaves the receptor. The relationship between g-proteins and cAMP may be utilized to target cancerogenous cells to prevent them from altering the chemical environment of a patient.

Naomi Chao

1. Animal Sciences 2. Psychology at

University of Arizona

Mentored by Dr. Evan MacLean (Anthropology)

"Effects of Aging on Canine Cognition"

ABSTRACT: While it is widely accepted that elderly dogs experience cognitive decline, the exact effects across the species are not fully understood. This study examines how cognitive abilities such as memory, impulse control, and reversal learning are impacted by age in domestic dogs. The weakening of these abilities is often tied to Canine Cognitive Dysfunction, which is currently underdiagnosed and has limited intervention options. Through evaluating dogs of various ages, breeds, and backgrounds, this study investigates possible risk factors and trends of cognitive decline to assist future diagnosis and treatment research.

Janell Kartoz

Microbiology at University of Arizona

Mentored by Dr. Gerardo Lopez (Animal and Comparative Biomedical Sciences)

"The Life Cycle of *Cyclospora cayetanensis* and Methods for Epidemiological Investigation of Cyclosporiasis Outbreaks"

ABSTRACT: Protozoan intestinal parasites contribute heavily to the 1.7 billion reported cases of diarrheal disease each year worldwide, severely burdening health services. Among these parasites, *Cyclospora cayetanensis* has emerged as a microbial pathogen of public health concern. *C. cayetanensis* is a human-specific coccidian parasite which causes a diarrheal disease called cyclosporiasis, which in some cases can become severe and chronic. *Cyclospora cayetanensis* has caused large outbreaks of disease in developed countries in which consumption of contaminated fresh produce has been implicated as the transmission route. However, there are currently gaps in knowledge concerning the mode by which contamination occurs and details about the unusual life cycle of the parasite. To discover how the produce becomes contaminated and further examine the life cycle of *C. cayetanensis*, we performed prevalence studies in produce-growing regions of Arizona, Mexico, Florida, and California. Our methods borrowed from the FDA Bacteriological Analytical Manual Chapter 19C protocols for analysis of agricultural water for *Cyclospora cayetanensis*, which included dead-end ultrafiltration, extraction and purification of DNA, and real-time qPCR assays. Notable additions included sieving for the purpose of analysis using flow cytometry and microscopy. Further study will include genome sequencing to confirm positive samples and enable future source tracing. Use of these methods to determine how produce initially becomes contaminated with Cyclospora and how the life cycle of this parasite might contribute to outbreaks represents the first steps toward the prevention of future cases of cyclosporiasis and facilitates broader applications to the fields of parasitology and epidemiology.

Kristina Manasil

Computer Science at University of Arizona

Mentored by Dr. Adriana Picoral (School of Information)

"Predicting Course Retention: A Learning Analytics Segmentation Model Based on Course Attributes"

ABSTRACT: Student Retention is a critical issue facing educational institutions as it directly impacts their financial abilities and professional reputations. New data driven approaches to improving these rates have become a focus in educational data mining and learning analytics. Many retention studies are unique to the institution they are conducted at since they focus on individual student characteristics or distinctive environmental settings. The need exists to develop an approach to study retention that is portable across academic institutions. This study aims to fill the gap by developing a retention model based on generic course attributes. The inspiration for this model is the RFM segmentation models used in the business industry that have proven to be portable regardless of the business size, focus, or scope of operation. The goal of creating RFM components from common course features allowed for a segment label of High risk or Low risk to be assigned to each segment group based on the average withdraw percentage for the course. A predictive model that utilized PCA and logistic regression was able to achieve an accuracy of 74.71% and an AUROC of 85.78%. The model accurately predicted 8 out of 10 courses that were Low risk. However, the model was only able to identify 4 out of 10 High risk courses. Despite shortcomings in classification rates, this technique of using an RFM score to build a segmentation model is promising in its potential to identifying courses that should be prioritized in terms of interventions and additional support.

Eric Vazquez

Aerospace Engineering at University of Arizona

Mentored by Dr. Jekan Thanga (Aerospace and Mechanical Engineering)

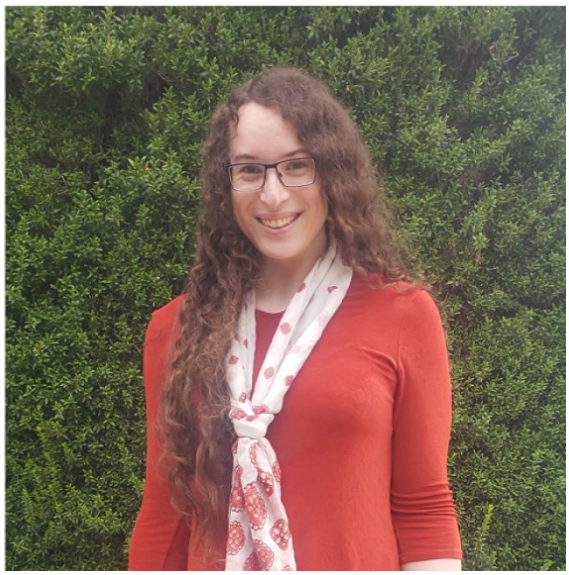
"Smart Breadcrumbs for Extreme Environment Exploration On The Moon and Mars"

ABSTRACT: Efforts are being made to explore extreme environments on the Moon and Mars for applications ranging from searching for life to finding new shelters for humanity. The environments include caves, canyons, cliffs, chasms, and crater rims; some offer natural shielding from hostile surface conditions such as micrometeorite impacts, radiation and extreme temperature swings. Current landers and rovers are unable to access these extreme areas due to limitations in their maneuverability over such tough-- terrain. Past work on a spherical rover called SphereX, developed at The University of Arizona, shows promising techniques utilizing unconventional hopping mobility to traverse these environments. In this project we propose a "smart" breadcrumb device that will be the size of a credit card and used to aid the spherical robots in their exploration missions. The breadcrumbs will enable safe and efficient techniques to explore the most extreme environments by creating self-sustaining communication and power during missions. Optimizing the robot's ability to transfer data, communication, and power will offset the high cost and risk that normally writes off these more rewarding missions. Currently, work is being done to produce a conceptual design of the breadcrumb device which will include all key functions and requirements of communication, data, and power subsystems for desired tasks. Further development of a detailed design accommodating preferred device volume and thermal and radiation effects is necessary. With this work we intend to evaluate if "smart" breadcrumbs can provide a new leap in exploration capabilities.

June Wagner

Computer Science at University of Arizona

Mentored by Dr. Celina Valencia (Family and Community Medicine)



"Evaluating Social Networks of Latinas with Breast Cancer"

ABSTRACT: Latina women in the United States are less likely to regularly get preventative cancer care like mammograms than non-Latinas, and this is reflected in the fact that breast cancer is the single cancer with the highest incidence and mortality rate for them. Health literacy represents a person's capability at navigating a system of healthcare, and social networks are one vector for the spread of health literacy. However, there is a gap in knowledge about how the social networks of Latinas with breast cancer distribute health literacy. The objective of this longitudinal study is to assess how health literacy spreads between members of social networks of Latinas with breast cancer in the United States. In order to do so, the study examines both a cohort of Latinas with breast cancer (n = 30) and a cohort of people in the social networks of Latinas with breast cancer (n = 40). Survey forms are used to collect self-reported information about the social networks of these study participants, and then participants are given a piece of health literacy information. They are asked to report on the spread of this information in their social network after four weeks, and then they are asked how they or the people in their social network acted upon the information after an additional four weeks. The study is not yet in motion, but results may indicate new directions for the effective spread of health literacy to vulnerable and minoritized groups in the United States.

UROC – PREP

Program Director: Andrew Huerta, PhD

Administrative Assistant: Victoria Juvera

Graduate Teaching Assistants:

Joanna Sanchez Avila, ABD and Mary L. Bankhead

Sponsors: University of Arizona Graduate College and Western Alliance to Expand Student Opportunities (WAESO)

Nicole Ferguson

1. Neuroscience 2. Biochemistry at

University of Arizona

Mentored by Dr. Erika Eggers (Physiology)

"Physiological Impacts of a High-Fat Diet on the Retina in Male and Female Mice"

ABSTRACT: A high-fat diet (HFD) has been found to recapitulate the pathogenesis of metabolic disorders, including diabetes, in rodent models. Left untreated, metabolic disorders can impact retinal function and health, impairing vision. Stained retinal images from male and female C57Bl/6J mice fed a HFD (60% saturated fat) or a normal mouse chow diet (4% fat) for 18 weeks were analyzed in ImageJ/FIJI to elucidate physiological changes across both sexes resulting from a HFD. Blood vessel (Isolectin antibody stain) area was lower for the male HFD than male Control ($p=0.048$), and lower for the HFD compared to Control ($p=0.026$). The area of vessels overlapping with astrocytes (anti-GFAP stain) was greater for female HFD than female Control ($p=0.013$), and greater in HFD compared to Control ($p=0.012$). Morphological features of astrocytic processes including terminal loops, coils, frayed ends, and thickened processes were quantified. Proportion of astrocytes with frayed ends was greater for male HFD than the male Control ($p=0.005$). Both HFD groups indicate a trend of increased thickened astrocytic processes than their prospective Control groups. All of these findings correlate with blood glucose and body weight measurements obtained in Week 18. Dopaminergic amacrine cell (anti-Tyrosine Hydroxylase stain) density and area were analyzed with no significant differences found. The HFD-induced changes including decreased vessel density, increased interactions between vessels and astrocytes, and morphological changes in astrocytes are consistent within both sexes, but appear to impact males more significantly or potentially earlier than females.

Access, Wellness, And Relational Determinants of Student Success (UROC-PREP/ AWARDSS)

PI: Michelle Perfect, PhD,
Co-PI: Brandy Brown Perkl, PhD
Program Coordinator: Stephanie Moreno, MBA
Assistant Professor: Andrew Huerta, PhD
Graduate Teaching Assistants: Joanna Sanchez-Avila and Mary Bankhead
Graduate Research Associate: Allison Fairchild
Graduate Assistant: Taylor-Kristen Myers
Sponsors: U.S. Department of Education - Institute of Education Sciences (Award: #R305B160003 and #R305B210019), University of Arizona, University of Arizona College of Applied Science and Technology, University of Arizona Graduate College, and University of Arizona College of Education

Asa Adekoya

Psychology at University of Arizona

Mentored by Dr. Lia Falco (Disability and Psychoeducational Studies)

"Mental Health Outcomes of Students of Color: School Based Mental Health Services Impacting Academic Attitudes"

ABSTRACT: For students of color in K-12 public schools, it can be difficult finding free or low-cost mental health services. School-based mental health services help students receive counseling for as long as they need without the added issues of transportation, cost, and timing. This integrative review synthesize research related to the intersection of adolescent students of color and access to school-based mental health services. 16 studies published between the years of 2012 and 2022, were selected for this review through an iterative key word search in Google Scholar. Findings were examined within the context of academic outcomes for students with access to school-based mental health services. The academic outcomes searched for were self-efficacy, increased GPA, motivation, and self-advocacy.

Lady Dorothy Elli

1. Public Health 2. Speech, Language, and Hearing Sciences at University of Arizona

Mentored by Dr. Karina Salazar (Higher Education)

"The Impact of Cultural Centers in the Involvement, Success, and Retention of Students of Color"

ABSTRACT: Cultural centers in universities serve as hubs where students, especially students of color, are able to express themselves, learn more about their culture, and find ways to extend their involvement beyond the classroom. In predominantly white institutions (PWIs), cultural centers serve as a form for students of color to find support and community which can eventually influence their involvement, success, and retention throughout their undergraduate careers. This study aimed to explore the effect of using services and programs provided by cultural and resource centers on student involvement, engagement, and retention at The University of Arizona. A mixed methods approach was utilized to ensure that quantitative (surveys) and qualitative (interviews) were included in the study to reflect student experiences. Surveys were completed by 150 students, and interviews were conducted with ten students who further expanded on their responses and shared information about the cultural centers' role in their undergraduate careers. For the survey, the questions include student demographics, involvement in the cultural centers, resources used, the impact of the centers, and other suggestions by the study participants. The purpose of the study was to understand the role and impact of cultural centers in influencing student persistence, as reflected by student retention, as well as their level of involvement in the university throughout their undergraduate careers. The larger study is in progress as the final pieces for IRB approval are currently being processed. The pilot study conducted during Summer 2022, however, received initial responses from students involved in the cultural centers. The students in the pilot study expressed similar experiences in terms of their sense of belongingness, attainment of self-defined success through the support they received from the centers, and impact of the centers on their motivation to stay at the university. A feedback survey was also sent to the participants of the pilot study and the results revealed the competence of the study instrument and the overall satisfaction of the students.

Yahaira Leon Gomez

Psychology at University of Arizona

Mentored by Dr. Cindy Trejo (Title V Director, Outreach FAMILIA)

"Persistence Amongst Latinx Students"

ABSTRACT: Students choose to go to college due to different factors whether it may be to look for more opportunities, overcome poverty, or find ways to help better their communities. The Latinx student population being a group that is susceptible to considering the pathway towards education. This study determines what factors motivate Latinx students from San Luis, Arizona to pursue higher education. Literature was reviewed to verify different factors within the Latinx student population across the country. Additionally, this study contributes to those factors by focusing on Latinx students from the border town of San Luis and emphasizing their experiences. During this study, a method utilized was "platicas" which is described as more casual interviews. This method was conducted via the platform Zoom and portrayed the context of 4 Latinx students and the factors that motivated them to go into higher education. Secondary data from previous literature is another tool that was utilized throughout this research. Qualitative data is the main component that contributed to the findings. It was found that family and community, programs, resources, and immigration status are reoccurring factors that persisted Latinx students within the community of San Luis to go into higher education. It was highlighted by participants that familial sacrifices, participating in college-going programs, having access to resources, and their families immigrating to the United States to provide a better life, impacted their academic pursuits. Future studies should use a greater sample size and have no time constraints to obtain more data on this topic.

Natasha Meehleib

Plant Sciences at University of Arizona

Mentored by Dr. Josephine Korchmaros (Southwest Institute for Research on Women)

"Community School Garden Programs for Gen Z Health"

ABSTRACT: This paper investigates the relationship between grade enrollment and nutritional behavioral and knowledge outcomes as a result of Community School Garden Programming (CSGP) in the Tucson Unified School District. ANOVA statistical analysis is used on de-identified data to compare students' mean responses (n=100) on 0-5 likert-type scale questions about their nutritional behavioral changes and nutritional knowledge gains since participating in the CSGP. Group differences in the ANOVA nutritional knowledge gains analysis were identified to be between grades five (n=26) and three (n=27), with fifth graders exhibiting the highest grade group mean (3.88) to the self-evaluative question. No statistically significant grade group differences were identified in the ANOVA nutritional behavior analysis. Further research is needed to determine whether these results are consistent with a larger sample size and with a more comprehensive measurement tool than the self-evaluative verbally-administered survey.

Antonio Moreno

Psychology at University of Arizona

Mentored by Dr. Josephine Korchmaros (Southwest Institute for Research on Women)

"The Use of Social Media for Sexual Health Messaging"

ABSTRACT: Sexual health information should be accessible and correct. Misinformation may be easier than it is for correct information to spread to those who are looking through the most common access point for sexual health information, the Internet. In this study, a group of 10 diverse participants was recruited to determine the effect that Instagram posts about sexual health had on youth. The purpose of this study was to see what characteristics of Instagram posts grab the attention of youth, as well as to find in what ways can the messaging be changed to reach more youth and increase interactions with the posts. Through individual structured interviews, youth were asked about their social media use, as well as were shown and questioned about sample Instagram posts pulled directly from the Bridges-to-Wellness Instagram page. Results show the importance of aesthetics of and resource information included in posts. These themes led the posts to be ranked higher on effectiveness and interesting scales. It could be a possibility to create a YouTube and TikTok account to spread sexual health information, as those were among the most frequently used social media platforms along with Instagram. Further research should be conducted, with a larger sample size in order to gain a better understanding of the effect social media may have on the spread of sexual health messaging among youth. There is also a future possible study for which one would look at social media other than Instagram to measure the effectiveness of sharing information of that social media platform.

Iriana Muñoz

Family Studies and Human Development at University of Arizona

Mentored by Dr. Katharine Zeiders (Family Studies and Human Development)

"Online Discrimination, COVID-19 Changes, and Latinx Youth Academic Well-Being"

ABSTRACT: Latinx individuals in the United States have high rates of only completing some of high school. During the COVID-19 pandemic, new challenges emerged for Latinx youth, as Latinx communities were hardest hit by the pandemic, and youth found themselves engaging in schooling online. The current study examined how online racial discrimination and COVID-19 life changes related to 293 Latinx youths' academic motivation, academic aspirations, and academic expectations. Participants (Mage = 13.17, SD = 1.41) completed an online survey. Results revealed a negative association between the total online racial discrimination scores and youths' academic motivation. It was also found that the older participants reported more instance of online discrimination. Positive COVID-19 life changes related to higher academic motivation, aspirations, and expectations. Potentially show-casing that due to the new world-wide hardship, teachers gave the students more support than before the pandemic. Directions to consider in the future are to expand the scope of participants throughout the nation, and consider other factors such as screen time usage, and the racial and ethnical demographics of the students, teachers and other staff within the schools of the participants.

Karla Paredes Aguilar

Astronomy at University of Arizona

Mentored by Dr. Sara Chavarria and Dr. Corey Knox (Education)

"Deciding on a STEM Major: Exploring factors that influence Latinx high school students participating in an informal archeology heritage outreach program"

ABSTRACT: Although we are starting to see diversity increasing in STEM majors, students of color including Latinx students are still highly underrepresented in STEM. In this study, I examine the factors that influence Latinx high school students to decide on a STEM major as they participate in an experiential outreach program. Studies have shown that educational outreach programs, maintaining interest in STEM and allowing students to connect STEM material to their own lives and cultures can have a positive influence in the career choice and success of Latinx students in STEM. By taking a closer look into the factors that influence students' career choice, educators and programs can benefit from learning how to help students succeed in higher education. The three data sets were used, pre and post survey responses, students' own digital stories and semi-structure interviews. The data sets were later analyzed using a mixed methods approach and applying the LINCSS framework. Findings showed that when students connected to STEM careers it influenced their career choice, as well as the positive sense of STEM belonging that is created by creating personal connections to STEM material. Findings also showed that students' experiences during the program helped retain STEM interest. These findings encourage us to continue studying career influences so educators and program creators can encourage and support Latinx and other students of color in their STEM career journey.

Samuel Rodriguez

Psychology at University of Arizona

Mentored by Dr. Purnima Madhivanan (Public Health)

"Mental Health and Resiliency: A Look into the Minds of American College Students"

ABSTRACT: This exploratory study aims to better understand the role of self-efficacy on stress and academic success. The main focus-group of this study will be first generation Hispanic students at a large public institution. This is a correlational study that will analyze the correlations between levels of self-efficacy, stress, and academic success. There exists little mental health literature on young adults in academic settings, let alone among non-traditional population groups. Data will be gathered using self-reported surveys which will be comprised of measures of stress, academic success and academic self-efficacy. The data from this study will be used for future mental health investigators in the production of coping methods in the face of academic stress. No data has yet been obtained but will be gathered throughout the Fall 2022 academic semester at the University of Arizona.

Anais Ruiz

Public Management and Policy at University of Arizona

Mentored by Dr. Richard Orozco (Teaching, Learning, and Sociocultural Studies)

"Microaggressions Against Latine Students and their Effect on Academic Motivation Within a College Setting: The Latine Student Experience at the University of Arizona "

ABSTRACT: Microaggressions are intentional and unintentional slights against a person of color centered around their race or ethnicity. Individuals who experience racism or discrimination tend to deal with an increased amount of mental health issues than those who do not. This can be seen with Racism-Related Stress (RRS), which microaggressions are a factor of. Individuals dealing with RRS tend to deal with issues such as depression, amotivation, and headaches. While many studies have focused on the relationship between racism or RRS and the negative effects this has on students, this study compares how microaggressions themselves may influence a college student's academic motivation. Data collected from a digital survey using the Racial and Ethnic Microaggressions Scale and the Academic Motivation Scale will be used to determine if there is a significant correlational relationship between the two.

Annysa Sapien

Psychology at University of Arizona

Mentored by Dr. Michelle Perfect (Disability and Psychoeducational Studies)

"Role of Sleep in Executive Functioning in Kids with Type 1 Diabetes"

ABSTRACT: Many children and adolescents do not consume the recommended amounts of sleep. The recommended amount of sleep is about 8-10. Children with type 1 diabetes are often at a disadvantage when it comes to getting a recommended amount of sleep. Past literature suggests that there may be a link between executive functioning and how it can be declined when not achieving the recommended amount of sleep. Further research had to be investigated. In my findings, I found that when looking at the BASC3- executive functioning subscale there was no significance between sleep and EF in youth with type 1 diabetes. How ever in other subscales of EF in the BASC-3 there was significance. There were some limitations in this study as the sample population was not tested, there was not any other forms of testing executive functioning, the regression was not tested and not all ACTi watch data was adjusted. This study is still ongoing and there are plans to get a bigger population, adjust all ACTi watch data, and test the regression of this study.

Alyssa Torres

Speech, Language, and Hearing Sciences at University of Arizona

Mentored by Dr. Aileen Wong (Speech, Language, and Hearing Sciences)

"Student Supports in Audiology Programs at Hispanic Serving Institutions: A Review of Websites"

ABSTRACT: The field of Speech, Language, and Hearing Sciences (SLHS) has a professional workforce lacking in cultural and linguistic diversity (ASHA, 2022). It is critical that SLHS health care providers, such as audiologists, serve their culturally and linguistically diverse patients appropriately, by practicing relevant and tailored care. Increasing workforce diversity in this field starts with undergraduate education and graduate training programs that are student-centered. Hispanic Serving Institutions (HSIs) are academic institutions that are poised to support Hispanic/Latino students on their way to graduate health programs, such as obtaining a Doctor of Audiology (AuD) degree. Investigation is needed to examine visible support systems that exist for students in AuD programs or for SLHS undergraduate students interested in applying to graduate AuD programs. To investigate the topic of student-centered supports and practices, a website screening examined the twelve accredited audiology graduate programs at designated HSIs. Examples of supports targeted in the search were drawn from Lozano et al. (2018) recommendations, using guidelines from their consensus report focused on transforming STEM education at HSIs. The website screening questions were centered on the critical focus areas of advising, mentoring, and non-academic support systems. Key findings included increased accessibility/guidance for scheduling with advisors, opportunities for increased peer advising, need for departmental established mentoring programs, and improvement of family-based supports. Notably, many programs demonstrated evidence of active student organizations and community service/outreach.