Poster Abstracts

Patricia Adu-Mensah, Summer Divine-Ramos, Scout Lightfoot, and Diana Rodriguez, "Soil's Secret Exposed"
Major: Patricia Adu-Mensah (Nursing), Summer Divine-Ramos (Pre-Dental), Scout Lightfoot (Pre-Med), and Diana Rodriguez (Biology)
Faculty Advisor: Dr. Joann Latorre
CHEM 2115

Nearly two-thirds of antibiotics used in medicine today originated from soil (Hernandez, et al, 2021). Tiny Earth addresses the challenge of the diminishing supply of effective antibiotics and delves into sharing instructional innovations to promote current advancements and challenges in antibiotic discovery. It is hypothesized that antibiotic resistant bacteria found in soil may be extracted and characterized. The purpose of this study was to explore methods that could be utilized to establish a baseline protocol and to isolate chemical compounds responsible for antibiotic activity.

Marwa Al Aqtash, "Metabolic Characterization of Breast Cancer Cells Using Seahorse XF Technology: A Dual Analysis of Mitochondrial Function and Glycolytic Rates in Tamoxifen-Treated Breast Cancer Cells"
Major: Chemical and Materials Engineering
Faculty Advisor: Dr. Jessica Houston
NM AMP, URS Program

Breast cancer cells exhibit metabolic plasticity, allowing them to adapt bioenergetic pathways in response to environmental changes. This study utilizes the Agilent Seahorse XFp Extracellular Flux Analyzer to investigate mitochondrial function and glycolytic activity in breast cancer cells through real-time measurements of oxygen consumption rate (OCR) and extracellular acidification rate (ECAR). The primary objectives include assessing mitochondrial respiration using the Seahorse XFp Cell Mito Stress Test, quantifying glycolytic activity with the Seahorse XFp Glycolytic Rate Assay, and evaluating the metabolic shifts induced by key modulators such as oligomycin, FCCP, rotenone, and antimycin A. By analyzing the dynamic interplay between oxidative phosphorylation and glycolysis, this research aims to provide insights into the metabolic adaptations of breast cancer cells and their potential vulnerabilities. The findings are expected to contribute to the development of targeted metabolic therapies and enhance our understanding of bioenergetic reprogramming in cancer progression.

Mohammad Al Aqtash, "DMS Identification of Volatile Organic Compounds Found in Surgical Smoke from I-Knife Tissue Cutting and Cauterizing"
Major: Chemical and Materials Engineering
Faculty Advisor: Prof. Gary A. Eiceman
NM AMP, URS Program

Surgical smoke generated by electrosurgical tools, such as the intelligent knife (I-Knife), contain volatile organic compounds (VOCs) that may provide chemical biomarkers to distinguish between healthy and cancerous tissues. This study explores the use of differential mobility

spectrometry (DMS) for the rapid identification and characterization of VOCs in I-Knife surgical smoke. The primary objectives include isolating VOCs from aerosols, determining the chemical identity of VOCs in various tissue types, and assessing the feasibility of using an I-Knife-DMS system for real-time tissue differentiation. This research project aims to enhance the precision and efficiency of tumor resection by optimizing the front-end processing of surgical smoke for chemical measurements, minimizing unnecessary tissue removal and improving patient outcomes. The results are intended to contribute to the advancement of cost-effective, high-speed cancer diagnostics, offering a potential alternative to conventional surgical margin analysis techniques, such as frozen section pathology and mass spectrometry-based techniques.

Jared Alderman, “Synthesis derivative of Napabucasin analog (8q) in testing bioavailability and effectiveness in fibrolamellar Carcinoma”
Major: Biochemistry
Faculty Advisor: Dr. Lyons

Fibrolamellar hepatocyte carcinoma (FLC) is a rare and highly lethal liver cancer that mainly affects children and adolescent adults. Patients who have FLC typically have a five-year survival rate below 50%. Current medical treatments are limited, with surgery being the most preferred treatment. Napabucasin, a natural naphthoquinone compound, has been shown in past studies to have anti-tumor and cancer properties. Analogs of Napabucasin (LD-17,8q, and 7e) have been shown to have improved bioavailability and effectiveness, along in previous studies Napabucasin was shown to be effective in drug screening against tumors in FLC patients-derived xenograft (PDX) models. However, these derivates have not yet been tested on FLC cells. This study focuses on the synthesis of Napabucasin analogs (8q). the analogs will then be tested on FLC cells to evaluate their potential therapeutic effects. These findings would give a further understanding of FLC and the bioavailability of Napabucasin analogs.

Mayte Alonso Carrillo, “Disentangling active and passive sustained attention: Evidence from temporal patterns in pupillometry”
Major: Psychology
Faculty Advisor: Dr. Michael Hout
Discovery Scholars Program

The potential distinction between vigilance and sustained attention has yet to be addressed in the cognitive science literature. This study investigates whether active and passive (vigilant) forms of sustained attention can be dissociated, offering new insights into their underlying structure. Pupil dilation is compared across two conditions: an Active Multiple Object Tracking Task (A-MOT) and a Passive Multiple Object Tracking Task (P-MOT), each designed to target a different form of sustained attention. Paired-sample t-tests will be used to assess differences in pupil size at various time points during the tracking period. Data collection is currently ongoing. Clarifying this distinction holds theoretical significance for models of attention by challenging the notion of sustained attention as a unitary construct and contributing to a more nuanced understanding of its cognitive and neurophysiological components.

Anthony Alvarez, Joseph Flores, and Santiago E. Jimenez Martinez, “Applying Variable Forces in Real-Life Situations Using Calculus-Based Physics”

Major: Anthony Alvarez (Civil Engineering), Joseph Flores (Civil Engineering), and Santiago E Jimenez Martinez (Mechanical Engineering)
Faculty Advisor: Dr. Bethuel Khamala
PHYS 1320L-Calculus Based physics ll

This research explores the application of variable forces in real-life situations using calculus-based physics. Variable forces, which change in magnitude or direction over time or space, require calculus to analyze their effects on physical systems accurately. The study focuses on key concepts, including force, work done, energy, and electromagnetism, utilizing differential equations and integrals to model scenarios involving non-constant forces. Applications include gravitational variations, spring dynamics, and fluctuating electromagnetic fields. Practical examples, such as calculating work done by non-uniform forces and analyzing energy transformations in electric fields, demonstrate the relevance of these concepts. By integrating calculus with physical principles, the research provides insights into dynamic systems and optimizes engineering applications. The study highlights the significance of calculus in comprehending variable forces, facilitating more precise modeling and problem-solving in applied physics.

Gage Alvin Robert Anderson, “44 Treaties and the 7th Fire: Identity and the Citizen Potawatomi Nation”
Major: Anthropology, History, Biology
Faculty Advisor: Professor Shawn Werner
Anthropology Internship (ANTH 385), Honors Internship (HNRS 410)

Gage Anderson spent a summer in Shawnee, Oklahoma, as part of an immersive 6 week course on tribal governance with the Citizen Potawatomi Nation. While there, Gage learned the modern issues tribal governments face, how sovereignty is expressed, and was encouraged to reflect on his own tribal identity, by learning both about the history of the Citizen Potawatomi Nation, and his family history. His thoughts are collected here in this presentation: 44 Treaties and the 7th Fire: Identity and the Citizen Potawatomi Nation.

Makani Araujo, “Investigating the fate-and-transport of Environmental Contaminants in Treated Produced water”
Major: Environmental Science
Faculty Advisor: Dr. Kenneth Carroll and Dr. Runwei Li
NM AMP URS

During the extraction of oil and gas, produced water is generated as a byproduct. This byproduct has the potential to be reused for agricultural applications. This study examines the fate and transport of ammonium, a common contaminant in treated produced water. A bench-scale soil column is constructed using agricultural soil collected from NMSU Artesia agricultural center. This soil was packed into a stainless steel column and injected with treated produced water to observe solute transport. Effluent was collected from the column and analyzed by Ion Chromatography. The data illustrates the movement of the concentrated ammonium present within the treated produced water. Kinetic sorption slowed solute transport, likely reducing the peak concentration to half of the injected water concentration, a natural contaminant attenuation behavior. Future experiments will explicate the specific impacts pH variability has on the transport of ammonium, supplying insights on the implications of reused treated produced water.

Samantha Baez and Kassandra Valdez, "Effects of Manipulation of CXCL12 on Autophagy Expression in the Developing Sheep Placenta"
Major: Animal Science
Faculty Advisor: Dr. Ryan Ashley

A healthy pregnancy requires proper placental development, as poor placental function can impact maternal health and increase chronic fetal diseases. Similar complications occur in livestock, negatively affecting productivity. The CXCL12/CXCR4 signaling pathway is crucial for placental development, with disruptions linked to preeclampsia and intrauterine growth restriction, though precise functions of this axis are unclear. To investigate, a sheep model was used. On day 12 post-breeding, ewes underwent surgical implantation of pumps to deliver either saline (control), a CXCR4 inhibitor (AMD), or a CXCL12 agonist into the uterus over a seven-day period. On day 20 of gestation, fetal and maternal tissues were collected and analyzed via western blot. In caruncle (CAR) tissue, LC3B protein increased with AMD treatment and slightly decreased with CXCL12 treatment. In intercaruncle (ICAR) tissue, LC3B protein also increased with AMD and decreased with CXCL12. These findings suggest that CXCL12/CXCR4 signaling influences autophagy-related processes during early placental development.

Ellary Battle, "Using eBird data to explore trends in wintering abundance of American kestrels (*Falco sparverius*) in Mesilla Valley"
Major: Fisheries and Wildlife Conservation Ecology
Faculty Advisors: Dr. Martha Desmond and Megan Lemmo
ACES UG Research Program

The American kestrel (*Falco sparverius*) is the most widespread falcon in North America, yet it has been experiencing significant population declines across the continent. While causes of this decrease remain unclear, researchers have suggested that kestrel population abundance and trends during wintering months are worth examining to better understand the overall decline. Using eBird data, a citizen science program through Cornell Lab of Ornithology, this study analyzed changes in kestrel population abundance during wintering months (November-March) in Mesilla Valley, NM from 2009-2024. We standardized the count data from the last 15 years based on effort, and using a GLM, we found a statistically significant increase in the number of eBird reports. We compared the standardized data to the minimum temperature each winter but found no statistical significance between them. Ultimately, our findings highlight the importance of citizen science and aim to encourage public participation in wildlife matters.

Timothy Bautista, Blakely Kade Briscoe, Kyle Begay, Cassandra Dresler, Pamela Hernandez Villalba, Leigh Mayers, Emily Zinter, Jordan Bell, Melissa Coronado Arrieta, Maria Del Sol Nunez Pena, Chadwick Pilkington, Jared Pulliam, and James Wilcox, "DAVINCI in the Desert: H2O Drone Experiments to Simulate Venus Atmospheric Descent Imaging"
Major: Timothy Bautista (Aerospace and Mechanical Engineering), Blakely Kade Briscoe (Biology), Kyle Begay (Aerospace Engineering) Cassandra Dresler (Electrical Engineering), Pamela Hernandez Villalba (Electrical Engineering), Leigh Mayers (Mechanical and Aerospace Engineering), Emily Zinter (Mechanical and Aerospace Engineering), Jordan Bell (Geology), Melissa Coronado Arrieta (Engineering Physics), Maria Del Sol Nunez Pena (Mechanical and

Aerospace Engineering), Chadwick Pilkington (Geology), Jared Pulliam (Aerospace Engineering), and James Wilcox (Engineering Physics)
Faculty Advisor: Dr. Nancy Chanover
ASTR400 - Undergraduate Research and NASA Here to Observe program

NASA's Deep Atmosphere Venus Investigation of Noble gases, Chemistry, and Imaging (DAVINCI) mission will sample the Venus atmosphere and image Venus' surface as it descends over the volcanic region Alpha Regio. To simulate the imaging sequences that the onboard Venus Descent Imager (VenDI) will collect, the NMSU Here to Observe (H2O) team completed several drone imaging flights at the Aden Lava Flow Wilderness in New Mexico due to its geological similarities to Alpha Regio. Digital Elevation Models and orthographic maps of the area were then created and downsampled, allowing us to test the presence of key geologic features at resolutions that mirror VenDI's actual capabilities. This analysis will provide a crucial comparison for VenDI's proof of concept, particularly by assisting in identifying gaps in collected data and allowing us to ascertain what details are lost or missed due to VenDI's lower resolution and reduced spatial coverage.

Demetrius Billey, "Evaluating and Optimizing Hardware Enclaves for Overloaded Systems"
Major: Computer Science
Faculty Advisor: Dr. Naveed Ul Mustafa
CAHSI Local Research Experience for Undergraduates

This study aims at understanding Security Service Engines (SSE) in managing system call overheads for applications running in hardware enclaves. SSE pairs each enclave with a lightweight responder core to handle system calls with the objective of reducing the cost of OS interaction. Static coupling of responder cores with enclaves can lead to resource underutilization and performance degradation in overloaded systems. To address these challenges, this work intends to measure the SSE's efficiency by running workloads in an overloaded system, analyze both the results and SSE approach to identify performance bottlenecks, and then propose design optimizations to achieve performance scalability.

Alvin Birmingham-Monroe, "Analyzing Research Trends in Per- and Polyfluoroalkyl Substances (PFAS) via Systematic Review"
Major: Civil Engineering
Faculty Advisor: Dr. Runwei Li
NM AMP Undergraduate Research Scholars

Per- and poly-fluoroalkyl substances (PFAS) are persistent pollutants with serious health risks. These synthetic chemicals are widely used for their water—and grease-resistant properties but resist degradation, leading to environmental contamination and bioaccumulation in humans and animals. Over the past decade, PFAS research has grown rapidly, covering contamination, exposure, toxicity, and remediation. However, research efforts remain fragmented, and a clear understanding of focus areas is lacking. While remediation techniques have been well-studied, long-term health effects are still underexplored. Identifying research gaps is crucial for guiding future studies and policy decisions. This project aims to systematically review academic literature to map research distribution and highlight areas needing further investigation.

Luis Borja, "Generic Object for Laboratory Enviromental Testing (GOBLET)"

Major: Aerospace and Mechanical Engineering
Faculty Advisor: Dr. Abdessattar Abdelkefi
NM AMP URS

Traditional dynamic environment tests are typically conducted in the manner of applying forces ideally one axis at a time along the systemic principal directions. Nonetheless, recent research determines that the simultaneous multi-axis excitation might possibly be much more similar to the real conditions. This method has attracted a lot of players, especially if someone is trying to do multi-axis testing with smaller, distributed shakers. In some situations, like the transportation sector, most of the vibrations arise from the bases of the structures. The present research is aimed at the multi-axis vibration testing setup that consists of a large base-exciting shaker that is assisted with an additional shaker working along a different axis.

Pacha Botero, "HIDA as a Ligand for Oxo-Bond Disruption in Vanadium and Actinide Complexes"
Major: Chemistry and Biochemistry
Faculty Advisor: Dr. Cory Windorff
McNair Scholars Program

Amavadin, an eight-coordinate vanadium (IV) complex found in Amanita muscaria fungi, forms a 2:1 structure with hydroxyiminodipropionic acid (HIDPA). The achiral analog hydroxyiminodiacetic acid (HIDA) has demonstrated the ability to break the strong oxo bond in vanadyl acetylacetonate during the formation of the $[V(IV)(HIDA)_2]^{2-}$ complex. Given vanadium and uranium's similar coordination chemistry, HIDA presents a potential route for oxo-group disruption in the uranyl ion (UO_2^{2+}). This work focuses on synthesizing, purifying, and crystallizing HIDA and the vanadium complex, laying the groundwork for future studies with uranium. The successful synthesis of HIDA has been confirmed, while challenges in purifying and crystallizing its vanadium complex are guiding ongoing optimization efforts. If successful, this approach could deepen understanding of f-block coordination chemistry and inform nuclear waste processing, environmental remediation, and tailored actinide chelation.

Jacarthie Kim Brazil, Gloria Hernandez, and Hailey Luker, "Investigating the Mosquito Repellent Properties of Essential Oils from Hedge Apples"
Major: Chemistry
Faculty Advisors: Dr. Catherine E. Brewer, Hailey Luker, Dr. Immo Hansen
Undergraduate Research Training Initiative for Student Enhancement (URISE)

With value-added use of biomass in mind, essential oils from hedge apple fruits (*Maclura pomifera*) were extracted to determine their efficacy as mosquito repellents. The fruits have traditionally been placed in outdoor spaces as a natural repellent. The lack of data supporting this home practice inspired this study. The essential oils were extracted through steam distillation, which minimizes the risks of compound degradation. A preliminary trial using arm-in-cage assay was conducted to observe the behavior of yellow fever mosquitos (*Aedes aegypti*) with the essential oils present. The initial results showed some repellence in terms of total protection time. Further trials are anticipated to the extent that sample volumes allow. Current work focuses on chemical characterization of the essential oils by gas chromatography-mass spectrometry (GC-MS). This study intends to supplement the understanding of the mosquito repellent properties of hedge apples and potentially contribute to the development of pest management solutions.

Samantha Brazil, “Using time-lapse microscopy during *Drosophila melanogaster* eye development to determine the role of the small GTPase Rap1 in morphogenesis”
Major: Microbiology and Biology
Faculty Advisor: Dr. Jennifer Curtiss
New Mexico State University Undergraduate Research Training Initiative for Student Enhancement (U-RISE)

Morphogenesis is the process by which cells and organisms develop their shape and structure, crucial for proper physiological function. Understanding this process can enhance wound healing, birth defect treatments, and tissue engineering. An example of morphogenesis is the frog's development from a spherical egg to an elongated tadpole. In epithelial tissues, morphogenesis is driven by cell adhesion and contractile forces, with E-cadherin playing a key role in cell movement and shape changes. The fruit fly, *Drosophila melanogaster*, serves as a model, with its compound eyes demonstrating how cell shapes are regulated. The small GTPase Rap1 acts as a switch in signaling pathways that control cell adhesion and actomyosin contractility, vital for morphogenesis. Using time-lapse microscopy, we are studying wild-type and Rap1 mutant cells in the Drosophila eye to understand Rap1’s role and gather data for a hypothesis on the molecular mechanisms behind morphogenesis.

Blakely Kade Briscoe, Timothy Bautista, Kyle Begay, Cassandra Dresler, Pamela Hernandez Villalba, Leigh Mayers, Emily Zinter, Jordan Bell, Melissa Coronado Arrieta, Maria Del Sol Nunez Pena, Chadwick Pilkington, Jared Pulliam, and James Wilcox, “Water in the Desert: The NMSU Here to Observe Program”
Major: Blakely Kade Briscoe (Biology), Timothy Bautista (Aerospace and Mechanical Engineering), Kyle Begay (Aerospace Engineering) Cassandra Dresler (Electrical Engineering), Pamela Hernandez Villalba (Electrical Engineering), Leigh Mayers (Mechanical and Aerospace Engineering), Emily Zinter (Mechanical and Aerospace Engineering), Jordan Bell (Geology), Melissa Coronado Arrieta (Engineering Physics), Maria Del Sol Nunez Pena (Mechanical and Aerospace Engineering), Chadwick Pilkington (Geology), Jared Pulliam (Aerospace Engineering), and James Wilcox (Engineering Physics)
Faculty Advisor: Dr. Nancy Chanover
Here to Observe Program

The goal of the NASA Here to Observe (H2O) program is to increase undergraduate student engagement in STEM disciplines by providing them with the opportunity to observe a NASA mission team alongside mentors and peers. The program focuses on promoting mentorships, supporting cohort-building, and providing exposure to a NASA mission. New Mexico State University (NMSU) was selected in 2023 for the H2O program and is paired with DAVINCI, a Discovery class mission to Venus that is currently in development. The H2O program at NMSU was designed with several elements including (1) curricular course content tied to a NASA mission, (2) weekly seminar-style meetings, (3) a tiered mentoring program, and (4) off-site field trips. We present metrics such as application numbers, post-graduate employment to assess the success of the program, and self-reflections to highlight the impact that the program has had on student self-efficacy and career preparation in STEM.

Alexa Brito, “Crystal Structure of 1-Deoxy-D-xylulose-5-phosphate Reductoisomerase: A key Enzyme in the Mevalonate-Independent Pathway and a Gateway to Novel Antimicrobial Drugs”

Major: Biochemistry and Biology
Faculty Advisors: Dr. Eric Yukl and Dr. Chris Baker

The enzyme 1-Deoxy-D-xylulose-5-phosphate Reductoisomerase (DXR) is a key enzyme in the non-mevalonate pathway for the biosynthesis of isoprenoids in some bacteria (including E.coli) and plants. This pathway is not present in humans, thus making the enzymes of this pathway excellent antimicrobial targets. To better understand the role and binding of DXR, this project aimed to crystallize DXR using hanging drop vapor diffusion and microbatch crystallization, and determine the crystal structure using X-Ray Crystallography. The findings are still being determined at present, but the goal is to identify the major amino acids involved in the binding domain. These findings hold strong implications for greater specificity of the antimicrobial drug targets being developed against DXR, potentially leading to more effective treatment against bacterial infections. This could improve therapeutic outcomes and reduce the prevalence of drug-resistant strains.

Maxine Burford and Chloe Roman, “Benefits of Using Nature and Landscape Design to Enhance the Health of Urban Populations”
Major: Horticulture
Faculty Advisors: Dr. Kulbhushan Grover and Dr. Omar Holguin
Undergraduate Seminar, AGRO/HORT/ENVS/SOILS 447

'Creating landscapes in urban settings has become more popular as urbanization has increased in the United States, furthermore the world. The presence of greenery has an immediate effect on an environment’s biodiversity, together with the overall health of humans residing in the environment. This case study addresses the importance of utilizing and appreciating landscape design as a way to improve a sustainable quality of life for both humans and an ecosystem enhancing climate regulation and air circulation. Literature research in this study provides practical ways that populations can embrace landscape design and maintain ecosystems amongst urban environments. Research also supported the idea that landscaping projects are a tool in building community and can foster positive social interactions between people. This study will showcase examples of how green spaces have shown to improve natural areas and surrounding community(s) by increasing mental and physical health, air quality, community involvement, and biodiversity.

Katherine Bursum, “Casa de Peregrinos: Fighting Hunger and Building Community”
Major: Associate of Arts (Political Science)
Faculty Advisor: Dr. Lori Keleher

This presentation explores the role of the Las Cruces based nonprofit Casa de Peregrinos (CdP) in our community’s fight against hunger and food insecurity, and my role in supporting their mission as an intern. “Casa de Peregrinos' mission is to end hunger while providing mobile pantries and resources that build strong, diverse, and inclusive relationships and partnerships in the community” (casadeperegrinos.org). The wide variety of programs that they offer is vital to the success of their mission and a testament to the importance of acknowledging the nuances of social issues like food insecurity. There is no ‘one size fits all’ solution. Analyzing the successes and obstacles of these programs is crucial to understanding the range of barriers to food security facing not only the people of Las Cruces, but also the surrounding rural areas. This analysis gives us direction in advocating for the policy support we need to address our financial and operational challenges. CdP’s holistic approach to addressing problems of food

insecurity not only builds a strong community, but provides a strategic vision for the future of Las Cruces.

Damian Cano, “Coaching Fairness: A Proposal for Exploring Athlete & Coach Perceptions of the Consequences of Fair and Unfair Coaching Practices”
Major: Kinesiology (Exercise Science)
Faculty Advisor: Dr. Katie Hirsh
HEST Discovery Scholars Program

Research on coach fairness has been predominantly explored through quantitative methods, with tools designed for non-sport contexts (e.g., organizational leadership). This study addresses this gap by exploring university coaches’ and athletes’ perceived consequences of fair and unfair coaching. Participants will include approximately 20 university athletes and coaches who will complete one semi-structured interview. An open-ended interview guide will facilitate in-depth discussion, and all interviews will be transcribed verbatim from audio recordings. This research will extend current understandings of consequences of coach fairness by revealing lived experiences and interpretations of athletes and coaches through a qualitative approach. Such an approach will provide a more nuanced sport-centered understanding of fairness. The results of this research could introduce a new guideline for coaches as to what fairness is and how the consequences affect their athletes and contribute to the development of a more comprehensive theory of fairness in sport.

Bethany Chacon, “Nuclear Space Propulsion”
Major: Mechanical Engineering
Faculty Advisor: Dr. Steven Stochaj
NM AMP

This research on nuclear thermal propulsion will foreshadow new fuel types by offering a potentially cleaner alternative to traditional rocket fuels, which contribute to greenhouse gas emissions. The project will employ a combination of analyzing published works, computational modeling through theories and CAD software, as well as comparative analysis. The analysis of published works will examine existing research on nuclear thermal propulsion, focusing on LEU fuel performance, federal policy and how it affects our changing climate. Computational modeling will be used to simulate the performance of an LEU-fueled NTP engine, evaluating key parameters like thrust, specific impulse, and operating temperatures versus traditional rocket fuels. Software to be used will be SolidWorks and NASA’s General Mission Analysis Tool (GMAT). A comparative analysis will then assess the LEU-fueled NTP system against traditional liquid hydrogen systems. Using these methods should demonstrate economic feasibility, climate sustainability, and improvements to the future of rocket science.

Esai Cisneros and Stanley Cheng, “Mechanosensitivity in Glioblastoma Cell Cultures”
Major: Genetics and Biotechnology
Faculty Advisor: Dr. Elba Serrano
NIH Undergraduate Research Training Initiative for Student Enhancement

Responses to extracellular stiffness play a crucial role in the growth and differentiation of cells and tissues. This research will establish an experimental framework for comparing the morphological and mechanical characteristics of glial cell lines from cancerous and normal brain

tissue. Biological atomic force microscopy (BioAFM) was used to measure the membrane Young's modulus (YM) of F98 glioblastoma cells (ATCC CRL-2397), providing insight into their mechanical properties. Preliminary results show success acquiring BioAFM measurements that yield YM glioblastoma values between 0.1 and 0.3 kPa. Ongoing experiments are assessing the morphology of glioblastoma cells grown on different matrix stiffness (0.2 kPa; 2 kPa; 16 kPa) using fluorescent probes to examine cell nuclei density and actin cytoskeletal microfilaments. It is hoped that understanding these biomechanical interactions may inform therapeutic strategies targeting mechanosensitive pathways in glioblastoma.

Maya Helene Clausen, Caleb Jimenez, and Karim Rojo, "Fungal Responses to Global Change: Assessing Growth and Pigment Production Under Warming, Drought, and Nitrogen Pollution"
Major: Maya Helene Clausen (Biology), Karim Rojo (Environmental Science), and Caleb Jimenez (Agricultural Biology)
Faculty Advisor: Dr. Adriana L. Romero-Olivares

Fungi play essential roles in our ecosystem; they mediate biogeochemical cycles and interact with all living organisms. Fungi are vulnerable to the effects of global climate change, yet little is known about their specific responses to different global change drivers. In this project, three drivers (i.e., warming, drought, and nitrogen pollution) were assessed to determine how they affected growth rate and pigment production; these indicate the energy fungi invest towards growing and producing protection molecules. We measured these traits of 48 different fungal species under global change drivers and control conditions. One-week incubations followed by measurement of colony size and assessment of pigment using a computer software were done. We hypothesized that there would be differences in fungal trait responses based on global change drivers and on species. We aim to deepen our understanding of fungal trait ecology under global change drivers to understand their consequences on our ecosystem.

Jayce Collins, "Evaluation of Putative Allergen Gene Expression in Pecan Pollen"
Major: Biochemistry
Faculty Advisor: Dr. Jennifer Randall

In 2023, pecan production in New Mexico was valued at $189 million. Pecan trees cultivated in the desert southwest are affected by heat and low water availability. In 2020, a water deficit study was performed on 'Pawnee'. Trees received either full water or 75% ET. In Spring 2021, pollen was collected from these trees for evaluation. There were distinct differences observed in the germination of pollen from each treatment. Since pecan pollen is allergenic, the purpose of this project was to evaluate the gene expression of two putative allergen genes, Ole and Profilin, between the water deficit and full-watered pollen. These genes were chosen as they were previously identified as allergens in pollen. RNA was extracted from pollen samples from 2021, and gene expression was evaluated via quantitative reverse transcriptase-PCR. Results showed no significant differences in gene expression between treatments. Subsequent experimentation could be performed for other putative allergen genes.

Melissa Coronado Arrieta, "Comparative Study of Position-Velocity Maps Obtained with Alma Observatory"
Major: Engineering Physics

Faculty Advisor: Dr. Ilhuiyolitzin Villicana Pedraza
Latinidad NSF Grant

The Position Velocity maps can be used to study the motion of gas and dust in galaxies. By observing the Doppler shifts in spectral lines, we can infer the velocity distribution of interstellar matter, aiding in the study of galaxy dynamics and star formation. In this work we will show different position velocity maps of one Seyfert galaxy observed with ALMA, comparisons between them and the results derived from said maps.

Aileen Cortez and Hillary Rojas Villalon, "A cross-sectional study on nonword repetition skills in school aged Spanish-English bilingual children"
Major: Communications Disorders
Faculty Advisor: Dr. Prarthana Shivabasappa
HNRS 400

This study aims at exploring changes with age in the Nonword repetition (NWR) skills in Spanish-English bilingual children. NWR task involves auditory presentation of nonwords and asking participants to repeat back each word as they heard it. Performance on this task is dependent on verbal working memory and ability to accurately produce novel phoneme sequences moderated by robust phonological representations. This task is less biased in identifying DLD in bilingual children from diverse language backgrounds. Hence this study contributes to overcoming our limited understanding of developmental patterns of this skill. Participants were 12 students in grades from 2nd-5th and were administered a NWR task in English and Spanish. Parents and teachers filled in a language-history and use questionnaires. Audio recordings of children repeating 2, 3 and 4 syllable non-words in both languages are being analyzed for the percentage of accurate phonemes produced. The performance will be compared across their grades, two languages and correlated with language use to further inform bilingual language assessment.

Andrea Mariana Cruz, "Learning Japanese-English Word Pairs"
Major: Psychology
Faculty Advisor: Dr. Dominic Simon
Undergraduate Research Training Initiative for Student Enhancement (U-RISE)

Language learners often have to acquire new vocabulary, but rarely get instructions about how to do so. In this study participants were to learn 48 Japanese nouns. In study each Japanese word was paired with a) its English equivalent, or b) a picture depicting the noun. In addition, words were presented once or twice, and the second presentation of twice-presented words were either close (1 item between) or far (8 items between); also, twice presented pictures were either the same, or differed from one another. After initial study, a distractor period occurred (10 mins) followed by a test in which Japanese words were presented, and participants typed their English Equivalents. Consistent with earlier findings, we anticipated that recall of the English equivalents would be affected by the manipulated variables. Results may assist in suggesting ways for students to learn new foreign vocabulary.

Zachary Cruz, "Transforming native Southwestern plants into fabrics and materials that can be machined in a machinery shop"
Major: Chemical and Mechanical Engineering

Faculty Advisor: Dir. Ken Ruble
NM AMP Undergraduate Research Scholars

Creating textiles from Southwestern plants such as yucca is an ancestral practice that dates back to the ancient Americas. This work analyzes the effects of soaking yucca, creosote, and cacti in sodium hydroxide solutions to isolate plant fibers; this, combined with ancestral weaving methods, creates ecologically friendly alternatives to traditional, water-intensive fashion materials. This research also aims to synthesize biodegradable and durable material out of plant fibers and plant saps that can be manufactured with using traditional machining equipment. The results demonstrate a method of creating biodegradable, composite plant materials while maintaining ancestral knowledge and reducing environmental effects.

Emerald Davis, Michael Medina, and Kevin Marin, “Study of Pressure Distribution in Soil Layers Due to Rocket Exhaust”
Major: Aerospace Engineering (all members)
Faculty Advisor: Dr. Bethuel Khamala
PHYS 1320L- Calculus Based Physics II

This study examines the pressure distribution in soil layers caused by rocket exhaust using calculus-based physics. Drawing from concepts learned in a calculus-based physics class at Dona Ana Community College, we apply principles such as resistance forces (analogous to friction), work done by forces, and the interaction between forces and materials. The focus is on how rocket exhaust pressure interacts with the soil surface, the resistance the soil offers, and the resulting energy dissipation. By analyzing pressure distribution across soil layers, we aim to develop a mathematical framework to describe how rocket exhaust forces dissipate and influence soil behavior. The study offers insights into the mechanical effects of rocket exhaust on the environment, improving our understanding of soil dynamics. This work is inspired by research conducted by Dr. Cortes at the New Mexico State University (NMSU) research lab, following a field trip experience.

Esha Desai, “Addressing Fears and Misconceptions about Physical Therapy”
Major: Kinesiology (Exercise Science)
Faculty Advisor: Dr. Kimberly Oliver

This project examined common fears and misconceptions about physical therapy as well as how clinics can address these concerns. Physical therapy can help individuals in recovery and with injury prevention. Unfortunately many do not partake in treatment due to these fears and misconceptions. This project analyzed physical therapy clinic websites and evaluated how these clinics address, ignore, or dismiss concerns. The website's responses were also compared to recommendations of how to address patient concerns and misconceptions. This project demonstrates how online websites for physical therapy clinics can improve communications about these concerns to promote engagement in treatment.

Kayda Donohue, Beatriz Flores, Kimberly Montgomery, and Ben Tobin, “Inclusive Marketing in Super Bowl Commercials?: Using Content Analysis to Explore Historical Trends in Gender & Ethnic Representation in TV Advertisements (1967–Present)”
Major: Psychology (all members)
Faculty Advisor: Dr. Timothy Ketelaar

PSYC 400: Independent Research

This project explores how Super Bowl commercials reflect broader cultural narratives related to race, gender, and identity. Our team is conducting a large-scale content analysis using AI-based image recognition tools to examine gender and ethnic representation in Super Bowl advertisements spanning several decades. We are particularly interested in identifying trends in demographic representation, portrayed roles, and associations with specific product categories. While data collection and pilot analyses are still in progress, we aim to present preliminary comparisons across a small set of representative years—each from a different decade—to explore how gender and ethnic representation in Super Bowl commercials has changed over time. This study represents an interdisciplinary approach located at the intersection of media studies, psychology, and advertising that frames commercials as both persuasive instruments and cultural artifacts that may reflect or reinforce societal values.

Rachel S. Doyle, "Brucellosis Management in Bison Populations and How This Pertains to the Meat Industry"
Major: Animal Science
Faculty Advisor: Dr. Katie Young
Wildlife Disease Ecology

Brucellosis abortus, or bovine brucellosis, is a contagious bacterial disease of livestock and wildlife that causes spontaneous abortion, unhealthy calves, decreased milk production, infertility, and weight loss. Bovine brucellosis entered Yellowstone National Park (YNP) through cattle herds before 1920[2] and the Teton National Park herd is believed to have contracted it thru feedground elk. Though eliminated from most US cattle herds since the 1930s, brucellosis persists in GYA bison and elk populations. The Yellowstone herd is America's last wild, genetically pure, and oldest bison population ~60% of adult female bison are seropositive, regardless of population fluctuations[1] eliminating brucellosis would boost bison population growth by 29%[1]. Since 2002, most domestic cattle infections trace to elk, not bison, suggesting a need to shift management focus.

Vance Doyle, "Motivated Science Reasoning: Can worldviews bias the evaluation of simulated scientific papers?"
Major: Counseling and Community Psychology
Faculty Advisor: Dr. Timothy Ketelaar
CEPY 4998 Internship in Counseling & Community Psychology/PSYC 400 Independent Research

This project investigates how worldviews influence evaluations of scientific evidence and arguments. Building on Kunda's (1987) foundational work on motivated reasoning, our study uses simulated scientific papers adapted from published peer-reviewed research papers on controversial topics (e.g., diet, gun control, climate change, etc.). Each paper is presented in two versions, identical in form but differing in the conclusion supported by the data. Participants will be asked to assess the credibility and rigor of these simulated studies, allowing us to explore whether prior beliefs bias scientific reasoning. We aim to extend this paradigm by comparing responses across individuals with varying political, dietary, and scientific worldviews. While data collection has not yet begun, our poster provides an overview of the research design, sample materials, and planned analytic strategies. This interdisciplinary project

contributes to psychology and science communication by examining how belief systems can shape how people interpret—even ostensibly objective—scientific evidence.

Mackenzie Dybvik and Anthony Frost, “Does Heat Exposure and Income Shape Climate Change Attitudes?”
Major: Mackenzie Dybvik (Sociology and Biology); Anthony Frost (Sociology and Pyschology)
Faculty Advisor: Dr. Heather Harper

The objective of this research is to assess the attitudes about climate change regarding those who live in poverty and in areas with heat and heat related illness vulnerability. This research will cross-analyze data from the CDC’s National Environmental Public Health Tracking Network - Heat & Heat Related Illness Vulnerability & Preparedness - Percent of Population Living in Poverty - National By County 2020 as well as the findings from a nationally representative survey that is looking at people’s attitudes and beliefs about climate change to assess the relationship between income, heat related challenges, and attitudes about climate change. We hypothesize that there will be a statistically significant relationship between the two, meaning that low-income individuals who live in heat impacted areas will be more aware of climate change compared to higher-income individuals, when controlling for all other demographics.

Lauren Farrar, “Exploring the Processes of Wound Healing that Contribute to Chemical Allodynia in *Drosophila melanogaster* Larvae”
Major: Biology and Microbiology
Faculty Advisor: Dr. Jacob Jaszczak

Would healing sustains the integrity of the epithelial barrier following tissue injury. During this process, sensory neurons become hypersensitized to protect the tissue while it heals; a phenomenon called allodynia. Allodynia is pain from a stimulus that is normally innocuous. Drosophila larvae experience allodynia during wound healing due to sensitization of the class IV peripheral sensory neurons, located directly below the epidermis. Previous literature has identified 0.5% hydrochloric acid (HCl) to be subthreshold, but after puncture wounding, 0.5% HCl becomes noxious to *Drosophila* larvae. Wound healing involves the formation of a plug to stop bleeding, melanization, and scab formation, followed by re-epithelialization. Non-puncture forms of wounding do not melanize and do not induce allodynia. We hypothesize that specific steps within the melanization process contribute to allodynia. This research aims to elucidate the mechanisms of pain during wound healing, potentially identifying novel factors to enhance patient care.

Clarissa Flores, Melissa Rocha, Paulina Campos, and Paola Dunque, “Finding Bacteria that Produces Antibiosis Against Human Pathogens”
Major: Clarissa Flores (Biology), Melissa Rocha (Nursing), Paulina Campos (Nursing), and Paola Dunque (Kinesiology)
Faculty Advisor: Dr. Concepcion Miller
BIOL 2110 Laboratory CURE

Antibiotics are becoming less and less effective against bacteria as intolerance continues to increase. In order to diminish the intolerance against known antibiotics, research and extraction of bacteria found in soil can be the solution to finding new and effective antibiotics. This

experiment was conducted to look for bacteria found in soil that may be able to produce antibiosis against human pathogens. Over ten isolates were obtained from a soil sample and screened for production of a zone of inhibition against *Bacillus subtilis* and *Enterobacter aerogenes*. The results indicated that there was one isolate of bacteria that produced antibiosis against *B. subtilis*. The promising isolate was characterized using conventional and modern techniques. This study showed that soil may be a good source for microbes with the production of antibiosis, which can eventually lead to finding new antibiotics against known bacterial pathogens.

Zachary Flores, "Soluble Solids in Sugar Snaps: Comparing Hydroponic, Fresh, and Frozen Sources"
Major: Horticulture
Faculty Advisor: Dr. Rachel Gioannini

This project investigates the soluble solid content—primarily sugars—in sugar snap peas grown in a Deep Water Culture (DWC) hydroponic system compared to both fresh and flash-frozen commercially available peas. By using a refractometer to measure °Brix values, this study evaluates whether hydroponically grown sugar snaps offer comparable or superior sweetness and quality. The research contributes to the field of sustainable horticulture by exploring the viability of hydroponic systems in producing crops with desirable consumer traits. Findings from this study may inform growers, retailers, and consumers interested in alternative production methods that emphasize freshness, flavor, and sustainability.

Logan Flowers, "Twin M1-Class Flares Leading to M9 Solar Flare"
Major: Cybersecurity
Faculty Advisor: Dr. Juie Shetye
NMSU Astronomy Department

Context: On April 30, 2024, three solar flares erupted from Active Region 13654. The flares were observed between 15:00 and May 1 at 03:00 using the Dunn Solar Telescope (ZYLA instrument) and NASA's Solar Dynamics Observatory (SDO/AIA).
Aims: This project analyzes flare structures and intensity variations using multi-wavelength observations from Dunn and SDO/AIA to study their evolution and dynamics.
Methods: FITS files are processed, aligned, and composited into a video to visualize flare progression. Light curves are generated to examine intensity fluctuations, focusing on quasi-periodic pulsations (QPPs) during flare peaks and declines.
Results: Analysis reveals intensity peaks, QPPs, and structural changes, confirming oscillatory reconnection and atmospheric variations across wavelengths that could drive a sequence of flares.

Brandon Garcia, "Aggregate Alkali-Silica-Reactivity and Mitigative Measures"
Major: Civil Engineering
Faculty Advisor: Dr. Zhe Wan
NM AMP Undergraduate Research Scholars

Internal pressure propagated by the formation of alkali-silica gel can cause concrete to swell leading to misalignment, structural deformities, and fractures. Alkali-silica reaction (ASR) is an abstruse issue whose complexities have made it difficult to predict and prevent due to a variety

of underlying factors that may or may not occur in structures for multiple years. ASR begins when siliceous components present within aggregates interact with alkali ions in cement, creating an alkali-silica gel that absorbs water, expanding its volume. As various points of expansion begin to appear, the cracks generated from the pressure converge diminishing the structural properties of the concrete affected. This research project aims to analyze various supplementary cementitious materials (SCMs) and their potential to mitigate ASR through various ASTM standards, identifying the relationship of long-term and short-term testing, and establishing a statewide aggregate reactivity database containing information on local pozzolans.

Alejandro Gomez, “Autogenic succession and floristic composition in abandoned gypsum quarries”
Major: Fish, Wildlife and Conservation Ecology
Faculty Advisor: Dr. Donovan Bailey
McNair Scholars Program

Plant nurse species play an important role in promoting plant facilitation, plant growth, and increasing water and nitrogen uptake to neighboring plants. The objective of the project investigates spontaneous succession, comparing soil and floristic composition between disturbed gypsum quarries without the presence of *Gypsophila struthium* and undisturbed shrubland. The study was conducted in an abandoned quarry located in Almeria, Spain, with mining operations ceasing 10 years prior to study. Ten plots were established in disturbed areas and five plots with similar dimensions in natural undisturbed areas. Flora presence was recorded in each plot and subplot, with soil samples being collected and analyzed from each plot, measuring element concentrations. Statistical analysis using Species-Area Relationships (SAR) linear regression models show varied soil element concentrations and flora composition between disturbed and undisturbed areas. The results highlight the importance of understanding the role of nurse plant species and ecological restoration efforts in gypsum ecosystems.

Janet Gomez, “Effects of Low and High Aspirin Dose in the Development of *Drosophila* Larvae”
Major: Biochemistry
Faculty Advisor: Dr. Jacob Jaszczak
BIO498 and McNair Program

Non-steroidal anti-inflammatory drugs (NSAIDs) such as aspirin are commonly known for their benefits in relieving pain and reducing fever. However, at high doses these drugs have been found to have harmful impacts. The study investigates the effects of aspirin on *Drosophila* larvae development. The larvae were administered at different dosages, revealing that all larvae are sensitive to high doses of aspirin. The findings suggest that the development of larvae is influenced by the tissues involved in their sensitivity to aspirin. Future research will explore the pathophysiological effects of analgesic medications during larval development to understand the potential risks of toxic interventions. This study will enhance our understanding of effective pain management and provide greater insight into the toxicity of pain medications in developing animals.

April Gonzales, “Investigating Tamoxifen Resistance Through Receptor Expression in Breast Cancer Cells”
Major: Chemical and Materials Engineering; Minor: Biomedical and Computational Engineering

Faculty Advisor: Dr. Jessica Houston
CHME 498-Undergrad Research

Breast cancer is a common malignancy that affects 1 in 8 women in the United States. Most patients are diagnosed with estrogen receptor-positive breast cancer that is commonly treated with estrogen receptor antagonists like the selective estrogen receptor modulator (SERM) tamoxifen or the selective estrogen receptor degrader (SERD) fulvestrant. While these treatments have proven effective, the development of resistance to treatment remains a clinically relevant complication. Previous work from many labs, including ours, has shown that treatment resistance is coincident with decreased expression of the insulin-like growth factor 1 receptor (IGF-1R), and our lab showed that increased integrin β1 (CD29) is observed in treatment-resistant breast cancer cells. The goal of this work is to optimize a sensitive, flow cytometry-based methodology to identify treatment-resistant breast cancer cells within a large population of breast cancer cells that are mostly treatment-sensitive. Improving the ability to identify treatment-resistant breast cancer cells early during treatment may provide valuable insights into the mechanisms behind treatment resistance and inform the development of improved diagnostic and treatment strategies in the clinic.

Valerie Guha, “Enhancing Salads with Berries: A Polyphenolic Study”
Major: Biochemistry
Faculty Advisor: Dr. Ivette Guzman
PACR U54 Research Project

Polyphenolics are compounds produced by many plants to protect themselves. They have antioxidant activity and when eaten, their antioxidant activity protects our bodies against chronic disease, inflammation, and even cancer. The objective of this study was to determine the polyphenolic content in spinach berry salads and southwestern slaws. Since published research indicates strawberries are very high in polyphenolic content, the hypothesis of this study was that the spinach berry salads have higher polyphenolic content than the cabbage-containing southwestern slaws. A polyphenolic extraction and analysis method using acetified methanol and Folin spectrophotometric assay were used to measure polyphenolic concentration on the salads. A known phenolic compound, gallic acid, was used as the standard, the amounts were reported as gallic acid equivalents. Results indicate that the spinach berry salads had highest polyphenolic amounts. In conclusion, our hypothesis was supported, however both salad types had polyphenolics which are beneficial to humans.

Zachary Gurule and Amanda Velazco, “The Highs and Lows of Cannabis”
Major: Horticulture
Faculty Advisors: Dr. Kulbhushan Grover and Dr. Omar Holguin
AGRO/HORT/ENVS/SOILS 447

Cannabis, a plant with a long history of use, presents a complex profile of both potential benefits and risks. This project aims to synthesize current scientific literature to provide a balanced overview of these effects. By examining the therapeutic potential of cannabinoids, such as Delta-9-tetrahydrocannabinol or THC, in treating conditions like chronic pain, epilepsy, and nausea, while also addressing the potential adverse effects associated with cannabis use, including cognitive impairment, respiratory issues, and the risk of developing cannabis addiction. Furthermore, assessing the economic implications of cannabis legalization and the ongoing debate surrounding its long-term impact on the public. By evaluating existing research,

this project seeks to contribute to a deeper understanding of cannabis and inform evidence-based discussions regarding its use and regulation.

Nicole Heckathorn, “Yellow Peril’s to Memorial Rocks - Japanese American World War II Internment Camps in New Mexico”
Major: Criminal Justice
Faculty Advisor: Dr. Carlos Posadas
CJ 484 Hate Crimes

The reason for this paper is to explore internment camps, particularly in light of the unique times we are currently experiencing. The purpose of this paper is to examine President Roosevelt’s response to the Japanese bombing of Pearl Harbor in 1941. This devastating attack raised concerns among U.S. leaders regarding potential spying and threats from people of Japanese descent. It is important to note that anti-Asian sentiment existed before the events of Pearl Harbor. This fear and mistrust lead to Executive Order 9099. The order relocated 120,000 Japanese Americans to U.S. Internment Camps for safekeeping from 1942 - 1946. It’s important to note, people of Japanese descent were “never charged with a crime, and could not appeal their relocation, loss of property or possessions” (NARA, 2024). The topic is Due Process in America, and that peoples’ constitutional rights were violated all out of racism and fear. Japanese Americans were forcefully relocated, lost their possessions, endured harsh living conditions, and yet showed resilience. The Infographic included images to outline the research, findings, methodology, and study limitations. Four of these camps were in New Mexico: Lordsburg; Santa Fe; Ft. Stanton, Old Raton Ranch (Baca Camp).

Faith Heritage and Jaedyn Sanchez, “Investigating Motor Dual-Tasks in Children with Autism Spectrum Disorder ”
Major: Biomechanics
Faculty Advisor: Dr. Alyssa Vanderlinden

Children with Autism Spectrum Disorder (ASD) often exhibit motor deficits compared to neurotypical (NT) children, including gross and fine motor skills resulting in reduced coordination (Pan et al. 2009). Previous research also suggests children with ASD have abnormal gait and poor balance (Kindregan et al. 2015). While many studies explore motor deficits in autism, few have examined how motor dual-tasks impact gait. This study investigates how a motor dual-task affects gait in children with ASD compared to NT children. Fifteen children with ASD and fifteen NT children (ages 8–17) will participate. Data will be recorded using a 10-camera Vicon motion capture system, and three AMTI force plates. Participants will walk at a self-selected speed normally and walking while holding a tray with three tennis balls. Understanding how performing motor tasks while walking affects their movement can guide better interventions and develop individualized therapeutic strategies for children with ASD.

Chantay Herrera, “Transcendence”
Major: Studio Art
Faculty Advisor: Professor Craig Cully
Advanced Painting: Spirituality

I will be exhibiting four different paintings "Locked Out (Found the Key)", "Senses in Shambles", "Oculus", and "Universal Experience" about my views and experiences through spirituality and

how I've interpreted my different assignments to put meaning into my paintings that follow my beliefs. Stylistically I tend to be more representative and rendered in my paintings. I aim for realism in a lot of my work. Spirituality to me is light and lively and in my interpretations of spirituality in my four paintings it expresses those views through the content, subject matter, and color but also based on my experiences and research. I am working on other paintings in my class one that explores life after death and how I view that experience spiritually.

Alfonso Hernandez-Barraza and Estevan Soto, "Natural Disasters: Long Term Damage"
Major: Alfonso Hernandez-Barraza (Environmental Science) and Estevan Soto (Horticulture)
Faculty Advisors: Dr. Kulbhushan Grover and Omar Holguin
AGRO/HORT/ENVS/SOILS 447

There are many types of natural disasters such as tornadoes and wildfires, we usually only see the damage right after the disaster, what we don't see is the long-term effects on the community affected, such as contamination in water, soil, or air and the time it takes to rebuild. The physical effects of these natural disasters are felt heavily by the farmers and other agriculturists who must repair or recoup their equipment, infrastructure, crops, livestock or a plethora of other problems that occur due to these disasters. The objective of this presentation is to understand the long-term effects from natural disasters which can help us prepare for it.

Destiny Hernandez, Angel Torres, Christopher Zubiate, Cesar Jara, and Emile Tannous, "Guar as an Alternative Crop in New Mexico"
Major: Destiny Hernandez (Horticulture) Angel Torres (Agronomy), Christopher Zubiate (Agronomy), Cesar Jara (Agronomy), and Emile Tannous (Agronomy)
Faculty Advisor: Dr. Kulbhushan Grover
Guar Research Program

Guar or clusterbean (*Cyamopsis tetragonoloba L*.) is a high value legume crop that can be grown for fresh beans, protein-rich forage, or for seed to produce guar gum. Guar gum is obtained from guar seed endosperm, a galactomannan polysaccharide giving the high viscosity properties and is widely used in various industrial products. Currently, most of the world guar production takes place in semi-arid and arid regions of south Asia and about 90% of the US guar demand is met through imports. Guar can be adapted to semi-arid region of desert southwest including New Mexico due to its ability to tolerate high temperatures and dry conditions. The objective of this presentation is to share updates on evaluating its adaptability in the region. Results indicate that guar could grow and adapt well in the local cropping systems of New Mexico.

Eliha Hernandez, "Detection of Cancer-Associated Genes in the Regeneration Blastema of *Sternopygus macrurus*"
Major: Microbiology
Faculty Advisor: Dr. Graciela A. Unguez
NMSU AMP & U-Rise

The South American electric fish *Sternopygus macrurus* regenerates all tissues including skin, skeletal muscle (SM), muscle-derived electric organ (EO), and spinal cord following tail amputation (Unguez, 2013). Repetitive tail removal leads to a robust stem-cell-based regeneration (Unguez, 2013). To date, there is no evidence of uncontrolled growth or tumor

formation during regeneration. The relationship between tissue regeneration and cancer has not been tested in electric fish as in other highly regenerative animals (Maggiore and Zhu, 2023). We test the hypothesis that genes associated with human cancers are detected in S. macrurus regenerative blastema. Using standard molecular biology techniques, we look for transcripts from csde1, eno1a, usp2a, cpt1ab, and tp63. Our data (n=2) support our hypothesis in that mRNAs for the five genes were detected in all tissues. Qualitative PCR showed bands for all five transcripts in blastema's 14- days post-amputation is like those observed in mature SM and EO tissues.

Garrett Hitchcock, "Full-Range Leadership and the Prevention and Frequency of Injuries in Athletes: A Proposal Examining the Influence of Different Coaching Behaviors"
Major: Kinesiology
Faculty Advisor: Dr. Katie Hirsh
SPMD 4997

This study will investigate the relationship between coach leadership styles, as defined by the Full-Range Model of Leadership (Avolio, 1999), and injury incidence and rehabilitation in high school athletes. The study aims to identify which leadership styles are most beneficial in preventing injuries and supporting athlete recovery. Researchers will collect data from high school athletes using the Multifactor Leadership Questionnaire (MLQ) to assess coach leadership styles, injury reports to track injury incidence, and interviews with athletes to explore coach-athlete interactions. The study hypothesizes that transformational leadership will correlate with lower injury rates, while laissez-faire leadership will be associated with higher injury rates. By administering the MLQ at multiple time points, the study will also examine how coaches' leadership styles adapt in response to team injury status. This research will contribute to the limited understanding of how coach leadership impacts athlete health and inform recommendations for effective coaching practices.

Ruby Hollomon, "Game Development from the Ground Up: Physics-Based Platformer in Python"
Major: Computer Science
Faculty Advisor: Dr. Bill Hamilton
CS-448 - Senior Project

This project focuses on the complete design and implementation of an online 2D platformer that combines expressive visuals with dynamic, physics-based gameplay—all built without a traditional game development framework, instead using Python's Pygame and Pymunk libraries. The game's art direction draws inspiration from 16-bit aesthetics, with custom hand-drawn sprite work. A central mechanic is the player character's ability to transform into different forms, each affecting movement and interaction with the game environment in unique ways. These transformations, combined with real-time physics-based interactions, create a sense of weight and momentum that elevates the gameplay experience. Through combining creative design with technical problem-solving, such as optimizing and working without use of a conventional game engine, this project showcases how open-source tools can be used to create engaging, responsive, and visually striking indie games.

Monet Hunt, Kyla Saucedo, Shaylie Salopek, and Makayla Mullins, and Niklas Kronlein,
"What EWE should know about placental biology: Using sheep as a biomedical model to gain valuable insights into pregnancy complications impacting humans and livestock"
Major: Animal Science (all members)
Faculty Advisor: Dr. Ryan Ashley

The concept of One Health is increasingly important in animal science, leveraging animal research to address embryonic development issues. In this study, sheep served as a model to explore pregnancy complications linked to disruptions in growth and vascularization of the placenta. The CXCL12/CXCR4 axis plays important roles in placental development as disruptions to this chemokine axis are associated with preeclampsia and intrauterine growth restriction. However, precise roles of this axis during placentation are unclear. To investigate, sheep received three different doses (1X, 1.5X or 3X) of CXCR4 inhibitor, AMD3100 or saline (control) in the uterus for 14 days and on d90, placenta was collected and analyzed for FGF-2, a critical player in placental angiogenesis using immunofluorescent imaging. This research aims to better understand how dysregulated vascularization impacts placental development and contributes to pregnancy complications, offering potential pathways for improving maternal and fetal health by addressing these underlying mechanisms.

Gael Ibarra, "Don't Look At Me"
Major: Surveying Technology
Faculty Advisor: Professor Dianna Baltosser
ARTS1320: Ceramics 1

I made a 3-inch diameter clay tube, cut in half to make two cups, one of which became this piece. The piece was decorated using hand-molding techniques. The idea behind this artwork was simple: "Big nose". I wanted to make the cup have a big nose to mimic a handle which became the starting point. My imagination and workflow led me to add arms, eyes, and a bum - none of which were part of the original idea. I then thought it would look better with a plant inside, so I added a hole in the bottom for drainage. I ended up with a piece that expresses who I am as a person, with each of the pieces representing a different part of me. The hands and arms showing my anxiety, the nose my creativity, and the bum my goofy side. The piece will be displayed elevated with a plant inside.

Caleb Jimenez, Karim Rojo, and Maya Clausen "Fungal Responses to Environmental Stress: A Decomposition Experiment"
Major: Caleb Jimenez (Agricultural Biology (Applied Microbiology)), Karim Rojo (Environmental Science), and Maya Clausen (Biology)
Faculty Advisor: Dr. Adriana L. Romero-Olivares

Amidst global change, studying fungi can help scientists gain an understanding of how biogeochemical cycles, such as the carbon cycle, will be impacted by environmental changes. Our objective was to determine how decomposition rates by different fungi are affected by global change drivers. We conducted a decomposition experiment using mesquite shrub (*Prosopis sp*.) leaflets and 48 different fungal species. Specifically, we inoculated mesquite leaflets with each fungus under three different global change drivers, warming, water stress, and nitrogen pollution. We measured decomposition after six weeks. The decomposition rates varied with each global change driver, showing highest decomposition rate for the warming treatment, and lowest decomposition rate for the water stress treatment. Similarly, there were higher rates

of decomposition for the nitrogen treatment when compared to the control treatment. Our results shed light on how decomposition rates of different fungal species are affected by different global change drivers.

Noel Lara, Mariah Humphrey, and Kenzie Smithyman, “Effects of pecan shell supplementation on complete blood counts of endotoxin-challenged cattle”
Major: Animal Science
Faculty Advisor: Dr. Clint Loest
LEADING program

Weaning and transporting beef calves cause stress, inflammation, and a compromised immune system. Pecan shells have antioxidant properties and may reduce inflammation in stressed calves. The objectives were to evaluate the effects of pecan shell supplementation on complete blood count (CBC) of endotoxin-challenged cattle. Twenty-four beef calves were randomly assigned to four treatments (2 x 2 factorial). Treatments were 2 dietary supplements (cottonseed hulls vs pecan shell) and 2 lipopolysaccharide (LPS) challenges (control vs LPS). Blood was collected via jugular catheters at 0, 1, 2, 4, 8, 12, and 24 h after injecting LPS. White blood cell counts decreased ($P < 0.05$) in cattle in response to LPS, and pecan shell supplementation did not alter ($P > 0.05$) the LPS effects on CBC. These results demonstrate that the antioxidant properties of pecan shell did not alleviate the harmful effects of an endotoxin on CBC of stressed calves.

Alejandro Lazo-Loya, “Role of IGFBP6 in the Cell Cycle and Interferon Response”
Major: Biochemistry
Faculty Advisor: Dr. Kevin Houston
NMSU AMP

The goal of this project is to investigate how Insulin-Like Growth Factor Binding Protein-6 (IGFBP6) regulates breast cancer cell responses to ultraviolet (UV) radiation, a factor influenced by environmental changes and increasing radiation exposure. Prior research in our lab has demonstrated that IGFBP6 is induced by progesterone to antagonize estrogen-driven proliferation. As UV radiation exposure can damage DNA, disrupt microtubule stability, and alter immune responses, this project aims to determine how IGFBP6 modulates these processes to influence cancer resilience. Understanding these mechanisms could contribute to broader discussions on community health and environmental factors affecting cancer incidence and treatment outcomes.

Luis Diego Lazo Loya, “Evaluating synthetic cannabidiol derivatives for treatment of greenhouse gas associated melanoma”
Major: Biochemistry
Faculty Advisor: Dr. Amanda Ashley
NM AMP URS

Cannabidiol (CBD) the major non-psychoactive component of cannabis is known as an inhibitor for pro-inflammatory signaling due to interactions with endocannabinoid receptors CNR1 and CNR2, showing benefits in conditions relating to regulation of endocannabinoid homeostasis. We have synthesized biologically based CBD derivatives that we suspect will show a more potent ability to diminish and mitigate inflammation derived from enhanced binding to CNR1

and/or CNR2. Our objective is to assess if proliferation and motility are diminished in melanoma cell lines after exposure to our synthetic CBD derivatives. Melanoma is an aggressive form of skin cancer that has seen rise due to exponential increase in greenhouse gases. We expect after growing melanoma cell lines following exposure to our synthetic CBD derivatives, we will find results in our analysis showing changes in proliferation indicating our enhanced binding derivatives will mitigate inflammation supported by establishing lethal dose values, quantitative PCR, and immuno-blotting.

Jonathan Leuenberger, “How Refugees use Technology when Entering the United States”
Major: Anthropology and Computer Science
Faculty Advisor: Dr. Shiva Darian

We are researching the use and access of technology as refugees cross the Mexican border into the United States. Amid the growing negative feelings towards refugees in the United States' current political climate, this research is vital to help give scholars and the general public a better understanding of the transitions refugees go through when crossing the border. We are specifically focused on the technology transitions refugees experience in shelters after crossing the US/Mexico border. Our sample thus far has been with refugees from South and Central America, as well as the Middle East. We are using semi-structured interviews to get participants’ stories of their journeys. We are using a locally hosted Whisper model (Large LLM) to transcribe and translate audio recordings. This research aims to educate and prepare future applied research where we will address the needs and US policy affecting refugees, through the lens of technology use.

Rodney Levendosky, “Analysis of Tonga Volcano eruption”
Major: Animation and VFX
Faculty Advisor: Dr. Juie Shetye
ASTR 400

This study uses GOES-17 satellite data to analyze the Hunga Tonga–Hunga Ha’apai eruption on January 15, 2022. The goal is to determine when the volcanic plume reached its maximum visible altitude during twilight and calculate the solar zenith angle (SZA) at that time to better understand atmospheric light interaction. The eruption produced a large plume observable by GOES-17's multi-channel sensors, including infrared, RGB, and volcanic ash detection bands. Twilight imaging provides favorable contrast, helping isolate the plume against the background. Different spectral channels are used to track the plume’s height and visibility over time. Preliminary analysis shows the plume’s peak visibility occurred during twilight in select infrared and ash-detection channels. The calculated SZA at peak altitude offers insight into light-plume interactions. These results support improved satellite-based monitoring of volcanic activity, especially under low-light conditions.

Isaid Lopez, “Ammonia Removal and Recovery from Produced Water Using Sodium-Pretreated Zeolite for Beneficial Reuse”
Major: Civil Engineering
Faculty Advisor: Dr. Yanyan Zhang
NM AMP, URS Program

A large amount of produced Water (PW) generated from oil and gas extraction necessitates the treatment of PW for safe disposal or beneficial reuse. However, after the desalination process, there is still a high concentration of ammonia in the treated PW from the Permian Basin. This study focuses on removing the remanent ammonia by zeolite and recovering it for beneficial reuse. In both batch and column studies, sodium pre-treated zeolite reduced ammonia concentration from 24 mg/L to 0.1-1 mg/L, with an optimum ammonia adsorption capacity of 20.19 ± 0.61 mg/g. 10% NaCl was identified as the best zeolite regenerant among all tested regenerants. We also found the initial pH of the regeneration solution did not significantly impact the regeneration capacity. The ammonia in the spend regenerant could be recovered further as a fertilizer.

Ashley Manger, “Tuning Halloysite Nanoparticles for Drug Delivery in Human Cancer Cells”
Major: Microbiology
Faculty Advisor: Professor Deepak Subedi
NIH Bridges to Baccalaureate

Cancer treatments are widespread throughout the body; however, a method could be developed to target only cancer cells. Nanoparticles may be used to facilitate this goal. Halloysites are a naturally occurring clay derived nanoparticle that has been utilized in medicinal and nanotechnological fields. Using bases to dissolve the inner portion of the nanoparticle, and attaching biotin, then the nanoparticle is loaded with doxorubicin HCl, a common cancer drug. Simultaneously HeLa cells were being grown in an incubator. This research is ongoing and will be continued by Deepak Subedi and his undergraduate students.

Julian Daniel Martinez, “From Fields to Futures: Academic and Career Paths for Students with Agricultural Labor Experience”
Major: Agricultural Economics and Agricultural Business
Faculty Advisor: Dr. Frannie Miller
Honors Agricultural Policy

This research is to explore the academic and career choices available to college students who have grown up working as field laborers in agriculture. This study is rooted in my personal experience working as a field laborer as a kid and in my family’s role as agricultural workers who migrated to the United States from Mexico, combined with my choice to pursue a bachelor's degree in agricultural economics.

Natalie Martinez, “Examining Athlete Preferences for Leadership: A Proposal on Formal vs. Informal Leader Roles”
Major: Psychology
Faculty Advisor: Dr. Katie Hirsch
SPMD-4997 Independent Study

Leadership within sport teams significantly influences athlete experience and performance (Cotterill & Fransen, 2016). While coaches serve as primary leaders, athletes also take on leadership roles in formal (e.g., captains) and informal (e.g., veteran teammates) capacities (Fransen et al., 2014). However, limited research has examined differences in expectations for these leader types (Loughead et al., 2006). This study will investigate university athletes’ preferences for leadership behaviors in formal versus informal athlete leaders through a

quantitative survey. Participants will complete the Leadership Scale for Sports (Chelladurai & Saleh, 1980) and the Differentiated Transformational Leadership Inventory (Callow et al., 2009) to assess their preferences of different leadership behaviors. Results will provide insights into how athletes distinguish between leadership roles within teams, informing future leadership development programs and best practices for coaches and sport psychology consultants. By clarifying role expectations, this research aims to enhance team cohesion and overall athlete performance.

Trisha McCaul, Alexia Garza, and Gabriella Esparza, "Secondary Metabolite Compounds of Soil Bacteria as Novel Antibiotic Sources"
Major: Nursing (all members)
Faculty Advisors: Dr. Concepcion Miller
Cellular & Molecular Biology (BIOL 2110)

In the field of microbiology, the rise of antibiotic-resistant microbes is contributing to an increase in infectious diseases that evade treatment by current medicines, moving us closer to a post-antibiotic era. Further research is necessary to isolate soil bacteria that produce novel secondary-metabolite antibiotic compounds. In this research project, soil bacteria were isolated and tested for antibiotic production against ESKAPE pathogen safe relatives for *Staphyloccus aureus* and *Mycobacterium tuberculosis*. This yielded five bacterial isolates demonstrating antibiotic activity against *Staphylococcus aureus* and three bacterial isolates demonstrating antibiotic activity against *Mycobacterium tuberculosis*. Two isolates with strong antibacterial properties were selected and identified via Biolog (carbon source utilization) and 16s ribosomal RNA PCR analysis. These were *Bacillus thuringiensis/cereus* and *Bacillus zhangzhouensis/australiensis*. These findings are significant because they provide potential novel forms of antibiotics for treatment involving resistant pathogens.

Renee Medina, "Electrochemical Evaluation of a Dawson-Type Polyoxometalate (POM)"
Major: Chemistry
Faculty Advisor: Dr. Scott J. Folkman

In this research, a Wells-Dawson-type polyoxometalate (POM) with the formula S2W18O62·H2O was synthesized and investigated for its potential as an electrode material in supercapacitor applications. Polyoxometalates have gained attention due to their distinctive redox properties, enabling efficient electron transfer and stable energy storage. Through a systematic synthesis approach, uncontaminated Dawson-structured S2W18O62·H2O was obtained and tested for its redox properties. Cyclic voltammetry revealed that a pure product was synthesized. The POM's unique framework and robust thermal stability, as well as possible high-power density and good cycling stability, highlight the potential of this Dawson-type POM as a promising energy storage material. These future tests and findings may open doors for further optimization and scaling, ultimately contributing to the development of advanced supercapacitors with higher performance and longer operational lifetimes at much lower costs. Additionally, doping or functionalization strategies may further enhance the device's performance with further testing and research.

Maria Mendoza, "'Justice for Women': Archival Research on Feminicides"
Major: English / Gender & Sexuality Studies
Faculty Advisor: Dr. Cynthia Bejarano

Discovery Scholars Program

My poster will present archival research on the anti-feminicide and feminist movement in Ciudad Juárez and Chihuahua from 1994 to 2014. In particular, I wish to highlight NMSU's J. Paul Taylor Symposium that took place from March 29th to 31st, 2006. The theme of the symposium was "Justice for Women," which included various exhibitions aimed at raising awareness of the feminicides occurring in the border region at the time. Additionally, this symposium invited some of the mothers of the murdered women to speak about the gender violence happening in their communities. Feminicides continue to be an issue in today's society, with their impact spreading across borders. My poster will feature photographs of the symposium's exhibitions and excerpts from interviews with several organizers and presenters who attended this event. My goal is to acknowledge the efforts made to honor the victims of this gender violence.

Madison Grace Michaels and Emma Rozzelle, "Understanding Athlete Leadership in Crisis Situations: Best Practices and Behaviors"
Major: Kinesiology (Exercise Science)
Faculty Advisor: Dr. Katie Hirsh

Previous research in public administration and organizational contexts has found helpful approaches to handling crises, such as a 10-step Framework (Boin et al., 2013) for managing crises. However, less is known about how leaders in sport handle crises and this was highlighted during the COVID-19 pandemic. The present research aims to identify effective strategies for informal athlete leaders and formal athlete leaders in addressing sports crises. One-on-one interviews were conducted with 25 varsity athletes across seven sports to explore how the Covid-19 pandemic affected athlete leadership processes during the first three months of the pandemic. Data will be analyzed to explore "What are the most beneficial steps and behaviors athlete leaders can take during a sports-related crisis?" The findings will be developed into practical guidelines for athlete leaders to follow so they can navigate crises, support teammates during challenging times, and help lead their team in overcoming adversity.

Elida Miller, "A Study on Manure and Feed Trailer Transportation Laws"
Major: Agricultural Economics and Agricultural Business
Faculty Advisor: Dr. Brian Hurd
Young Agri-Scientist Program

The transportation of manure and feed is a critical component of agricultural operations, yet it is subject to a complex web of state laws. This research project examines the legal framework governing the transportation of manure and feed trailers in New Mexico, focusing on a comparison with other agricultural states and the environmental impact. This study identifies key legal challenges faced by NM agricultural producers and transporters. Special attention is given to other states' laws, and the diesel and emission impact of hauling multiple trailers. This project aims to provide policy recommendations that support producers and transporters while considering other impacts on the state.

Sheyla Miramontes, "Microplastic Detection"
Major: Electrical Engineering
Faculty Advisor: Dr. Miranda Van Iersel

Microplastics are everywhere, and we now understand they are a problem. This challenge highlights the urgent need for improved detection to reduce the spread of microplastics. Our research focuses on enhancing the detection of microplastics and other microparticles through the scattering of a laser beam and the use of photodiodes to measure and analyze the scattered light. By using simple yet effective optical equipment, we aim to develop a reliable and labor-efficient method for identifying microplastics in water. This approach supports a critical environmental issue that demands immediate attention.

Breanna Molina, “Reauthorize the Radiation Exposure Compensation Act”
Major: Justice, Political Philosophy, and Law
Faculty Advisor: Dr. Dwight Kealy

I argue that the Radiation Exposure Compensation Act must be reinstated. I examine both values of the Downwinder Movement as they apply today and a case study on RECA eligible health burdens outliving its nullification. By analyzing both qualitative and quantitative data, I demonstrate that reinstating RECA is an effective means of upholding the ideals of restitutive justice. My findings will contribute to the field of political philosophy and public policy by illustrating the significance of philosophical principles in policy making.

Jamie Monrroy, “Restoring Biological Truth”
Major: Philosophy
Faculty Advisor: Dr. Lori Keleher

On January 20th, 2025, President Trump signed the executive order “Defending Women from Gender Ideology Extremism and Restoring Biological Truth to the Federal Government” (Executive Order 141468. 2025). With this executive order, there is an emphasis on reality, specifically the biological reality and social reality of sex. claiming that gender identity and gender ideology have a negative impact “not just on women but on the validity of the entire American system” (Executive Order 141468. 2025). However, Trump's executive order does not stand in the biological or social reality of our world. Gender identity and gender ideology are not putting women or the validity of America in danger. This is because trans people have always been a part of our social reality, and our biological reality is more complicated than the definition of female and male given in the executive order.

Lilian Montoya, “Testimonial Scriptwriting: Visibilizing Rape Culture at a Public University on the US-Mexico Borderlands”
Major: Gender and Sexuality Studies
McNair Scholars Program

I experienced campus sexual assault in January of 2024. I wrote four testimonios, distilled them into a short testimonial theatrical script and performed it as a monologue. My primary aim in this project was to understand how sociocultural norms facilitated and obscured sexual assault. I also wanted to understand how testimonial scriptwriting as research methodology and process of divulging may guide me in visibilizing my experiences/testimonio, facilitate my healing process, and possibly bring insights into institutional complicities and silences about rape culture. Testimonial scriptwriting and performed monologue were an intertwined me-search/research approach, guided by writing and/or critical self-reflexivity about/within the violences of the institution. In the first stage of this project, I wrote until the screenplay was

complete. In the next stage of this project, I plan to analyze my reflections, hoping to gain insights into my primary and secondary aims for this project.

Sabrina Montoya and Namhi Gallegos, “Design, Fabrication, and Testing of an Artificial Muscle-Driven Limbless Robot for Agile Locomotion”
Major: Mechanical Engineering/ Aerospace Engineering
Faculty Advisor: Dr. Mahdi Haghshenas Jaryani
Bio^2 Robotics Lab

Robots that use limbless locomotion are being explored as options for exploring the moon and other planets. One such robot is the semi-soft snake robot, which is currently not very agile or efficient. In order to improve efficiency and agility this design uses McKibben Pneumatic Artificial Muscles (PAMs). The goal is to characterize PAMs to allow for better modeling and control. The muscles were created using an inner bladder of Thermoplastic and an outer, braided sleeve. Isotonic tests were performed to characterize the behavior of PAMs of different lengths and diameters. The isotonic characterization of the muscles indicates the magnitude of the velocity is impacted by the length of the muscle and that the behavior of these muscles concerning force, contraction percent, and shortening behavior is consistent with other research. These results allow the most optimal PAMs to be chosen to improve the efficiency of the snake robot.

Celeste Mora, “Synthesis of Napabucasin Derivative for treating Fibrolamellar hepatocellular carcinoma”
Major: Environmental Science
Faculty Advisor: Dr. Barbara Lyons

Fibrolamellar hepatocyte carcinoma (FLC) is a highly lethal liver cancer affecting children and young adults, first discovered in 1980. Fibrolamellar refers to the fibrous bands in the tumor when observed under a microscope. Current treatment options for this cancer are limited, with surgery being the only partially effective approach. However, new treatments are being discovered. Napabucasin, also known as BBI608, is a natural naphthoquinone compound derived from plants *Newbouldia laevis, Ekmanianthe longiflora,* and *Handroanthus impetiginosus*. Based on past work from other researchers, this compound has shown anti-cancer activity against FLC. However, its bioavailability and efficacy may be further optimized. This procedure primarily focuses on synthesizing and testing three Napabucasin derivatives (LD-17, 8q, and 7e) previously shown to enhance bioavailability and efficacy in other cancers. These analogues will be tested on FLC cell cultures to assess their medicinal potential. These findings may contribute to the development of new systemic treatments for this lethal cancer.

Erick Morales, “Underactuated Robotic Hand Gripper for Green Chile Pepper Harvesting”
Major: Mechanical and Aerospace Engineering
Faculty Advisor: Dr. Mahdi Haghshenas-Jaryani

Robot Harvesters have shown promising in effective harvesting of other high-valued crops. These robots have employed a variety of grippers and end-tools for harvesting fruits and vegetables. Some of the current models developed for high-valued crops harvesting utilize different types of mechanism such pneumatic soft actuators, electric grippers with rigid and flexible fingers, achieving harvesting without damaging the crops. Inspired by the human

harvester's hand motion and reverse engineering, the design of a three-finger gripper, a series of underactuated compliant robotic grippers with different finger configurations was designed, prototyped, and tested. Initially, design requirements, constraints, and specifications were determined. Kinematic analysis of the robotic fingers motion was carried out to determine the geometrical dimensions of the fingers, range of motion of the joints, and selection of servo motors rotational properties. Increasing efficiency in crop harvesting and improving working conditions for field laborers are key goals.

Isaac Moreno-Carrillo, "Investigating the use of different phage RNA polymerases in in vitro transcriptions to address the issue of product 3' heterogeneity"
Major: Biochemistry, Microbiology, Biology, and Spanish
Faculty Advisor: Dr. Venkat Gopalan
The Ohio State REU

In vitro transcription (IVT) is a widely used method for RNA synthesis, with T7 RNA polymerase being the most common enzyme employed. However, the increasing demand for higher precision in RNA products, particularly in reducing 3' heterogeneity (non-templated nucleotide additions), is critical for applications such as site-specific RNA modification and ligation. In this study, we explored RNA polymerases from a library, expressed under various conditions in different cell lines, and purified them using nickel affinity chromatography. The RNA polymerases of interest included Dickeya phage Misterion (R5), Pectobacterium phage PP74 (R6), and a mutant T7 polymerase (T7 P266L). IVT was conducted to synthesize RNA transcripts encoding the amino acid pTyr using these polymerases, with T7 polymerase serving as a control. Mass spectrometry analysis revealed that the T7 mutant RNA polymerase produced reduced levels of the undesired RNA product, demonstrating its potential for applications requiring high precision in RNA synthesis.

Marlene Mosqueda, "Investigating the Impact of "Three Degrees of Change" on Ice Cream"
Major: Chemical Engineering
Faculty Advisor: Dr. Sergio Martinez-Monteagudo
NM AMP, URS program

It has been proposed to raise the standard temperature of frozen storage and transportation from -18°C to -15°C in order to reduce energy costs and demands, as well as greenhouse gas emissions. Although the impact may be negligible for some frozen vegetables, French fries, and meat, this temperature change may negatively impact ice cream quality. The purpose of the proposed study is to assess how various frozen storage temperatures affect the quality of these frozen desserts by using descriptive sensory evaluations and physical tests. The dairy industries strive to minimize food waste by ensuring that the quality of their frozen dessert products do not degrade, or that the shelf life of frozen storage items is not adversely affected. In addition to maintaining the quality of the final product, these sustainable factors will potentially enable the company to meet the requirements of not over-freezing the product and significantly reducing food waste.

Makayla Mullins, Kyla Saucedo, and Samantha Baez, "The Impact of Manipulating the CXCL12/CXCR4 Chemokine Axis on Glucose and Amino Acid Transporters in the Developing Placenta"
Major: Animal Science

Faculty Advisor: Dr. Ryan Ashley
ACES Undergraduate scholar project

The placenta is a crucial organ in pregnancy, influencing maternal and fetal health by regulating nutrient exchange, oxygen supply, immune tolerance, and endocrine signaling. Insufficient placental function can increase the risks of chronic diseases in offspring. While this is well-studied in humans, it is less explored in livestock, despite its impact on animal health and productivity. The CXCL12/CXCR4 axis is key in placental function, especially in angiogenesis and immune adaptation, but its exact role remains unclear. Disruptions in this pathway are linked to complications like preeclampsia and fetal growth restriction. This study used a sheep model to investigate the impact of manipulating the CXCL12/CXCR4 axis on glucose and amino acid transport in the placenta. Results showed that treatments influenced the expression of key transporters, such as GLUT-3 and GLUT-1, suggesting that CXCL12/CXCR4 modulation could affect placental function and fetal development, offering potential strategies for improving pregnancy outcomes and addressing related disorders.

Alexis Munoz, Christopher Le-Dozal, Lorena Escandon, Zion Lopez, and Noctis Maciel,
"URCAS Logo Design Presentation"
Major: Art
Faculty Mentor: Professor Brita d'Agostino

Each student from ARTS 455 Advanced Graphic Design was asked to come up with unique design for the 2025 URCAS logo. This presentation will cover each of the designs that were submitted, with each designer talking about their concept and how they went about this project. There are five presenters for this presentation in total, each with a completely unique and individualized logo and concept.

Mariana L. Navarrete Ovalle, "Detection of Low-Level Atmospheric Turbulence Using Surface Weather Station Networks in Southern New Mexico"
Major: Physics
Faculty Advisor: Dr. Juie Shetye

Using data from 40 surface weather stations across southern New Mexico, we investigate small-scale atmospheric turbulence occurring below 2 km altitude. Our analysis reveals rapid fluctuations in temperature and wind that suggest persistent low-level turbulence, especially during periods of strong surface heating and terrain-driven flow. To interpret these observations, we incorporate a local temperature model developed by our team, which simulates vertical temperature gradients and helps explain the onset of turbulence through convective mixing. The combined use of dense station data and theoretical modeling offers new insight into boundary layer dynamics in arid regions. Unlike coarse radiosonde measurements, which are typically unavailable or too infrequent in this area, surface networks provide valuable high-resolution input for understanding short-term atmospheric variability. This work highlights the importance of local-scale observations and models for capturing real-time weather changes and supports the potential use of future tethered systems to extend vertical resolution.

Alana Pedersen-Kamaka, "*Artibeus jamaicensis* as a novel model: quantifying and comparing leptin receptors in bat placentas"

Major: Conservation Ecology
Faculty Advisor: Dr. Teri Orr
ACES Undergraduate Research Scholars Program

Pregnancy requires a precarious energy balance due to competing demands between maternal maintenance and offspring development. Energy is particularly problematic in bats as they have high metabolism, demanding locomotion, and low-fat stores. The placenta is unique to pregnancy and synthesizes leptin; a hormone active in reproduction, regulation of energy, and immune responses. Leptin has not been well-studied in *Artibeus jamaicensis*, a novel model for mammalian pregnancies. A. jamaicensis undergoes two annual pregnancies, varying in length by two months. We aim to quantify placental leptin receptors (Ob-R) and compare them between the two pregnancies using immunohistochemistry, however, immunohistochemistry has never been used to stain for Ob-R in bat placentas. Here we present our findings to three questions: (1) Is immunohistochemistry effective for staining Ob-R in bats? (2) Do bats regulate Ob-R differently under the two types of pregnancy? (3) Are there morphological differences in placentae between the two types of pregnancies?

Alyssa Quinones, Kayden Robey, and Alex Rodriguez, “Calculus-Based Physics Approach in Aerospace Engineering ”
Major: Environmental Science (all members)
Faculty Advisor: Dr. Bethuel Khamala
PHYS 1320L-Calculus Based physics ll

Aerospace engineering relies heavily on a calculus-based physics approach to analyze flight dynamics, systems, and structural integrity. Our research explores the important contributions of force, work done, power, kinematics, and dynamics to aerospace engineering. Integral-based math provides the foundation for understanding aerodynamic forces, thrust, and orbital motion. The principles of work and energy are used for fuel efficiency, while power calculations play an important part in engine performance and electrical systems in spacecraft. Kinematics helps understand motion prediction, which is essential for trajectory planning and satellite positioning, where dynamics, including body and orbital mechanics, ensure stability and control in flight. By including these core concepts, engineers can enhance the performance, efficiency, and safety of spacecraft systems.

Hubert Quintana III, “Locating MgII in Galaxy Cluster Spectra using in SDSS-V Quasar Spectra”
Major: Engineering Physics (Aerospace Engineering)
Faculty Advisor: Dr. Joseph Burchett

Intergalactic gas clouds are largely very illusive, as they emit little to no light. However, quasars—distant, luminous objects—illuminate these gas clouds, allowing us to detect absorption lines in their spectra. The ion MgII has two distinct spectral features that serve as key tracers of intergalactic gas. Using recent data from the Sloan Digital Sky Survey (SDSS), this study identifies 25 MgII absorption systems within galaxy cluster fields. By analyzing their properties, we can explore the role of galaxy clusters in shaping large-scale cosmic structure and evolution. This research provides insight into the complex interactions between galaxies and their surrounding environments, offering a deeper understanding of the universe’s large-scale structure over time.

Hailey Ramos and Janae Jasso, "The Effects of Cognitive Dual Tasks on Gait in Children with Autism"
Major: Kinesiology
Faculty Advisor: Dr. Alyssa Vanderlinden

Autism Spectrum Disorder (ASD) can cause both cognitive and motor impairments. Children with ASD often have atypical gait patterns compared to neurotypical (NT) children, and deficits in multiple cognitive domains (Dichter et al., 2010). Previous research on NT children demonstrates gait can be affected by the attentional demands caused while performing a cognitive dual task (Boonyong et al. 2012). However, there is limited knowledge of dual tasks and gait in children with ASD. The study will compare gait in children with ASD while performing a cognitive dual task to NT children. 15 children with ASD and 15 NT children, ages 8-17 will participate. A 10-camera Vicon system and 3 AMTI force plates will collect data while children walk and walk while performing a Stroop Color Word test. Understanding how cognitive dual-tasks affect gait patterns expands knowledge of motor deficits in children with ASD for future diagnosis and treatment methods.

Sandra Rios Alba and Eliha M. Hernandez, "Expression of Cancer-Associated isoforms In Mature and Regenerating Tissues of a Weakly Electric Fish"
Major: Sandra Rios Alba (Biochemistry) and Eliha M. Hernandez (Biology)
Faculty Advisor: Dr. Graciela A. Unguez
U-RISE

Gene isoforms are different mRNA transcripts (and thus protein products) produced from the same gene resulting from molecular processes like alternative splicing. Vertebrate like humans and electric fishes (teleosts) produce a wide range of protein isoforms with different functions that allow their cells to respond to different conditions. In humans, alternative splicing is frequently altered leading to protein isoforms that result in cancers. In this study, characterize some of these isoforms in the weakly electric fish *Sternopygus macrurus*. The adult fish has an incredible capacity to regenerate multiple tissues (spinal cord, muscle, electric organ, etc.) lost after repetitive tail amputations without evidence of tumor formation. Given the conserved biochemistry and genetic similarity between humans and fishes, we hypothesize that cancer-associated gene isoforms are expressed in mature and immature regenerating tissues of S. macrurus. We report our findings on enol1, tp63, and usp2a gene isoform expression in mature and regenerating tissues.

Karim R. Rojo, Maya Helene Clausen, and Caleb Jimenez, "Global Change Effects on Fungal Mass Specific Respiration"
Major: Karim Rojo (Environmental Science), Maya Helene Clausen (Biology), and Caleb Jimenez (Agricultural Biology)
Faculty Advisor: Dr. Adrianna Romero-Olivares

Fungi play a vital role in ecosystem functions, particularly carbon cycling, which supports plants, animals, and microbes. However, the effects of global climate change on fungal functional traits, such as biomass and respiration, remain poorly understood. This knowledge is crucial for conservation and mitigation strategies. To address this, I investigated how warming, water stress, and nitrogen pollution impact fungal biomass and respiration. I conducted an experiment on 48 fungal species, incubating them under global change conditions to assess their

responses. Stress on these traits can disrupt essential ecosystem services like decomposition and CO_2 emissions. Our findings offer insights into how fungi in desert ecosystems respond to climate change, helping to inform conservation efforts aimed at preserving fungal diversity and function in a shifting environment. This research contributes to understanding the resilience of fungal communities and their ecological roles under future climate scenarios.

Annette Sciortino and Tristian Ramirez, “Sustainable Home-Growing Recommendations”
Major: Horticulture
Faculty Advisor: Dr. Kulbhushan Grover
AGRO/HORT/ENVS/SOILS 447

Home-growing and gardening is a rising trend with more than half of the American population having the desire to produce their own food. This increasing interest has led to an influx of self-sustaining practices that anyone can follow at home. Despite this interest, many struggle to determine how to begin their journey—both successfully and sustainably. The myriad of plants and the varieties to choose from can be daunting to the novice gardener; the techniques that are suggested, and possibly required at times, may stump newcomers and be an interesting reminder to those with experience. There are some fundamentals required for growing plants and progressive levels of knowledge that come with the work. The objective of this case study will be to examine and relay the essence of home-growing essentials. This will aim to detail the groundwork and suggestions that a home-gardener should heed as they work towards achieving their goals.

Ethan Reed, “Glamping and the next generation of travelers: Gen Z's role in shaping in the future of the lodging industry”
Major: Hotel, Restaurant, and Tourism Management
Faculty Advisor: Dr. Christina K. Dimitriou

Glamping, a blend of “glamorous” and “camping,” is a rising luxury travel trend featuring unique accommodations like yurts and glass domes (KOA Campgrounds, 2020; Souki, 2021). Major hospitality brands, including Marriott and Hyatt, are beginning to explore this profitable sector, though efforts remain in early stages. Existing research (CRR Hospitality, 2024; Dangel et al., 2020) has focused on Millennials and Baby Boomers, leaving Gen Z largely unexamined. This study bridges that gap by analyzing Gen Z’s values, motivations, and preference for nature-based social experiences. As one of the fastest-growing consumer groups (PDI Technologies, 2023), Gen Z prioritizes sustainability and social engagement, making them ideal glamping consumers. This paper offers strategic insights for hospitality brands to tailor and promote glamping experiences, enhance guest satisfaction, and maximize revenue in this emerging market.

Jesse Reyes, “Finding a Balance: Electronic Tuning of Strained Alkynes”
Major: Biochemistry and Physics
Faculty Advisor: Dr. Brian Gold

Click chemistry has provided novel reagents and innovative synthetic strategies within the molecular sciences. The prototypical 1,3-dipolar cycloaddition was extended into the biological realm, enabling chemical reactions to probe and control biological processes. This translation of click chemistry to living systems was enabled by the utilization of strained cycloalkynes

eliminating the need for the (toxic) copper catalyst. These strained alkynes presented a new challenge: designing reagents with sufficient reactivity in the desired reaction, while stable to all other species in complex biological environments. Strategies to increase reactivity typically implement either increased strain or electronic tuning. Our group has recently begun integrating these strategies in reagents such as 2-azabenzo-benzocyclooctyne (ABC) and oxa-azabenzo-benzocyclooctyne (O-ABC).1, 2 Recent advances in our efforts implementing this strategy integration to increase reactivity in the development of novel reagents useful in the fields of drug discovery, medicinal chemistry, chemical biology, and material science will be discussed.

Alyssa Richmond, "Critical Role of YAP Inhibition on regulating mechanotypes of TNBC Cells"
Major: Biology and Psychology
Faculty Advisor: Dr. Tae-Hyung Kim
Undergraduate Pipeline Network Summer Research Program (UNM)

Glucose is the most favored nutrient for most types of cells, including cancer cells. The tumor microenvironment (TME) is a hypoglycemic environment due to poor vascularization and increased glucose consumption by cancer cells. To adopt to the hypoglycemic environment, cancer cells including breast cancer cells overexpress glucose transporters (GLUTs), most frequently GLUT1 and GLUT3. Particularly, GLUT3 has the highest affinity for glucose molecules, therefore GLUT3 overexpression provides an advantage in glucose uptake. A few studies have shown that different glucose levels impact behaviors of different cell types, including migration of human breast cancer cells and invasion of human lung epithelial cells. However, the role that altered cell mechanics by glucose plays in cell locomotion is unknown despite the fact that 1) cell mechanics can directly regulate cancer cell motility, 2) cells consume > 50% of their energy, ATP, in maintaining their cytoskeletal network, which governs cell mechanics, and 3) actin cytoskeleton is tightly linked to regulation of ATP production via glucose metabolism. In our previous study, we found that selective inhibition of GLUT3 using pharmacological small molecule inhibitor (G3iA, ChemDiv) resulted in about 30% reduction of glucose uptake and decreased glycolysis rate and intracellular ATP levels. We further confirmed that such reduction in ATP production activates the 5′-Adenosine monophosphate (AMP)-activated protein kinase (AMPK) pathway resulting in inhibition of YAP. In this project, we asked if direct inhibition of YAP by verteporfin, a medication for eye disease by closing abnormal blood vessels in the eye, has regulatory role on motility of E0771 triple negative breast cancer cells. We measured the activity of actomyosin regulators (VASP, Cofilin, and myosin light chain 2), which play a critical role in cell motility, after YAP inhibition in multiple time points (0, 3, 6, 9,16, and 24 hours). This study can lead to targeted cancer therapies, with the YAP inhibitor in accompaniment with other targeted treatment, to slow the process of metastasis down.

Adriana Rivas, "Determination of CrAssphage levels in Human clinical samples in Irrigation Water"
Major: Food Science and Technology
Faculty Advisor: Dr. Willis Fedio
ACES Undergrad Research Scholar Program

In the agricultural industry, food contamination comes from many sources. One of the sources is contamination from agricultural water. The purpose of this experiment is to develop a method for human fecal contamination in irrigation water by evaluating in using the CrAssphage virus as a measure. Dead End Ultra Filtration of 10L irrigation water samples of concentrations of the CrAssphage virus from the FDA. Previous studies in our lab have shown that purified

CrAssphage was effectively detected in water at low level (10 or so). However, naturally contaminated samples were not detected of the virus. Two methods were used for PCR detection, FDA and CDC. The FDA method was able detect some traces of the virus due to the type of dye high, master mix used for testing and the amount of primer and probes used. Clinical samples of the virus provided by the FDA were not of great quality when running this experiment. Better extraction methods need to be developed to detect the virus.

Ashley Rivas and Lauren Morrow "Resveratrol Reduces Glioblastoma Cell Proliferation"
Major: Lauren Morrow (Biology) and Ashley Rivas (Biochemistry)
Faculty Advisor: Dr. Elba E. Serrano
McNair Scholars Program

Glioblastoma (GBM) is an aggressive form of brain cancer that comprises about 30% of malignant brain tumors. The unresponsiveness of GBM to current therapies underscores the need for developing new treatments. This pilot study aims to evaluate the proliferative response of glioblastoma (ATCC F98) cell lines to the plant compound, trans-resveratrol (RSV; Cayman 70675). Here we present preliminary results from experiments that exposed F98 cells to varying RSV concentrations (0 - 200 μM). RSV-treated cells cultured in a conventional incubator and viewed with a light/fluorescence microscope showed a qualitative reduction in cell proliferation when compared to untreated control cells. Ongoing experiments are using the Sartorius Incucyte S3 to grow cells for 72 hours and automatically capture images every 3 hours at 10x magnification. The Incucyte live-cell analysis software will be used to quantify the impact of RSV on glioblastoma proliferation.

Kiana Lynn Rivera, "Determination of Ruminal Degradation of Red Chile Byproducts In Vitro"
Major: Animal Science
Faculty Advisor: Dr. Clint Loest
LEADING Program and ACES UG Scholars

Using chile byproducts in ruminant animal diets can reduce food waste and lower feeding costs. This study evaluated the ruminal microbial degradation of red chile byproduct in vitro over a four-week harvest period. Ruminal degradation of chile byproducts and alfalfa hay was assessed using ANKOM Daisy incubators with rumen fluid from two cannulated cows over several incubation times. Degradation of dry matter was classified into fraction A (soluble), B (partially degraded), and C (undegraded), with fraction B degradation rate calculated using the slope of natural log. Fraction A was higher ($P \leq 0.05$), fractions B and its degradation rate were lower ($P \leq 0.05$), and fraction C was higher ($P \leq 0.05$) for chile byproduct than alfalfa hay. Results indicate that chile byproduct has more soluble and undegraded nutrients but fewer partially degraded nutrients than alfalfa hay. These findings suggest chile byproduct is effectively degraded in the rumen, potentially reducing chile waste and feed costs.

Mario Omar Rodriguez and Brooke Yehle, "Comparing Traditional Agave Production and Farming Practices and its effects of the Tequila Industry"
Major: Omar Rodriguez (Soil Science) and Brooke Yehle (Genetics and Biotechnology)
Faculty Advisor: Dr. Kulbhushan Grover and Dr. Omar Holguin
SOILS 447

The cultivation of *Agave tequilana* holds economic significance in the tequila industry. Traditional farming practices utilizes semi-arid domestication strategies however this system has low genetic diversity given it is a monoculture and will experience the negative effects brought on by climate change. Current literature shows that, unchanged methods of subsistence farming have been used for hundreds of years. With the basic understanding of plant development, farmers have been consistently able to produce agave for the Tequila industry. This project has identified the need for improvements in agricultural technologies like new irrigation systems, remote sensing technology, or new knowledge in plant breeding. This comparative analysis found that the use of these new advancements, 'agave producers and the tequila industry can see large improvements in things like cost, time, and overall yield.

Kyla Saucedo and Monet Hunt, "Effects of Suppressing CXCL12 During Implantation on Placenta Vascularization at Midgestation"
Major: Kyla Saucedo (Animal Science) and Monet Hunt (Animal Science)
Faculty Advisor: Dr. Ryan Ashley
ACES Undergraduate Research Scholar Project

Successful pregnancy relies on proper placental development, and placental insufficiency can affect maternal health and predispose offspring to chronic diseases. Similar issues arise in livestock, impacting production. The CXCL12/CXCR4 axis plays a key role in placental development, with disruptions linked to preeclampsia and intrauterine growth restriction. However, its exact role during placentation remains unclear. Using a sheep model, ewes received varying doses of the CXCR4 inhibitor AMD3100 or saline for 14 days starting on day 12 post-breeding. On day 90, placental and fetal tissues were collected for analysis. The study aimed to assess the impact of CXCR4 suppression on placental vascularization during midgestation. Immunofluorescent imaging revealed reduced CD34 levels and increased FLT1 in treated ewes, suggesting disruptions in this pathway may contribute to placental insufficiency. This research provides insights into pregnancy complications, offering a dual-purpose model for both human and livestock health.

Lorelei Rosskopf, "Cardiovascular Drift during Continuous and Interval Exercise in the Heat"
Major: Kinesiology (Exercise Science)
Faculty Advisors: Dr. Hillary Yoder, Elisabeth Zeitz

During continuous (CONT) and interval (INT) exercise in the heat, rectal temperature (Tre) and heart rate (HR) can increase, and maximal aerobic capacity ($\dot{V}O_2max$) can decrease. This research was performed to determine if CONT or INT exercise in the heat would differentially affect Tre, HR and $\dot{V}O_2max$. Eight participants performed a $\dot{V}O_2max$ test and 4 [two 15-min; two 43-min (CONT and INT for each)] heated trials, immediately followed by a $\dot{V}O_2max$ test. Tre and HR were higher at min 43 versus min 15. In the 43-min trials (same average intensity) average HR and Tre at min 43 were similar between CONT and INT. These findings contribute to the field of exercise science research by demonstrating that exercise –continuous and interval – in a hot environment lasting 43 min, results in increases in HR and Tre and declines in $\dot{V}O_2max$. This information is important for individuals who train/perform in hot environments.

Shaylie Jaye Salopek, "Effects of Manipulating CXCL12/CXCR4 Axis During Embryo Implantation on Growth Factors at the Fetal-Maternal Interface"

Major: Genetics and Biotechnology
Faculty Advisor: Dr. Ryan Ashley
ACES Undergraduate Research Scholar

Proper placental development is essential for pregnancy success and offspring health, while placental insufficiency increases the risk of chronic diseases. The CXCL12/CXCR4 axis regulates placental function, and its disruption is linked to pregnancy complications like preeclampsia and fetal growth restriction. To investigate this, a sheep model was used. Twelve days post-breeding, pumps delivered saline (control), a CXCR4 inhibitor (AMD), or a CXCR4 agonist (CXCL12) into the uterus for seven days. On day 20, tissues were analyzed for angiogenic factors. Key vascularization factors (FGF2, VEGF, FLT1) were downregulated in AMD and CXCL12 groups, while Pregnancy Associated Glycoproteins increased in AMD-treated ewes, suggesting compensatory mechanisms. These findings indicate that CXCR4 disruptions may contribute to placental insufficiency. Using sheep as a translational model enhances understanding of placental dysfunction, aiding therapeutic development for pregnancy complications in humans and livestock.

Eduardo Sanchez Jr., “Analysis of X-Class Solar Flare”
Major: Physics
Faculty Advisor: Dr. Juie Shetye

Context. X-Class solar flares form in high-activity regions. These outbursts of energy are more than 100 times larger than nuclear bombs. Analyzing them provides insight into the quasi-periodic pulsations within the solar atmosphere and the tornadoes formed by solar prominences separating from sunspots.
Aims. Analysis using instruments from DST and multiwavelength data via SDO to study an off-disk X-Class Solar Flare to demonstrate how energy is transferred after an X-class flare eruption observed in July 2024.
Methods. Observations of active region 13738 taken by Zyla, ROSA, the HMI, and the AIA used for image alignment for light curve comparison. Development of models to match light curves to study the quasi-periodic pulsations in the rise and decline of the solar flare.
Results. A solar tornado is observed to be formed in the declining phase of a high-energy solar flare. This tornado hints towards the physical mechanism related to post-flare energy release.

Mariah Sanchez Lopez and Shylah Romero, “Fairness in Athletics: Organization, Coaches, and Athletes”
Major: Mariah Sanchez Lopez (Kinesiology) and Shylah Romero (Kinesiology)
Faculty Advisor: Dr. Katie Hirsh
SPMD-4997

Athletes perceive fairness from various leaders in the sport context (e.g., coaches and athlete leaders). Current research has identified a variety of ways to measure fairness as well as predictors and outcomes of fairness. The purpose of the proposed study will be to conduct a review to of sport leader fairness literature to examine how leaders are treating their athletes, outcomes of that treatment, and key trends in the literature. A scoping review approach will be used following the Arksey and O’Malley (2005) framework that includes the following steps: (1) identify research questions, (2) identify relevant studies, (3) create criterions for related studies, (4) chart the data, (5) organize and summarize findings, and (6) consult with stakeholders. Our

potential findings will provide an overview of current research on fairness to identify predictors and outcomes of fairness, and show how leaders can apply this information in a sport setting.

Iris Santos, “Effects of Drought and Salinity Stress on Chile Growth and Yield”
Major: Biology
Faculty Advisor: Dr. Xuifen (Sophia) Li

New Mexico is a major producer of chile pepper (*Capsicum annuum*), but its sustainability is increasingly threatened by drought and soil salinity. This study evaluated the effects of these stresses on chile germination, growth, and yield through a 4-month greenhouse experiment using a Randomized Complete Block Design (RCBD) with four replicates. Two cultivars, NuMex Odyssey and Sandia Select, were subjected to drought at soil moisture levels of 65% (control), 55%, 45%, and 35% of field capacity and salinity at electrical conductivity levels of 1.85 (control), 3.0, 4.0, 5.0, and 6.0 dS/m. Key parameters assessed included germination, plant biomass, and fruit yield. Results show that severe drought and salinity significantly reduced growth and yield, with the greatest impact at 35% field capacity and 5.0–6.0 dS/m. These findings highlight the need for adaptive irrigation and soil management strategies to improve chile resilience in arid environments.

Zackary Schwarzkopf and Joseph Youtz, “Efficacy of Remote Sensing Cameras on Detection Probability of Birds Within Pinyon-Juniper Woodlands”
Major: Zackary Schwarzkopf (Fish, Wildlife, and Conservation Ecology) and Joseph Youtz (Geography)
Faculty Advisor: Dr. Jennifer Frey

Conservation is vital to sustaining natural resources and preserving biodiversity, yet it is generally underfunded and requires efficient allocation of resources to maximize data collection. Pinyon-juniper woodlands are the largest ecosystem in western North America, providing habitat for numerous wildlife species including several declining birds. Traditional bird surveys are costly and are limited by season and time of day, a caveat that cameras avoid. Our research aims to evaluate the effectiveness of remote sensing cameras for detecting birds in pinyon-juniper woodlands. We deployed remote cameras at 5 sites at Chupadera Mesa, Socorro County, NM from October 13, 2023, to January 16, 2025. Of 7804 photographs, 4% were of birds, with American Robins, Northern Mockingbirds, and Western Bluebirds detected most frequently. Photographs provide objective evidence of a species occurring at a given time and location. With many pinyon-juniper birds facing steep population declines, finding efficient and reliable survey methods is critical.

Rose Monique Solis, “Identification of thioester-containing proteins (TEPs) in the Biomphalaria glabrata cell line”
Major: Biology
Faculty Advisor: Dr. Maria Castillo

Schistosomiasis, known as bilharzia or snail disease, is a disease common in tropical countries. In the American continent, schistosomiasis is caused by the trematode S. mansoni. This parasite used the freshwater snail Biomphalaria glabrata as its intermediate host. Despite continuous efforts, current treatments have not reduced transmission significantly. The objective of this project is to obtain the sequences of the immune-related molecules called thioester-

containing proteins (TEPs) in a cell line derived from B. glabrata snails (Bge cells). If successful, this approach will provide a valuable tool to study the function molecules using the cell line rather than whole snails. Using molecular methods, we plan to amplify TEPs transcripts from Bge cells using primers designed on snail sequences. Further understanding the B glabrata's immune system will create new opportunities for disease control strategies, such as targeting the snail's biology to help block parasite development and reduce transmission of schistosomiasis to humans.

Anika Tafoya, "Exploring the Role of Insulin-Like Growth Factor 3 in Lipid Metabolism of Cancer Cells: Insights from Protein Expression via Western Blot Analysis"
Major: Biochemistry
Faculty Advisor: Dr. Kevin Houston

Breast cancer is a major worldwide health issue. In our research, we examine the protein Insulin-like Growth Factor-binding Protein 3 (IGFBP-3) in breast cancer cells and its relation to lipid metabolism—a process critical for the growth and survival of cancer cells. We used cell breast cancer lines that overexpress IGFBP3 to investigate how STAT proteins are expressed. For instance, STAT3 is a protein which regulates fatty acid synthesis and beta oxidation. The quantitation has been through Western blotting, to measure relative changes in expression between parental and overproduces cells. Our approach seeks to understand from a mechanistic perspective the role of IGBP-3 in cancer metabolism.

Petervon Tanedo, "Gut-Brain Axis: Measuring the Effects of Bacteria and Drugs on *Caenorhabditis elegans* Using Egg-Retention and Egg-Laying Assays"
Major: Health Sciences-Nursing
Faculty Advisors: Professor Russell Grahn and Professor Veronica Evans
Bridges Program

This study explores the impact of environmental factors, genetics, and serotonin (5HT) signaling on egg-related behaviors in *Caenorhabditis elegans*. Given that *C. elegans* feed on bacteria, the relationship between food and egg-laying behavior, known as the Gut-Brain Axis, was investigated. When food is limited, C. elegans cease egg-laying and retain eggs, a process influenced by serotonin. This study compared the effects of nonpathogenic E. coli OP-50 (control) with pathogenic bacteria and serotonin-modulating drugs (exogenous serotonin, fluoxetine, and imipramine). Assays measuring egg retention (EIW assay) and egg-laying (NGM plates) revealed significant differences between wild-type and mutant worms. Pathogenic bacteria altered egg retention in wild-type animals, and the presence of bacteria also influenced egg-laying in wild-type worms. Although drugs did not significantly affect egg-laying, bacteria showed distinct effects on mutant strains with defective egg-laying genes. These findings suggest that both food type and serotonin-modulating drugs influence egg-related behaviors in C. elegans. Further research is recommended for validation.

Carlos Torres, Mingfang Zhu, Edward Rivota, and Erick Lopez, "GuitR AI"
Major: B.S. in Computer Science-Big Data and Data Science Concentration), Mingfang Zhu (Computer Science), Edward Rivota (Computer Science and Electrical Engineering), and Erick Lopez (Computer Science)
Faculty Advisor: Dr. Bill Hamilton

GuitR AI is an application that uses artificial intelligence to recognize acoustic guitar chords from audio recordings. By isolating the guitar stem using Demucs and employing madmom for chord recognition, the app efficiently identifies chord sequences. Designed to support both beginners and experienced players, GuitR AI simplifies the learning process with real-time chord analysis. Initial surveys and feedback from peers indicate strong interest, confirming its potential to enhance music education and guitar practice. Overall, the project demonstrates the effective integration of existing Python libraries to create a user-friendly tool that bridges the gap between technology and musical training.

Grafton Urbatsch, “Patent Prior Art Examination Engine”
Major: Computer Science
Faculty Advisor: Dr. Jon Cook

The Digital Patent Prior Art Search Tool is a java-based command-line application designed to search, examine, and uncover potential prior art patents based off of a user input title and description. It uses an API (Application Programming Interface) to gather date from the United States Patent and Trademark Office (USPTO) database, retrieving patents from the past 20 years. It analyzes every claim of the retrieved patents to ensure thorough comparison, returning the relevant patent numbers, their respective filing dates, and abstracts. By automating the initial search process, this tool reduces time spent on manual research and enhances the accuracy of prior art identification. Future iterations will refine search algorithms and integrate more advanced natural language processing techniques.

Kassandra Valdez, Ema Alvarez, and Samantha Baez, “The Effects of CXCL12 Inhibition/Activation on Cytokine Expression in Reproductive Tissue”
Major: Fish, Wildlife, and Conservation ecology
Faculty Advisor: Dr. Ryan Ashley
ACES Undergraduate Research Scholar Program

The placenta is essential for maternal and fetal health, and its dysfunction is linked to chronic diseases in humans and reduced productivity in livestock. The CXCL12/CXCR4 axis is critical in placental function, but its precise role remains unclear. This study examined its effects using a sheep model, where ewes received intrauterine infusions of a CXCR4 inhibitor (AMD), an agonist (CXCL12), or saline from gestation days 12–20. Tissue analysis revealed that AMD reduced TNF expression in intercaruncle (ICAR) tissue but increased it with CXCL12, while both treatments decreased TNF in caruncle (CAR) tissue. IFNG expression increased in ICAR under both treatments. qPCR analysis showed AMD altered CXCR7, TNF, and TGFB expression in ICAR, while CXCL12 affected IL12 and TNF. These results suggest CXCL12/CXCR4 modulation influences placental inflammation, and targeting this axis may provide methods to improve pregnancy outcomes in humans and livestock.

Jonathon Valencia, “Repeated low-dose endotoxin exposure on hematological and febrile response in nulliparous Rambouillet ewes”
Major: Animal Science
Faculty Advisor: Dr. Jennifer A. Hernandez Gifford

Administration of lipopolysaccharide (LPS) elicits immune response that can adversely affect female fertility. Nulliparous ewes have naïve immune systems that may be more susceptible to

endotoxins. This study aimed to assess hematological immune response to repeated low-dose LPS in nulliparous ewes during key stages of folliculogenisis. Fourteen Rambouillet ewes were assigned to receive subcutaneous injections of either saline, low, or high LPS on d 5, 10, and 15 of a synchronized estrous cycle. Whole blood for complete blood count and rectal temperatures were collected throughout a 24-h period following injection. Rectal temperatures were elevated by 4 h on d 5, 10, and 15. On d 5, total white blood cells (TWBC) in LPS-treated ewes initially decreased followed by a dramatic increase. By 12 h on d 10 and 15, TWBC were elevated. These data demonstrate that repeated low-dose endotoxin administration upregulates immune parameters that could have negative consequences on reproduction.

Emma Varela, "Factors Contributing to Growth of Nestling Western Bluebirds at Los Alamos National Labs"
Major: Fisheries and Wildlife Conservation Ecology
Faculty Advisors: Dr. Martha Desmond, Dr. Jeanne Fair, Dr. Abby Lawson, Dr. Obed Hernandez-Gomez
McNair Scholars, the LEADING program and the Avian Migration Program

Western bluebirds (*Sialia mexicana*) are declining in New Mexico. As secondary cavity nesters, they offer a unique opportunity to study factors affecting nestling development. I am investigating how diet composition and environmental conditions influence nestling growth across 40 nest boxes at Los Alamos National Laboratory. I hypothesize that diet quality and environmental stability impact nestling growth and fitness. To test this, I am collecting nestling measurements (wing cord, tarsus, tail feather, and weight) and fecal samples on days 5, 10, and 20. Using fecal DNA metabarcoding, I am identifying prey items in the diet to assess their nutritional contributions. I am also analyzing environmental variables such as temperature, nest spacing, and brood size to determine their effects on nestling condition. Expected results include correlations between prey quality, environmental stability, and nestling growth. This study offers insights into habitat selection and conservation strategies for bluebird populations in New Mexico.

Leonella Vazquez Perez, "Transforming an HSI in the Borderlands: Addressing the Needs of Hispanic Students at HSIs through Chicana/Latina Epistemologies and Testimonio Methodology"
Major: Foreign Languages and Animal Science
Faculty Advisor: Dr. Judith Flores Carmona
McNair Program

This project underscores the urgent need to address Hispanic students' educational disparities at Hispanic-Serving Institutions (HSIs) such as New Mexico State University. Through a detailed examination of the institutional shortcomings, including the lack of bilingual faculty and culturally responsive pedagogies, this study aims to illuminate the systemic barriers that inhibit the academic success of Hispanic students. As a first-generation female student whose first language is not English, who belongs to the Hispanic culture, and who is currently studying at an HSI in the United States, I am aware of the challenges and barriers that must be faced to obtain a university degree successfully. Integrating personal testimony and literary analysis from Hispanic, Chicana, and Latino communities will enrich our understanding of these challenges and offer a nuanced perspective on the academic experiences of these students. Furthermore, the research will leverage frameworks from the *Journal of Mujeres Activas en Letras y Cambio Social (MALCS),* advocating for decolonizing educational methods that currently fail to fully

embrace and utilize Hispanic students' cultural and linguistic assets. By focusing on enhancing faculty diversity and implementing inclusive pedagogical strategies, the findings of this study will provide actionable insights aimed at transforming HSIs into truly supportive environments that promote the success of all students, particularly those from historically marginalized groups.

Kaitlin Victorian, “Measuring the developmental and neurological consequences of acid exposure on *Drosophila larvae* for an ecosystem indicator”
Major: Microbiology
Faculty Advisor: Dr. Jacob Jaszczak
NM AMP Undergraduate Research Scholars (URS) Program

Two consequences of climate change are the degradation of healthy ecosystems through the acidification of soil as well as a global insect population decline. These trends could be connected, as soil acidification could be detrimental to insect health. However, the contribution of soil acidification to insect populations has not been studied on the developmental level. This project aims to determine the developmental consequences of acid exposure. I will measure the effects of acid exposure on growth. I will also measure the neurological responses to acid exposure in Drosophila larva over a long period of time. It is known from previous laboratory studies that larva have hyposensitivity to acid when they are re-exposed to acid at a short period of time, indicating neurological damage. Re-exposing larva to acid over a longer period will help to determine if they can experience neurological regeneration.

Samyra Villasenor and Ashley Manger, “Tuning of Poresize in Halloysite Nanotubes for Targeted Drug Delivery in HeLa Cancer Cells”
Major: Animal Science
Faculty Advisor: Dr. Deepak Subedi
NIH Bridges to Baccalaureate

This study investigates how tuning the pore size of Halloysite Nanotubes (HNTs) affects drug delivery for treatment efficacy. It explores the impact of varying pore sizes on drug delivery efficiency, providing understandings into optimizing nanotube design for improved cancer treatments.

Brooke Wallace, “An Exercise in Desire: What Does It Take to Read Every Single Word of *Gravity's Rainbow*”
Major: English: Literature, Language, and Culture
Faculty Advisor: Dr. Fabrizio Ciccone

The project aims to tackle issues encountered when taking on a long text. *Gravity’s Rainbow* by Thomas Pynchon is regarded as a difficult text, a novel that is impossible to read. The American classic has 776 pages and over 300 characters. A behemoth of a text, and something not typically tackled in the classroom setting. In collaboration with EUSO’s The Underground Book Club, I aim to provide in depth personal insight into an intense reading process through journaling; thus illuminating the struggles encountered with a long and dense text. The goal of the research is to provide readers with adequate tools, and hopefully the desire to pick up *Gravity’s Rainbow*.

Mary Williams, “Targeting Insulin-receptor substrate 1 “Chico” in *Aedes aegypti* mosquitoes using ReMOT-Control CRISPR”
Major: Microbiology
Faculty Advisor: Dr. Immo Hansen

Aedes aegypti mosquitoes are the principal vector of major emerging and re-emerging infectious diseases such as dengue, zika, and chikungunya. By using gene editing tools, we can identify and study potential targets to be exploited for mosquito control. We chose the first intracellular effector in the insulin-like signaling cascade in mosquitoes as our target gene for knockout. This gene encodes the Insulin Receptor Substrate 1 (IRS1), “Chico”. CHICO is a known regulator of metabolism and development in both, arthropods and vertebrates. We utilized a gene editing technique known as Receptor-Mediated Ovary Transduction via Cargo (ReMOT Control), which allows the Cas9-RNP complex to be delivered via microinjection into the hemolymph and taken up into developing oocytes for germline editing. We are currently screening for knockouts. The goal of this research is to establish IRS1-knockout Aedes aegypti lines that will be used for further study of IRS1 in mosquito metabolism and development.

Joshua Wojahn, “College Student Mental Health: What is Known and What are the Gaps?”
Major: Microbiology
Faculty Advisor: Dr. Merranda Marin
U-RISE

College student mental health has become a growing concern in higher education, with increasing rates of anxiety, depression, and stress reported nationwide. Research shows that academic pressures, financial stress, social isolation, and identity development contribute significantly to student challenges (Mofatteh, 2020). Universities have expanded counseling services and wellness initiatives, yet demand often exceeds capacity, leaving many students underserved (Abrams, 2022). While much is known about prevalence and risk factors, significant gaps remain in understanding the effectiveness of institutional responses and long-term outcomes of interventions. Additionally, disparities in access to mental health support for students of color, LGBTQ+ students, and first-generation college students persist. Therefore, this research seeks to better understand what students want and need because more research is needed to evaluate systemic support structures and develop inclusive spaces that promote mental wellness across diverse student populations.

Brooke Yehle, “Characterizing the Role of lncRNA LAC in DNA Damage Response”
Major: Genetics and Biotechnology
Faculty Advisor: Dr. Richard Adeyemi
Summer Undergraduate Research Program, Partnership for the Advancement of Cancer Research

The lncRNA LAC was recently identified as a novel modulator of cisplatin sensitivity in a genome-wide CRISPR screen. Initial experiments in our lab confirmed that CRISPR/Cas9 knockdown of LAC impairs DNA repair, leading to accumulation of single stranded DNA and increased cell death after interstrand crosslinks form. The exact role of LAC in the DNA repair process remains unknown. To address this, we carried out cell synchronization and a nuclear fractionation coupled with qPCR to determine its expression and localization patterns in U2OS

cells. We find that LAC accumulates in the cell during G1, and early S-phase then drastically drops as cells enter G2. Additionally, though LAC equally partitions between the cytoplasm and chromatin bound factions, chromatin bound levels are elevated following cisplatin treatment. These results indicate that LAC may regulate translation of DNA repair factors in the cytoplasm and/or be directly recruited to DNA damage sites through chromatin interactions.

Valeria Yu, Alexandra Monroy, Lauren Hunter, Nika Mansouri Rad, and Lily McMillan,
"Code-Switching and Language Processing: Investigating Cortical Alignment to Linguistic Features"
Major: Communications Disorders (all members)
Faculty Advisor: Dr. Blake Rafferty

Code-switching is a phenomenon wherein a speaker switches between two or more languages during conversation. Importantly, code-switching is also likely to impact the cognitive processes that are important for speech comprehension in listeners. In this study, we used EEG to investigate the impact of code-switching on comprehension-related brain activity while neurologically healthy, bilingual adults listened to stories that were embedded with code-switching. We specifically considered changes in cortical tracking, which indexes an alignment of timing between neural firing and the occurrence of linguistic features in speech. We specifically considered the relationship between code switching and cortical tracking of linguistic features such as: word frequencies, parts of speech, two measures of lexical semantics, and n-gram surprisal. We hypothesized that code-switching will affect cortical tracking at the levels of word frequencies and n-gram surprisal.

Hayden Zongker and Erick Morales, "Automated Soil sampler & Packaging Robotic Arm"
Major: Mechanical and Aerospace Engineering
Faculty Advisor: Dr. Mahdi Haghshenas Jaryani

We aspire to achieve the autonomous, intelligent, and efficient taking of soil samples through robotic means. The way it is most often done today is by hand. This involves labor and time. The separation of crucial specimens must be done by people, and if not done the accuracy of data is compromised. The Automated Soil Sampler & Packaging Robotic Arm provides a solution that incorporates a robotic arm with a drill end-effector, a vacuum collector, and a packaging system. The compact integration of the system on an electric, autonomous rover allows navigation in planted crops, which is fundamental to obtaining updated and chronological data to observe the behavior of the soil over the season. The impact of our design is its accuracy and versatility. It has the capacity to separate all individual samples and gather them in optimal locations. All of this is without need for human labor or oversight.