Aggie Research Program (ARP)
Poster Session Abstract Book
1:00 PM-3:00 PM
MSC Bethancourt Ballroom (MSC 2300 D)
1. EPGENETIC REGULATION OF METABOLIC DISEASE
Catherine Powell
Pharmaceutical Sciences
Research Advisor: Dr. Mahua Choudhury

Laboratories are the fundamental setting where scientific breakthrough occurs. Labs can be described in various ways based on the area of research, their focus, the type of work done, etc.; not a single classification can define what a lab is and what a lab does. Nonetheless, certain components are consistently found across all kinds of labs: hierarchy, a typical pattern of organization, duties, and responsibilities, and more importantly, safety and order, among other components. In this project, we experienced first-hand how all of these elements come into play to create a proper environment where scientific developments occur. Undergraduate students with interest in laboratory research should be knowledgeable about the process of finding a laboratory, the training, and the techniques that will build a strong base for future research. We present one avenue to a research laboratory with networking, required training, and the skill set we are learning. We will contribute to the ongoing research focusing on the epigenetic regulation of metabolic disease through molecular and cellular biology techniques. In short, from this lab experience, we will acquire a sense of how labs operate and the necessary components that are required for the development of scientifically sound experiments, in addition to the techniques that can be used to perform them.

2A. CHILDHOOD FOOD SECURITY
Christa Cardenas
Sociology
Research Advisor: Dr. Sarah Gatson

The purpose of this study is to investigate different aspects of child food insecurity and examine the impact of garden-based nutrition education on children’s nutrition awareness and fruits/vegetables consumption. Studies have shown that approximately one out of four children in the Brazos County struggles with food insecurity (Feeding America, Brazos Valley Food Bank, Feeding Texas). In this study, we examine the rates of child food insecurity, contributing factors and health effects of food insecurity, and programs that address and attempt to combat child food insecurity in Brazos County. The treatment group is called “The Positive Sprout” that includes n students from 7-16 years old from the Boys & Girls Club, Brazos Valley, Bryan TX. The participants join our garden-based nutrition education for a total of 36 weeks. During the intervention, we introduce garden-based curriculum that are designed to educate students on how to use resources wisely, reduce waste, and explore gardening activities such as planting, weeding, watering, harvesting, and other food experiences.
2B. CHILDHOOD FOOD SECURITY
Christa Cardenas
Sociology
Research Advisor: Dr. Sarah Gatson

Our research has focused on how food insecurity affects children. We research topics aimed at improving our community outreach at the Boys & Girls Club of the Brazos Valley. Studying food insecurity in relation to garden-based education helps to effectively evaluate the needs and efficacy of garden-based nutrition education. Our goal is to use gardens as an effective health education tool to ensure food security, enhance nutrition knowledge and change children’s attitudes towards fruits and vegetables. We expect to see significant development in participants’ nutrition awareness and fruits/vegetables consumption. We aim to expand our garden-based education program to other Boys & Girls Clubs in different counties in Texas. We hope that our study helps to shed light into garden-based curriculum and its tremendous impact on child food insecurity.

3. GOOD AT MATH? HOW TEACHER MATHEMATICS ANXIETY AFFECT THEIR STUDENTS.
Danielle Bevan
Teaching, Learning, & Culture
Research Advisor: Dr. Robert M. Capraro

The purpose of the study was to examine contributing factors of mathematics anxiety. Meece, Wigfield, and Eccles (1990) found, “Mathematics anxiety is most directly related to students' math ability perceptions, performance expectancies, and value perceptions” (p. 60). The researchers found the factors of mathematics anxiety to be important because anxiety affects mathematics performance levels. Researchers performed a meta-synthesis over current research to determine the contributing factors of mathematics anxiety. Researchers discovered the common factors to be gender, age, their environment, and how much they value mathematics. Further research can be conducted to understand and lessen mathematics anxiety.

4. IMPACT OF COMMUNICATION DESING ON CUSTOMER SATISFACTION: INSIGHTS FROM ONLINE COURSES
Unnati Narang
Marketing
Research Advisor: Dr. Manjit Yadav

The goal of this research is to measure and explain the impact of various structural engagement initiatives adopted by online two-sided platforms on their customers’ engagement, performance and satisfaction. In recent years, two-sided platforms, such as Airbnb and Uber that connect two or more sets of participants have grown rapidly and are poised to comprise 30% of the world’s GDP by 2025. As a result, their design and delivery are critical for both companies and customers. Specifically, how a platform structures its engagement initiatives and designs the communication flows among participants is an important but under-explored issue. Our overarching argument is that specific engagement initiatives can have beneficial — and detrimental — implications for value creation in two-sided platforms. Furthermore, these effects may be aggravated or attenuated based on the anonymity of user identities online. Theoretically, the proposed framework advances our understanding of engagement initiatives.
contribute to value creation in platforms. Our empirical context is Coursera.org, an online course platform. We collect individual-level panel data from Coursera and also plan to conduct a number of field experiments in one of the world’s most popular Coursera courses on Digital Marketing. We apply advanced econometric techniques to provide a measurable estimate of the impact of engagement initiatives for customer-centric outcomes of a two-sided platform.

5. OVER-CHURCHED AND UNDER-FED: ORGANIZATIONAL MISSIONS OF RELIGION AND FOOD SECURITY
Andrew McNeely
Sociology
Research Advisor: Dr. Sarah Gatson

Religiously affiliated food provision in Brazos County is primarily accomplished by small, individual food pantries and larger para-church organizations. Loosely defined, para-church organizations are centralized, bureaucratic entities that consolidate resources from individual religious bodies in the area for the purpose of increasing efficiency and scope of service. Though both models—the small food pantry and the para-church org—have material and economic trade-offs, this poster outlines instead differences between the operations in terms of religious meaning. For many of the volunteers involved in these operations, the exercise, validation, or promotion of religious values is as important as the actual physical needs being addressed, and thus becomes a salient aspect of volunteering, modifying and at times even coming into conflict with the operation. Here, we briefly discuss the organizational differences in the operations we have been analyzing over the last 10 months, and present the classification schema being developed to connect religious meaning to material impact.

6. WHY DO STEM MAJORS BECOME STEM MAJORS
Devyn Rice
Mathematics
Research Advisors: Dr. Sue Geller & Dr. Sandra Nite

The number of available jobs in STEM fields is increasing at a greater rate than qualified workers are graduating with STEM degrees. To meet these needs, more students need to enroll in STEM programs. The purpose of this study is to identify what factors are most influential on a STEM majors decision to pursue their degree. A survey will be distributed to the Texas A&M University undergraduate STEM majors to be completed on a voluntary basis. The results of this survey will be analyzed as a whole set as well as based on differences in gender, ethnicity/race, and socioeconomic status. The goal of this study is to share the results with the academic community. These results are expected to be applied in a way that more students will become interested in STEM fields and subsequently professionals in the field.
7. HISTORICAL BIOGRAPHY IN WORLD CULTURES: USING NARRATIVES TO ENHANCE MIDDLE SCHOOL SOCIAL STUDIES EXPERIENCES
Eliel Hinojosa
Teaching, Learning, & Culture
Research Advisor: Dr. Lynn Burlbaw

As middle school students study world cultures their depth of understanding is often limited by the lack of biographical information from the people in those cultures. Using historical narratives and the biographies of people from around the world can provide students with greater understanding of the economic, social, political and environmental factors that shape/shaped their lives. Participants in this project will work to collect oral histories and/or recorded histories from people who represent their particular region. The objective is to collect historical accounts for the purpose of preparing them for use by the middle school social studies teacher. While the curriculum of the sixth-grade World Cultures course calls for an analysis of the overall society of the area studied, we hope to engage students more profoundly by allowing them to interact with first-hand accounts of real people whose lives are/were affected by the unique facets of their country. First-hand accounts will be gathered through personal interview as well as through analyzing recorded materials. Upon the completion of data gathering it is our intention to make the narratives suitable for middle school use and then compile them into a collection for use by the middle school social studies teacher. Additionally, this research will be conducted with the goal of earning a publication in a historical or educational peer-reviewed journal.

8A. NUTRITION AND HEALTH OF 17TH-CENTURY SAILORS
Grace Tsai
Anthropology
Research Advisor: Dr. Karen Kubena

Atlantic cod (Gadus morhua) has been a staple naval food since the 16th century, but little work has been done to analyze how salted cod affected the sailors’ physical health. Dried and salted cod was put on Elissa, the 19th century tallship docked in Galveston, in August, 2017. This cod is being monitored over the course of 2 months. Our team, using selective plating techniques, is in the process of isolating the microbes for downstream DNA sequencing of the 16s rRNA gene. This paper presents the preliminary data from two samples of cod sample retrieval. The results of this data will be used to determine how Atlantic cod influenced the health of sailors during the 17th century.

8B. NUTRITION AND HEALTH OF 17TH-CENTURY SAILORS
Grace Tsai
Anthropology
Research Advisor: Dr. Karen Kubena

Seventeenth-century cookbooks, sailors’ records, and data from archaeological faunal remains were used to replicate salted beef for the Ship Biscuit & Salted Beef Research Project. Samples of salted beef and brine were taken out regularly and tested for microbes at the USDA Agricultural Research Service laboratory in College Station, Texas. Our team, using selective plating techniques, is in the process of isolating the microbes for downstream DNA sequencing of the 16s rRNA gene. This paper presents the preliminary data from two samples of salted beef retrieval. This data will then used to
extrapolate the pathogenic and probiotic effects the microbes on the salted beef had on seventeenth-century sailor health.

9. LAYER-BY-LAYER POLYMER ASSEMBLIES WITH ANTIMICROBIAL AGENTS FOR BIOMEDICAL APPLICATIONS
Victoria Albright
Materials Science & Engineering
Research Advisor: Dr. Svetlana Sukhishvili

The future of polymeric materials as biological coatings (on implants or as wound dressings) to prevent bacterial infection depends on the ability to selectively trigger the release of components from the materials on demand. Our research group currently explores manipulating chemistry of polymer particles and films in order to develop polymeric materials that can deliver antibiotics in a controlled fashion. This work explores three different layer-by-layer systems: (1) temperature-responsive block copolymer micelles (MCs) electrostatically assembled with branch polyethyleneimine (BPEI), (2) antioxidant copolymers and a small molecule analog (tannic acid) hydrogen bonded with polyvinylpyrrolidone, and (3) antimicrobials and enzymes directly assembly with polyphosphazene polymers. The molecular weight of the assembly partner (BPEI) as well as salt concentration in deposition solutions was found to effect the swelling behavior of MCs embedded in films. Method of assembly, dip- vs. spin- assisted as well as percentage functionalization were found to impact the growth of films containing anti-oxidant copolymers. Hydrophobicity and number of charges were found to be critical for the direct assembly of antimicrobials with polyphosphazeness. The stability of each system was studied in various environmental conditions (pH, salt, temperature, etc.). Future work will focus on assessing antimicrobial release from the coatings as well as the ability of each system to be used as an antibacterial coating.

10. SYNTHETIC POLYMERIC ANTIOXIDANTS FOR CORROSION PROTECTION
Hanna Hlushko
Materials Science and Engineering
Research Advisor: Dr. Svetlana Sukhishvili

Antioxidants are active molecules found in fruits, leaves, and algae that are capable of effective radical scavenging. Introduction of such species within polymer chains results in advanced materials which can find applications as protective coatings for food packaging and corrosion protection. This research is focused on studies of antioxidant polymers containing different polyphenol moieties and their use as components of polymeric coatings. These polymers were synthesized via reversible addition-fragmentation chain transfer polymerization (RAFT) in Dr. Sukhishvili’s group. Using the 2,2-diphenyl-1-picrylhydrazyl (DPPH) assay, we found that the antioxidant activity of these polymers is dependent on the chemistry of pendant polyphenol rings and their percentage in the polymer chain. Additionally, we found that antioxidant polymers are capable of metal binding with metals due to the tendency of polyphenol rings to form complexes with metal ions, as was suggested by changes in the UV-absorption bands of the polymer solutions. Epoxy-based coatings containing these novel antioxidant polymers were prepared for electrochemical testing of their anticorrosion efficiency. Future work will explore wettability and degree of chemical crosslinking as well as spatial distribution of antioxidant polymers within epoxy coatings.
11. SUPPORTING WOMEN IN STEM LEARNING IN INFORMAL SETTINGS
Katherine Vela
Curriculum & Instruction
Research Advisor: Dr. Robert M. Capraro

Science, technology, engineering, and mathematics (STEM) lessons have been included in schools’ curriculum for years and have prepared students with the skills necessary to be successful in the 21st century. To expand students’ learning experiences, researchers are advocating for the explicit incorporation of arts, creating STEAM (science, technology, engineering, art, and mathematics). This study’s purpose is to determine if STEM activities, which inherently include the arts, will have a positive effect on participants’ desires to be creative. The participants were 7th through 12th graders (N=97) who attended a STEM summer camp. A survey was administered on the first and last days of camp to measure participants’ desires to be artistic. Participants began with a high level of interest in creating new products and using creativity in their future work. After camp, their mean scores increased, proving that STEM curriculum that naturally incorporates the arts improves students’ interest in being creative.

12A. EXPLORING THE PROPERTIES OF WENER COMPLEX USING COMPUTATIONAL METHODS & COMPUTATIONAL INVESTIGATIONS OF MOLECULAR GYROSCOPES
Lars Erik Andreas Ehnbom
Chemistry
Research Advisors: Dr. John A. Gladysz, Dr. Michael B. Hall, & Dr. Lisa M. Pérez

Experiments by Alfred Werner in the late 19th century on cobalt coordination compounds paved the road for modern coordination theory and stereochemistry. We followed in the footsteps of Werner and now use related cobalt-containing complexes for catalysis. However, we do not fully understand how these catalysts function and this project use computational tools to study the properties and energies of Werner complex and their isomers. We furthermore probe these catalysts ability to function as chiral shift agents.

12B. EXPLORING THE PROPERTIES OF WENER COMPLEX USING COMPUTATIONAL METHODS & COMPUTATIONAL INVESTIGATIONS OF MOLECULAR GYROSCOPES
Lars Erik Andreas Ehnbom
Chemistry
Research Advisor: Dr. John A. Gladysz, Dr. Michael B. Hall, & Dr. Lisa M. Pérez

Molecular gyroscopes represent a crucial step forward with regards to the standardized implementation of nanoscale devices. The characteristics of gyroscopes currently being examined are of particular note due to their ability to mimic symmetry, connectivity, and rotational abilities of macroscopic gyroscopes. By constructing a static outer cage from simple carbon chains in addition to the implementation of a transition metal center with various ligands, molecular gyroscopes are observed to rotate and this can be probed through computational calculations. As a result of this newfound rotational capability, the energy barriers that exist between rotational transition states can be characterized based on ligand type, count, and a total number of atoms that comprise the cage of the gyroscope itself.
This research project will focus on 3rd, 4th and 5th grade students’ development of STEM language. These elementary students are participating in a grant funded project where they use making and computer programming to learn science concepts. The research we will focus on is analyzing students’ language use and development across time (from their 3rd grade experience through their 4th grade experience) to see how they are acquiring STEM academic language. This team will work together to review literature, design methods for the transcription of video/audio data, plan the analysis and perform data analysis. The goal for this project is to put together a scholarly paper that displays how elementary students acquire STEM language while participating in making activities.

The 2016 U.S. Presidential Election was a mysterious and complicated one. The moments watching some states switching between blue and red can be breathtaking for voters. However, the rationale behind the “turncoat” remains unveiled. Economic performance is assumed closely related to the voting result, notably the unemployment rate. In this research, we will draw close attention to counties which opposite their opinion in the 2016 Presidential Election compared to the previous Presidential Election. Through analysis of county-level data, we will be able to decompose the voting population in these counties by age, education level, employment history and occupation, hence, an insight of voting rationale can be obtained. By the end of the research, a comprehensive conclusion of how employment rate can affect the voting results will also be provided. Furthermore, a sufficient foundation will be established in forecasting the next presidential election results. That being said, by keeping close attention on the overall employment status of the swinging states, one should be able to tell if the presidency will stay with incumbent party. Moreover, recommendations will be made regarding job creation and job securement in the US according to character-specific and industry-specific employment data.

It is well-understood that both blood perfusion and lymphatic drainage are critical for normal organ function. However, coronary blood vessels have been the primary focus of cardiac research. Investigators have only recently begun to investigate the function of the cardiac lymphatic vessels. Findings of a limited number of studies have provided the critical insight into the role of lymph flow in maintaining normal cardiac function. Furthermore, extrinsic compression and expansion of cardiac
lymphatic vessels by surrounding myocardium during a cardiac cycle has been suggested to drive cardiac lymph flow. The role of cardiac lymphatic vessels in cardiac lymph flow has been poorly understood primarily due to the lack of studies investigating biochemical and biomechanical properties of cardiac lymphatic vessels to determine function. Therefore, the purpose of the present work was to provide the first complete characterization of molecular, structural and mechanical properties of cardiac lymphatic vessels. Porcine epicardial lymphatic vessels were isolated from freshly collected hearts from a local abattoir. Isolated lymphatic vessels were either cannulated for evaluation of pressure-radius relationship, fixed with 10% formalin for determination of vessel wall structure or snap-frozen for later evaluation of endothelial, connective, and muscle cell molecular makeup. Findings of the present study are expected to form the basis for future investigations to determine the importance of proper physiology and function of lymphatic vessels within the heart.

16A. NEUROSTEROID OR EPIGENETIC THERAPEUTICS FOR ACQUIRED EPILEPSY
Victoria Dunlap Golub
Neuroscience & Experimental Therapeutics
Research Advisor: Dr. Samba Reddy

Epilepsy is a serious neurological disorder marked by spontaneous recurrent seizures (SRS), extensive neurodegeneration, and severe inflammation. Epilepsy can develop from a host of underlying conditions, through a heterogeneous process known as epileptogenesis. Treatments aimed at preventing epilepsy must address the seizure dynamic and the neuronal injury from neurodegeneration. There is no cure for epilepsy, and currently anti-epileptic therapeutics only provide symptomatic relief. Ganaxolone is a synthetic analog of the progesterone-derived endogenous neurosteroid allopregnanolone. Administration of GX has been shown to exert anticonvulsant activity and provide evidence for the modulation of epileptogenesis in seizure models such as pilocarpine-SE. In this study, we chemically induced epilepsy in male mice by injecting pilocarpine. Mice were perfused 90 days-post SE, and coronal slices of the brain containing the hippocampus and amygdala were stained for GFAP+ and IBA1+ immunohistochemistry. Densitometry techniques were used to analyze the extent of neuroinflammation from images taken of the dentate gyrus (DG), CA1, CA3, and amygdala (AMY) with an Olympus microscope system. Overall, GX treatment showed a significant reduction in neuronal damage caused by pilocarpine-SE in the hippocampus and AMY; however, there was a region-specific variation in its outcome. Pilocarpine-SE resulted in greatly increased astrocyte and microglia expression in all regions of interest. GX post-treatment reduced overall astrocyte and microglia activation, with a particular reduction in GFAP+ stain intensity in the CA3 and AMY. These results suggest that immediate post treatment with GX has the potential to reduce secondary astrocyte activation following SE, but does not affect levels of microglia infiltration measured 90 days after SE.

16B. NEUROSTEROID OR EPIGENETIC THERAPEUTICS FOR ACQUIRED EPILEPSY
Victoria Dunlap Golub
Neuroscience & Experimental Therapeutics
Research Advisor: Dr. Samba Reddy

Temporal lobe epilepsy (TLE) is characterized by the progressive increase in spontaneous recurrent seizures (SRS), which often do not respond to currently available antiepileptic drugs. New and effective drugs are needed to control TLE. Limited biomarkers are available at present for epilepsy detection and
therapy monitoring; however, there is evidence suggesting that high frequency oscillations (HFOs) can be EEG biomarkers of epilepsy. The HFOs including ripples (80-200 Hz) and fast ripples (250-500 Hz) are considered as biomarkers in human epilepsy because they represent pathological network activity underlying epileptogenesis in TLE. In this study, we investigated the effect of the synthetic neurosteroid ganaxolone (GX) on interictal spikes (IS) and HFOs in the dentate gyrus. TLE was induced in rats by injecting the organophosphate DFP and animals were monitored by video-EEG system. Rats with SRS were treated with ganaxolone (5 and 10 mg/kg) for one week. From EEG, epochs of 10-min were taken during light and dark periods (non-REM sleep), and analyzed for HFOs by a custom-built MATLAB algorithm. Our data shows increased HFOs (ripples & fast ripples) and IS in epileptic rats. GX treatment significantly reduced fast ripples without affecting ripples and IS. The overall HFOs incidence was lower in GX-groups. Withdrawal from GX treatment triggered a rebound increase in fast ripples, indicating greater seizure susceptibility. Diurnal analysis shows GX reduced HFOs in dark periods only. These results demonstrate that ganaxolone can reduce fast ripples without affecting IS, indicating distinct role of neurosteroid-mediated tonic inhibition in HFOs.

*Supported by NIH Grant U01-NS083460*

17. ALGEBRAIC FORMULA PREDICTING THE FRACTION OF ABSORBED FLUID TRANSPORTED BY MESENTERIC LYMPHATIC VESSELS

Chesley Johnson
Veterinary Physiology & Pharmacology
Research Advisor: Dr. Christopher Quick

Nutrients are absorbed from the intestinal lumen into the interstitial space through a combination of two parallel transport pathways—via intestinal capillary flow leading to portal circulation or by mesenteric lymphatic pumping to the cisterna chyli. Several perturbations can alter the fraction of fluid that is transported by the mesenteric lymphatics, such as nutrients present in the intestinal lumen, and microvascular and lymphatic outlet pressures. Experimental approaches employed to elucidate the mechanisms governing the relative flow through these two parallel pathways are limited because critical parameters are difficult to measure and cannot be independently controlled. Conventional mathematical modeling approaches are also limited, because the numerical solution of the systems of equations are sensitive to assumed parameter values and must employ advanced computational techniques. Therefore, the purpose of the present work was to develop a general algebraic formula that predicts the fraction of fluid that is transported by the mesenteric lymphatic vessels[CQ1] . Transport of fluid between the interstitium and the capillaries was characterized by the Starling-Landis equation. Lymph flow from the intestinal interstitium to the cisterna chyli was assumed to be a linear function of pressure gradients. The system of equations was solved algebraically to yield a formula for the fraction of fluid transported by the mesenteric lymphatic vessels. This simple model reproduces measured values of fluid flows, as well as the preferential transport of fluid by mesenteric lymphatic vessels under various conditions. This predictive model provides a novel tool to characterize intestinal fluid absorption.
The basement in the San Juan Mountains corresponds to Vallecito conglomerate (Proterozoic), followed by an angular unconformity causing a gap in the geologic record for a portion of the Paleozoic era. Limestones and dolomites (Devonian and Mississippian) overlay the metamorphic basement. Marine transitional to continental sedimentary rocks (Pennsylvanian and Permian) overlie the carbonate sequence. Another angular unconformity shows Mesozoic rocks overlying the Paleozoic section. Volcanism from the Rocky Mountain building event and local eruptions from the surrounding Calderas occurred in the mid-Tertiary. Three known orogenic events occurred within the area, resulting in ore deposit formation. Pleistocene glacial deposits and Holocene alluvial deposits top the sequence. Mesozoic and Cenozoic lithologies are predominant in the area. Orogenic events caused alteration of intrusive igneous rock as hydrothermal fluids deposited economically valuable minerals in the region. The Ouray mining district is known for its silver, copper, lead, zinc, and gold resources. Camp Bird Mine is one of the most productive mines in Ouray, producing from the 1890’s until the early 2000’s, and is the namesake for the rock glacier of interest. This research studies the internal composition of the Upper Camp Bird III rock glacier using traditional geological and geomorphological techniques, complemented with unmanned aerial vehicles (UAV), as well as geophysical surveys. The next phase of the project will use the geological, geomorphological and geophysical interpretations to produce a hydrogeological model of the rock glacier. With this model, the water resources stored in the rock glacier will be quantified and characterized.

The alpine environment of the San Juan Mountains (SJM) of Southwestern Colorado is fragile and severely affected by climate change. This threatens the limited freshwater resources in the SJM, including glaciers, groundwater, and rock glaciers. The latter are composed of an insulating mantle of fine sediments and rock fragments allowing for a slower response to temperature increases. In order to interpret their hydrogeological characteristics, as well as to quantify their potential for freshwater resources, it is integral to understand the internal structure of rock glaciers. To do so, as well as to determine the boundaries between resistive and conductive materials within the landform, time-domain and frequency-domain methods along with detailed geological and geomorphological mapping techniques were used. The G-TEM by Geonics Ltd is an innovative controlled-source time-domain electromagnetic induction system. Using the G-TEM, the distribution of electrical conductivity in the subsurface was mapped in order to characterize the internal structure of the rock glacier. The EM Profiler is a frequency-domain electromagnetic induction system that was implemented for the investigation of the uppermost layers of the rock glacier. The use of two different systems provides continuity across the data sets and helps validate measurements recorded with the new equipment. This research will validate the use of novel equipment in combination with traditional methods to characterize the internal structure and quantify the water resource stored within the Upper Camp Bird.
III rock glacier located in Camp Bird, Ouray, CO, with potential application to the study rock glaciers all over the world.

18C. CHARACTERIZATION OF THE UPPER CAMP BIRD III ROCK GLACIER IN THE SAN JUAN MOUNTAINS, COLORADO USING ELECTROMAGNETIC INDUCTION
Raquel Granados-Aguilar
Geology & Geophysics
Research Advisor: Dr. John (Rick) Giardino

Rock glaciers consist of poorly sorted rock debris shell, supported by an ice interior. Rock glaciers are frequently misidentified especially when looking at the surface alone. The frozen core of the glacier allows for plastic deformation and enables the structure to function similarly to an ordinary glacier. These features tend to form where the angle of a slope is less than 25 degrees. There are three rock glacier shapes, tongue-shaped, lobed, and spatulate. Another important distinction to rock glaciers is their status: active, inactive, and fossil. The selected rock glacier is located on the third level of the Camp Bird Mine in the San Juan Mountains, Colorado. The study area is comprised of sedimentary rocks, volcanic rocks, and a highly mineralized deposit with great economic value has been extracted from these mountains for the past two centuries. Rock glaciers are important in terms natural resource potential, as they contain fresh water, that could potentially be exploited. With an increasingly uncertain future, rock glaciers hold great promise both as a scientific tool to obtain additional knowledge about the past geologic history and as a practical freshwater reservoir. The Upper Camp Bird III rock glacier is tongue-shaped and active, meaning it has a long slender body descending the side of the mountain with one terminus at the bottom, and is constantly flowing. This research combines traditional geological and geomorphological mapping, remote sensing techniques and geophysical surveys to characterize the internal composition as well as the external surficial features of this rock glacier.

19. AGGIENOVA: EXPLODING STARS
Peter Brown
Physics & Astronomy
Research Advisor: Dr. Nicholas Suntzeff

The AggieNova Research Team will be working on supernova-oriented research. We will be using Swift satellite data in the ultraviolet and optical bandwidths, as well as ground-based data in the optical and near-infrared. Our goal is to update the Spectral Template Series for different types of supernovae, in order to better account for what occurs at ultraviolet wavelengths. We will also use the CMAGIC and SNOOPY tools to characterize type Ia supernova observations.
20. BITGRANGE: DEVELOPMENT OF A SMART HYDROPONICS DEVICE TO GROW VEGETABLESindoors
Alfredo Costilla-Reyes
Electrical & Computer Engineering
Research Advisor: Dr. Edgar Sánchez-Sinencio

BitGrange is a platform to educate kids about agriculture using technologies such a smartphone application and an internet-enabled plant-growing device and give them the tools they need to be part of a new generation of entrepreneurs in agriculture.

21. DOPAMINE’S EFFECTS ON LYMPHATIC VESSELS
Elizabeth Brown
Biomedical Sciences
Research Advisor: Dr. Ranjeet Dongaonkar

The lymphatic system plays an integral role in interstitial fluid volume regulation by removing excess interstitial fluid. Once considered to be a passive process driven by a pressure gradient, it is well-understood now that spontaneous contraction of lymphatic vessels is critical for active transport of lymph against a pressure gradient. Recent studies have reported that dopamine, a vasoconstrictor, increases lymph flow. However, how dopamine enhances lymph flow- by increasing pressure gradient driving passive lymph flow or by enhancing lymphatic pumping driving active lymph flow. Therefore, the purpose of the present study was to evaluate our hypothesis that dopamine increases lymph flow by enhancing lymphatic pump function. Our hypothesis was evaluated by characterizing pump function responses of bovine mesenteric lymphatic vessels to dopamine under isobaric conditions. Postnodal bovine mesenteric lymphatic vessel segments were isolated, cannulated and perfused with PSS warmed to 37°C at 6 cmH2O transmural pressure. After initial equilibration, spontaneously contracting lymphatic vessels were exposed to cumulative concentration of dopamine by replacing bath PSS with PSS+dopamine. Lymphatic contraction frequency, stroke volume and fractional lymph flow were calculated from the recorded diameter. Findings of these studies that establish the mechanisms of dopamine induced enhanced lymph flow are expected to not only contribute to the field of lymphatic biology but are expected to form a basis for development of pharmacological approaches to enhance lymph flow.

22. DOPAMINE EFFECTS ON LYMPHATIC VESSELS II
Cheyenne Rovello
Biomedical Sciences
Research Advisor: Dr. Ranjeet Dongaonkar

The lymphatic system plays an integral role in interstitial fluid volume regulation by removing excess interstitial fluid. Once considered to be a passive process driven by a pressure gradient, it is well-understood now that spontaneous contraction of lymphatic vessels is critical for active transport of lymph against a pressure gradient. Recent studies have reported that dopamine, a vasoconstrictor, increases lymph flow. However, how dopamine enhances lymph flow- by increasing pressure gradient driving passive lymph flow or by enhancing lymphatic pumping driving active lymph flow. Therefore, the purpose of the present study was to evaluate our hypothesis that dopamine increases lymph flow by enhancing lymphatic pump function. Our hypothesis was evaluated by characterizing pump function
responses of bovine mesenteric lymphatic vessels to dopamine under isovolumetric conditions. Postnodal bovine mesenteric lymphatic vessel segments were isolated, cannulated and perfused with PSS warmed to 37°C at 6 cmH2O transmural pressure. After initial equilibration, spontaneously contracting lymphatic vessels were exposed to cumulative concentration of dopamine by replacing bath PSS with PSS+dopamine. Lymphatic contraction frequency, stroke volume and fractional lymph flow were calculated from the recorded diameter. Findings of these studies that establish the mechanisms of dopamine induced enhanced lymph flow are expected to not only contribute to the field of lymphatic biology but are expected to form a basis for development of pharmacological approaches to enhance lymph flow.

23. ROLE OF REPLICATION PROTEIN A (RPA) IN TELOMERE MAINTENANCE
Behailu Aklilu
Biochemistry & Biophysics
Research Advisor: Dr. Dorothy Shippen

Replication protein A (RPA) is a heterotrimeric, single-stranded DNA-binding protein complex required for multiple processes in eukaryotic DNA metabolism, including DNA replication, repair and recombination. RPA homologues have been identified in all eukaryotic organisms examined and are composed of subunits that are approximately 70 (RPA1), 32 (RPA2), and 14 (RPA3) kDa. In contrast to the single copy RPA subunit encoding genes found in yeasts and most animals, Arabidopsis encodes five phylogenetically distinct RPA1 (RPA1A-E), two RPA2 (RPA2A & B), and two RPA3 (RPA3A & B) subunits. We previously showed that each of the five Arabidopsis RPA1 gene family members play unique roles in DNA replication (RPA1B and RPA1D), repair (RPA1C and RPA1E), and meiotic recombination (RPA1A) (Aklilu et al., 2014). Here we report a new role for RPA in the establishment of telomere length set point. We found that telomeres in rpa1b rpa1d double mutant plants display a stable, but shorter average length of ~1.5 kb over seven successive generations compared to wild-type (Col-0) plants which have an average telomere length of ~3 kb. Telomere length analysis in rpa1c rpa1e double mutants also reveal stably shorter telomeres through seven generations, but the average length of ~2.2 kb is longer than in rpa1b rpa1d mutants. These findings indicate that among the five RPA1 paralogs, RPA1B and RPA1D play the leading role in telomere length regulation. Current research in our lab is focused on identifying the molecular mechanism by which RPA establishes telomere length set point in A. thaliana.

24. NOVEL MAMMALIAN SIMILARITY PRINCIPLE PREDICTED FROM THE MINIMAL CLOSED-LOOP CARDIOVASCULAR MODEL
Emily Rimes
Biomedical Sciences
Research Advisor: Dr. Christopher Quick

Allometric scaling laws are empirical relationships relating particular parameters to body weight. Investigators have identified only a small number of allometric invariants for the mammalian cardiovascular system—combinations of parameters that have constant values independent of species weight. Although many allometric invariants have arisen from applying optimality principles, the mechanics governing blood pressures and flows impose constraints that strictly limit parameter values. Therefore, the purpose of the present work is to derive a novel mammalian similarity principle, assuming a closed-loop cardiovascular model. First, we assumed a standard minimal closed-loop model
consisting of two ventricles, four vascular compartments, and two resistances. Because ventricles were characterized by the time-varying elastance model, cardiac contractility was characterized by end-systolic elastance ($E_{es}$). Second, we linearized model equations. Third, we assumed systemic arterial pressure ($P_{sa}$) is regulated by renal control of blood volume. We then solved the model equations algebraically for stroke volume ($SV$). The equation was then rearranged to form a novel non-dimensional relationship ($SV E_{es}/P_{sa}$) as a function of sets of cardiovascular parameters, most of which are recognized allometric invariants. We then verified that $SV E_{es}/P_{sa}$ is itself invariant across mammals by substituting measured values from mammalian species of greatly varying weights. Although values of $E_{es}$ and $SV$ can vary at least four orders of magnitude, $SV E_{es}/P_{sa}$ varies less than a factor of two. We thus provide a novel allometric invariant derived from the fundamental principles governing blood flow and a novel tool to scale experimental results from diverse animal models.

25. X-NAV INTERPLANETARY MISSION SIMULATION
Stoian Borissov
Aerospace Engineering
Research Advisor: Dr. Daniele Mortari

This research investigates the feasibility of spacecraft position estimation during interplanetary spaceflight by x-ray pulsar navigation (X-Nav). While current methods for locating a spacecraft in space rely heavily on communication with ground stations, through X-Nav, a spacecraft can autonomously define its full state by using pulsars as deep space beacons. Pulsars are incredibly stable neutron stars that emit periodic beams of light and x-ray signals, similar to how a lighthouse communicates to a boat. Using the signal from each pulsar, one can implement a position estimation procedure to determine the distance of the spacecraft from a known reference point. The position estimation procedure was tested with multiple pulsars in two different cases: when each pulsar’s signal can and can’t be confidently distinguished. In addition, uncertainties in the pulsar signal were included and the variation of position estimation accuracy was evaluated. A visual model for X-Nav is being developed using NASA’s General Mission Analysis Tool (GMAT), which is an open source space trajectory simulation software. GMAT fundamentals such as using the Graphical User Interface (GUI), scripting and the MATLAB interface are presented as background information for the preliminary development of this project. Current work with GMAT includes creating a mission simulation to Mars, from which parameters of the spacecraft’s optimal flight path trajectory have been determined to fully define its state.

26A. SHAPING THE COTTON MICROBIOME FOR SUSTAINABLE PEST MANAGEMENT
Polly Harding
Entomology
Research Advisor: Dr. Greg Sword

Fungal endophytes are naturally occurring symbionts of plant species. Endophytes are capable of producing chemicals that can reduce insect population growth. Inoculating cotton plants with these endophytic fungi in conjunction with limited pesticide use may allow higher control of cotton aphid pest populations in cotton. We conducted a greenhouse study to observe the impact of two fungal endophytes on the usage of two insecticides. Cotton seeds were inoculated with Beauveria bassiana, Chaetomium globosum, or a sterile control. At the third true leaf stage, the plants were placed in individual cages and were infested with aphids. Each week, we counted the number of aphids per leaf.
During the non-reproductive stage we applied an insecticide spray if the aphid population exceeded a threshold of 20 insects per leaf, which was increased to 50 per leaf after flowering. Plants were sprayed with acetamiprid, imidacloprid, or a water control. The amount of insecticides necessary to maintain aphid populations below the economic threshold was used to determine whether or not the endophytic seed treatments are an effective tool for reducing pesticide usage.

268. SHAPING THE COTTON MICROBIOME FOR SUSTAINABLE PEST MANAGEMENT
Polly Harding
Entomology
Research Advisor: Dr. Greg Sword

The overuse of pesticides in agriculture is a major concern for public and environmental health. Fungal endophytes may be a potential solution to reduce grower dependence on pesticides. Endophytes are an organism, usually bacteria or fungi, which live within plant tissues. Plants can use fungal endophytes as a natural defense mechanism against insect pests. In this study, we investigate the compatibility of fungal endophytes with common insecticides in order to assess the potential for integrating endophytes within a pesticide program. We tested the effect of two common pesticides, acetamiprid and imidacloprid, on the reproduction of Beauveria bassiana and Chaetomium globosum. For each endophyte, 100 µL of a spore suspension with a concentration of 104 conidia/mL was plated on agar containing acetamiprid, imidacloprid, or a water control at low and high concentrations. After one week of growth, the number of germinated spores was counted on each plate.