Celebrating the Best of Texas A&M's Research from Across All Disciplines!

20th Annual

STUDENT RESEARCH WEEK

March 27-31, 2017

Student Research Week 2017

Abstract Book

Yashwant Prakash Vyas

Director
Student Research Week

Offices of the Dean of
Student Life
Division of Student Affairs

Texas A&M University

20^{th} Annual
Student Research Week

March 27-31, 2017
Memorial Student Center
Texas A&M University

Howdy!

On behalf of the 2016-2017 Student Research Week (SRW) Planning Committee, and the Graduate and Professional Student Council, it is my pleasure to welcome you to the 20^{th} Annual Student Research Week at Texas A&M University. This year's theme is inclusivity. Along with the 20th anniversary of SRW, we are celebrating the best of Texas A&M's research from across all disciplines.

SRW is the largest single-university student-run research symposium in the USA. SRW highlights research occurring on campus with an emphasis on research in which students participate. The mission of SRW is to recognize and celebrate student research at Texas A&M University by providing an opportunity for students to present research and to foster an environment for students, faculty, staff, and administration to learn about the research occurring at Texas A&M University.

Texas A&M University is a leading tier one research university of the world. SRW exemplifies Texas A&M University's long-standing commitment to providing educational research opportunities for students at all levels. It serves as a vital program in fulfilling university's mission of academic, research, and service excellence.

Each year, hundreds of the student researchers present their research at SRW. This year, 397 undergraduate student researchers, and 398 graduate and professional student researchers from fourteen different colleges are publicly presenting their research either through poster or oral presentations. The SRW Planning Committee of the Graduate and Professional Student Council supports the spirit of learning and strongly feels that it should be encouraged. So we invite you to attend these sessions from Monday 27 March 2017 to Thursday 30 March 2017. Additionally, there will be Interdisciplinary Research Discussion Panels held during the week. A detailed schedule of events and more information about 2017 SRW can be found on our website at SRW.TAMU.EDU.

Come learn about the research conducted at one of the world's leading tier one research universities and how it is making our world a better place to live.

2016-2017 SRW Planning

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Undergraduate Oral Presentations

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“Detection and Identification of Sign Language in Picture-in-Picture Video”
Department of Computer Science, College of Engineering
By: Mahak Mithani

The internet enables almost anyone to locate content on almost any topic. This ability, however, is not easily available for those who sign. In order to provide resources to those whose primary language is sign language, a digital library, called SLaDL, has been created. In order to ensure maximum efficiency of the video-processor that detects sign language, it is important to check that the program works on all video resolutions. This project aims to detect and identify sign language in picture-in-picture videos through polar motion profiles, working to expand the corpus of videos on which the processor is successful.

“MR Elastography as Technique for Investigation of Blast Induced Traumatic Brain Injury”
Department of Biomedical Engineering, College of Engineering
By: Shannon Nicole Ingram

With improvements in military protective gear over the past decade, risk of fatal injuries has been significantly reduced in recent conflicts overseas. Despite, or perhaps because of, this, an increase in frequency has been observed in relatively mild but longer lasting injuries, such as blast induced traumatic brain injury (bTBI). BTBI is caused when the shock wave from an explosion impacts the brain, and little is known about its mechanism of injury. A common method of studying bTBI involves simulation of the injury in animal models using a compressed air driven shock tube, paired with evaluation of results through methods such as behavioral studies, necropsy, or imaging. However, traditional methods of imaging, such as MRI, have provided little insight into the injuring mechanism. In this study, the plausibility of using MR elastography to assess the effects of blast on the mechanical structure of the brain is evaluated. Elastography allows imaging of changes in stiffness in a tissue by mapping displacement actuated throughout the sample by a mechanical shear disturbance. A system has been developed that can provide this shear disturbance and hold an animal model in the ideal location within an MRI needed for quality imaging. Its abilities to perform elastography will be evaluated with a series of brain phantoms designed and created to increase in complexity, followed by a euthanized animal model. If elastographic imaging is performed successfully, this method can then be used to investigate the mechanical changes associated with bTBI.

“Using Motion Analysis to Determine Physiologically Relevant Testing Parameters for Comminuted Fracture Repair”
Department of Mechanical Engineering, College of Engineering
By: Kelsey Marie Tara

This purpose of this study was to utilize motion capture and force plate technology to help determine the efficacy of a class two medical device surgically fixed around a comminuted fracture in a sheep’s leg. This was done by performing pre-operation gait analysis to analyze parameters of the foot strikes. These parameters included the maximum force of the foot strikes, and the range of motion of the tibia segment where the cuff will be implanted. The results from this study will be used to establish the testing parameters of a study designed to establish the mechanical properties of the cuff. Gait analysis was performed on 8 healthy sheep using a 12-camera Vicon Motion Capture System (Vantage V16), and four AMTI force plates (OR6-1000). Custom software was developed in Python to analyze the results.

After examination of the results, no significant differences were found in the foot strike parameters between the three groups of sheep (male-intact, male, female). The max force on the back foot (as a percentage of body weight) for each group was: 45 Â± 1.9 for male-intact sheep (n=2), 43 Â± 6.8 for male sheep (n=2), and 42.9 Â± 4.90 for female sheep (n=4). The overall averages for all of the sleep had a twist angle of 12.75 degrees and a tilt angle of 45.71 degrees with respective standard deviations of 8.46 and 15.08. Our future work includes applying the results of the software analysis to the mechanical testing of the bone cuff, and creating additional software to perform a more robust analysis of the sheep gait characteristics.

“Grid Spacer Influence on the Lateral Velocity Component within a 5x5 PWR Bundle”

Department of Electrical Engineering, College of Engineering
By: Nasan Tsengeg

This project was conducted with the motivation to understand and map the lateral velocity components of the turbulent effects on the flow caused from a 5x5 mixing vane grid in the rod bundle flow channels. The behavioral phenomena of liquid flow around fuel rod bundles with mixing vane grids can be tracked by using technically advanced measuring methods. Even though similar experimental benchmarks have been performed in the past, previous are results limited to the length of a sub-channel and point measurement probes. Therefore, there is a gap in the literature of experimental data with high spatial and temporal resolution capable of addressing multiple channels simultaneously. For this experiment measurements were taken using Particle Tracking Velocimetry (PTV) techniques.

The images were extracted; an average was created from 1000 images in order to create an image with no background particles. A parameter mask was created around each of the 25 rods to remove them from the remainder of the image processing. The masked average was then subtracted from the rest of the images to isolate the particles in the remaining images. A morphology average was created from the subtracted averages using the PTV software. PTV tracking software was used on the morphology average to create 2D lateral velocity vectors from the particle movement. Using python script, the PTV generated vector fields were smoothed. The smoothed vector fields were filtered again using PTV software to remove vectors outside of the statistical parameters. This process was repeated for all 15 laser heights from which data was collected. The results provide precisely mapped velocity vector fields tracking the fluid flow around rod bundles with mixing vane grids. The results demonstrate the usefulness of advanced hydraulic benchmark test data for future Computational Fluid Dynamics (CFD) benchmarking.

“Searching for a missing lysis gene: How bacteriophage phiKT breaks free”
Department of Biomedical Engineering, College of Engineering
By: Ashley Holt

Bacteriophages (phages) are viruses of bacteria. Phages must infect, replicate, and lyse their host to release progeny. Most lysis systems require three classes of proteins to lyse bacteria. Spanins, one of these three classes of proteins, function at the last step of lysis by disrupting the outer membrane. Recent evidence suggests that the spanins are fusogenic, disrupting the outer membrane by fusion to the inner membrane. Although spanins are well conserved in double-stranded DNA phages of Gram-negative hosts, 15 percent of these phages do not encode spanin genes. This is surprising because inactivating the spanins blocks lysis. To investigate how spanin-deficient phages lyse, we characterized the PhiKT phage of the 4s strain of E. coli. We have found that FKT lyses its host in conditions that require spanin function. This suggests PhiKT either encodes a spanin gene equivalent, or the outer membrane of 4s is intrinsically weak. To test this, we introduced the phage lambda lysis system into 4s. In this context, lysis was dependent on the presence of functional spanins. This indicates the outer membrane of 4s is normal and requires a lysis gene product for outer membrane disruption. Our results suggest that FKT has an undescribed gene serving the function of a spanin. Further studies will be necessary to identify the spanin equivalent(s) within FKT’ genome.

“TORCHE: Toolbox for Reactor Cross-Flow Heat Exchangers”
Department of Nuclear Engineering, College of Engineering
By: Jonah Benjamin Haefner

As interest within the scientific community for the development of small modular reactors (SMRs) grows, utilizing compact and cross-flow heat exchangers present many advantages. Cross-flow configurations of tube bundles allow a primary fluid such as water or a molten salt such as FLiBe to achieve turbulent flows on the shell side while the tubes contain a two-phase fluid such as steam in the secondary system of a nuclear reactor. The goal of this project is to provide the researcher with an easy to use set of tools for accurate calculations on order to enable rapid preliminary design checks. With a set of simple Python scripts, the user can determine the necessary quantities and correctional factors needed to tackle some of the most important problems in designing novel and efficient heat exchangers including: use of pressure drop effectively, ensuring optimum conditions for heat and momentum transfer, and understanding the changes in the flow in the inter-tubular spacing.

“In Situ Detection and Identification of Bacteria by Means of Fluorescence Spectroscopy”
Department of Electrical Engineering, College of Engineering
By: Matthew Alexander Walck

Bacterial infections cause thousands of deaths in the US every year. A method for fast, in situ identification of bacteria and confirmation of their live/dead status would be invaluable for infection prevention and treatment, especially, when conventional methods are unavailable. Excitation-emission matrices (EEMs) and synchronous fluorescence spectroscopy were used to study individual bacterial components. The effect of ultraviolet radiation on live bacteria was evaluated by determining the change in intensity of the fluorescence spectra as a function of irradiation time. Principle component analysis (PCA) was used to determine these changes. The results from this research have led to an improved understanding of the mechanism that controls bacterial inactivation and have also contributed to the development of a method employed to identify bacteria and determine their viability quickly and in situ. The results of this research are expected to provide a means for both prevention of infection and treatment of wounds in clinical and field settings.

“Experimental Studies towards understanding the Aeromechanics of a Flexible Robotic Humminbird Wing in Hover”

Department of Aerospace Engineering, College of Engineering
By: Kanika Gakhar

This study investigated factors influencing the aeroelastic mechanics of a meso-scale, flapping, two-winged robotic hummingbird capable of hovering. The investigation focused on observing trends in aerodynamic and inertial forces, mechanical power output, and electrical power input for various flapping frequencies, amplitudes, and wing designs. The purpose of analyzing these trends was to optimize lift generation and increase the overall efficiency of the flapper. In order to measure and record data for these trends, an experimental setup was designed to replicate the extended four-bar crank rocker mechanism and wing design from the original robotic hummingbird. This setup allowed for the variation of flapping parameters and incorporation of sensors. The sensors were used to measure the time history of lift, torque, flap angle, and current drawn. Digital Image Correlation and Particle Image Velocimetry tests were also conducted so as to decouple the analysis of inertial and aerodynamic loads. After processing, the data trends were analyzed, and the wing design as well as flapping amplitude that maximized lift while minimizing flapping frequency were deemed as most optimum. These results helped boost the performance of the robotic hummingbird and further understand the individual effects of inertial and aerodynamic forces on flapper performance.

“Toward Automatic Thermal-Based Victim Detection and Approach On Lifeguard Assistant Robot”

Department of Computer Science, College of Engineering
By: Rebecca Schofield

This thesis creates, implements, and validates a suite of computer vision algorithms to approximate the location of drowning victims in open water and enabling the commercially available Emergency Integrated Lifesaving Lanyard (EMILY) lifeguard assistant robot boat to autonomously move closely to the victims without scaring them. Currently, lifeguards working to save Syrian refugees crossing into Greece teleoperate EMILY to people in the water, but due to restricted depth perception, often overshoot and collide with the victim. Prior work with estimating the GPS location of the victims allows EMILY to navigate to the victims, but with GPS error, it may overshoot and collide with the victim or stop too far away for the victim to reach EMILY. Recent work by European researchers [3] have shown that small unmanned aerial vehicles (UAV) can use thermal imaging to reliably detect victims in the water, day or night. The project will extend the concept of thermal imaging to a robot boat, which has a different viewpoint from a UAV. It will interface a thermal imager to EMILY, develop blob detection algorithm to detect victims in the water, and a looming algorithm to estimate the distance to the victim. The output of this perceptual system will be used by an artificial potential field, developed independently of this thesis, to move EMILY reactively. The research will benefit the safety, security, and rescue robotics research community. In addition, there are two societal benefits. One is that if EMILY can react to heat signatures and autonomously refine its navigation towards those in the water, the victims have a higher likelihood of quick rescue. Second, is that it would free the lifeguard to rescue victims in higher states of distress while the robot autonomously navigated to less vulnerable victims. Risks include obtaining a lightweight water-resistant thermal imager, the difficulty of gathering camera data of real humans in the water, due to weather conditions, and the creation of a robust simulation for testing. Success will be determined through a simulation. Experiments include scenarios with both individual victims and multiple large groups of victims, testing with different weather conditions. Metrics measured are the number of successful detections, the ratio of successful detections to total detections (precision), the ratio of successful detections to total number of possible successful detections (recall) and the harmonic mean of precision and recall (F-measure).

"Overdischarge and External Short Behavior of Lithium-Ion Batteries"

Department of Mechanical Engineering, College of Engineering
By: Connor Fear

Lithium-ion batteries (LIBs) have become increasingly popular for commercial use in recent years, however, the frequency of accidents involving LIBs raises concerns over their safety. A commonly experienced condition for batteries is an external short, which causes the cell to discharge at a high rate and, hence, at large currents, resulting in rapid heat generation in the wire as well as within the cell. Another condition, known as overdischarge, is also becoming a common safety issue as greater numbers of cells are being connected in series, as is the case in systems requiring high voltages, such as electric vehicles. This work seeks to explain the mechanisms that cause internal damage to cells during external shorting and overdischarge and to determine the most dangerous conditions that can exist during these types of abuse.

"Recognizing Seatbelt-Fastening Activity using Wearable Sensor Technology"

Department of Computer Science, College of Engineering
By: Ellen Stanfill & Jake Leland

The goal of this research is to design an algorithm for use with an existing wearable device which is capable of detecting the action of putting on a seatbelt in real time. We collected test data using Pebble smartwatches, and we began the analysis process by graphing this data and searching for patterns. When notable features were identified, we were able to process the data and utilize machine learning software to generate a data detection algorithm. The final algorithm can be integrated with other data and applications such as GPS location or the detection of hand position on a steering wheel to determine whether a user is following safe driving practices. This information can then be relayed back to the user in order to modify any unsafe behavior.

“Evaluation of mechanical stability for a patent ductus arteriosus device”
Department of Electrical Engineering, College of Engineering
By: Sarah Brooke Raines

Patent ductus arteriosus (PDA) is a condition that occurs when the ductus arteriosus, a vessel connecting the aorta to the main pulmonary artery, does not close after birth. PDA causes irregularities in blood flow that can result in congestive heart failure. Current treatment options are highly invasive, expensive, and/or limited to larger anatomies. To address these issues, a low-profile nitinol cage device has been created that straddles this opening and occludes the opening with a polymeric foam placed in the center of the device. However, due to the pulsating high flow environment, which may contribute to unwanted device migration [1], stability testing for extraction is required to ensure that the device has appropriate mechanical strength to withstand physiological conditions.

To this end, dislocation force testing was performed using an Instron tensile test frame using bare foams (small and large pores) and hydrogel doped foams, foams covered in a gel that simulates the effects of blood clotting within the prototype PDA device.

The dislocation force is the maximum force required to dislodge the prototype PDA device once positioned inside the PDA. The dislocation force was measured to determine changes in stability immediately after deployment (bare foam) and once clotted (hydrogel foam). Results are compared with the current clinically-available option, the Amplatz Canine Ductal Occluder (ACDO).

The study indicated minimal differences between foam types used, small and large pore, and bare and hydrogel doped. Rather, the differences seen in the various PDA morphologies, which the prototype device was tested in, demonstrate the largest contributing factor to the increase or decrease in dislocation force was the positioning of the device. Thus, it was determined that though the dislocation force may provide insight into the stability of the device it is not the only contributing factor. The minimal changes seen in foam types indicate that the device’s performance will remain relatively unaffected as thrombus forms, and that using either small pore foams or large pore foams are both viable options. Given the physiological conditions do not exceed the dislocation forces gathered in this experiment, the device should remain stable regardless of foam types and can be expected to be influenced most by the device’s position within the various morphologies the PDA may take on.

"Harnessing Certainty to Speed Task-Allocation Algorithms for Multi-Robot Systems"

Department of Computer Science, College of Engineering
By: Denise Irvin

Some problems are best solved by systems of multiple robots, in which each robot is assigned one task. A multi-robot system can, upon the start of a series of tasks, compute the optimal task allocation for best performance of the team. In some cases, during runtime, changes in the environment, tasks, and state of individual robots might change which allocation of tasks to robots is optimal, and the performance of the team would improve if the robots switched tasks. Because communication between robots is expensive, in some cases it is better to calculate an interval in which changes in the environment, tasks, and robots are not significant enough to render the original allocation suboptimal. This way, robots only initiate communication and correction if the system is likely to switch tasks, which limits the costs of communication and computation in the system. In the problem of task allocation of single robot, single task cases where environments and thus optimal assignments are expected to vary over time, some knowledge of the system might help reduce computation and make possible a more scalable algorithm for determining cost changes. In some systems, some costs may be known not to vary over time. This research proposes creating and analyzing cost matrices of assignments to examine if taking advantage of the certainty of some variables will improve performance. If successful, our model for exploiting certainty of task allocation will take less computation than calculating ranges for all variables, and will save resources during runtime.

"A Neural Network Approach to Classifying Generic Expressions"

Department of Computer Science, College of Engineering
By: Carlo Jacob De Guzman

Generic expressions make statements about nonspecific entities. Characterizing generic expressions make broad statements about classes of entities, without belonging to any temporal structure, while habitual generic expressions refer to regularly occurring events and actions. Non-generic expressions can also be classified as characterizing or habitual, complicating the task of differentiating between generic and non-generic expressions. Correctly differentiating generic expressions from non-generic expressions plays a role in tasks such as information extraction and knowledge base population, as this distinction determines the type of information that can be interpreted from a given expression.

The goal of this research is to develop a neural network that classifies generic expressions. Previous machine learning approaches to classifying generic expressions required precise feature extraction prior to the training process, and did not fully utilize semantic information in learning to classify generic expressions. A neural network approach will allow the system to learn from grammatical and semantic features, and adjust its internal model to take advantage of features that strongly identify an expression as generic or non-generic.

“Computer Vision and Simulation Tools for Three-Dimensional Random Antenna Arrays”
Department of Electrical Engineering, College of Engineering
By: Joshua Thomas Ruff

This research project aims to develop and improve auxiliary tools which aid in ongoing research on beamforming with random antenna arrays. One of the challenges of conducting research on random arrays is the tedious nature of preparing electromagnetic simulations to test beamforming algorithms. This project presents an automation framework written in Python which will expedite the setup of simulations and reduce the room for error during this process. A second important tool used with the random array is a computer vision system designed to locate the feedline of the patch antennas used in this array. Refinements to the light filtering software and the position finding software are presented, and a machine learning algorithm for distinguishing between different antennas is developed and tested.

“A Constraint Satisfaction Problem Approach to High-Entropy Alloy Design”
Department of Mechanical Engineering, College of Engineering
By: Anas A. Abu-Odeh

High-entropy alloys (HEAs) are multi-principal element alloys at near-equiatomic concentrations that can have superior properties such as high irradiation resistance, high fatigue resistance, and high temperature

usage, compared to conventional alloys. This gives HEAs potential application to industries such as nuclear, aerospace, medical, and electronic. However, the design and discovery of HEAs has been largely limited to trial and error methods, therefore only a fraction of the possibilities has been produced. A computational alloy design methodology using the Constraint Satisfaction Problem (CSP) approach is proposed to accelerate HEA design and discovery. This approach consists of three major steps: mapping design requirements into mathematical constraints and using computational thermodynamic calculations to implement them, sampling, using genetic algorithms, the HEA space of composition and temperature within the constraints to search for solutions, and describing the final solution space using machine learning methods. Ultimately, the CSP approach enables the identification of all regions in composition space that satisfy material design requirements. A Thermo-Calc database was verified against experimental data in order to implement phase stability calculations. With kinetic considerations, ~71% of the 216 evaluated alloys showed good agreement between experiments and calculations using the database. This database was used to map out single-phase solid solution regions for the known CoCrFeMnNi HEA and all of its subsequent near-equiatomic quaternary and ternary systems. The results demonstrate the CSP’s capability to search HEA thermodynamic space and to accelerate HEA design and discovery.

“Synthesis and Characterization of Microparticles for Templating Porous Shape Memory Polymer Scaffolds”

Department of Biomedical Engineering, College of Engineering
By: Kedar Balakrishna

Shape memory polymers (SMPs) are proposed for use in a variety of medical devices, such as neural and peripheral embolism coils for aneurysm occlusion. These “smart” materials have unique advantages over shape memory alloys, such as light weight, large shape recovery of up to 400% plastic strain, nontoxicity, nonmutagenicity, ease of processing. and low cost. Processing SMPs into porous forms increases their potential for use in a number of applications due to unique properties, such as increased thermal and electrical insulation, large volume changes on recovery from compressive strain, and low density.

Current SMP foams utilize a gas blowing technique to create the pores. This method results in inhomogeneous pore sizes and may result in shearing of the foams. By templating the SMP foam matrix with microparticles of controlled diameters, we will be able to finely tune pore sizes within a set range and ensure pore interconnectivity.

Here, we fabricated alginate microparticles using a co-flow emulsion technique. The microparticles were sieved to a size range of 75 “125 µm before utilizing them to template poly(dimethyl siloxane) (PDMS) matrices. The resulting polymer matrices were characterized in terms of pore size, pore morphology, density, thermal transitions, and mechanical strength under tensile loading. We found that utilizing the microparticles to template the matrices resulted in an interconnected pore matrix with homogeneous pores, which we hypothesize will allow for controlled expansion of the matrix. These results found using PDMS matrix will lay the groundwork for future generation of SMP foams with controlled porosity, reduced risk of shearing, and enhanced material properties for a variety of medical applications.

“Synthesis and Characterization of Radiopaque Shape Memory Polymer Foams”

Department of Biomedical Engineering, College of Engineering
Kendal Paige Ezell

Medical professionals rely on noninvasive material visualization with x-ray fluoroscopy to enable safe and effective device placement. Shape memory polymer (SMP) foams have been proposed for a variety of medical applications, including brain aneurysm embolization and occlusion of peripheral vascular malformations. While these devices provide significant advancements in treatment, such as increased volumetric filling and improved healing outcomes, one inherent limitation is a lack of visibility under x-ray fluoroscopy. Although metal markers can assist with SMP device placement, it is difficult to anticipate the interactions between the expanding polymer device and the complicated vessel anatomy. Thus, there is a significant clinical need for the development of SMP formulations that can be observed under x-ray during expansion. Using a bulk synthesis method, a triodobenzene monomer was incorporated into the polymer composition in 15%, 20%, and 25% molar ratios to enhance x-ray visibility of the foams. This work outlines the synthesis and characterization of the radiopaque compositions necessary to achieve clinically relevant SMP foams. Foams were characterized using gel fraction measurements, differential scanning calorimetry, mechanical testing, expansion studies, scanning electron microscopy, and fluoroscopic imaging. The porous contrast agent containing foams successfully demonstrated x-ray visibility with enhanced mechanical properties, indicating their promise for further development into clinically relevant SMP medical devices.

Coagulation Modeling of a Stenosed Artery: A Coupled Chemical-Mechanical Approach

Department of Mechanical Engineering, College of Engineering
By: Dominic Isaiah Jarecki

Stagnation zone formation in the circulatory system is known to lead to the formation of clots in blood. Stenoses in the arteries, formed by the deposition of plaque, can lead to the formation of stagnation zones. In this work, these zones are studied in the post-stenotic blood flow using a computational model of an axis-symmetric stenosed artery coupled with a reduced-order model of the coagulation cascade, ideally laying groundwork for more detailed simulation and patient-specific clinical implementation.

"PCL Shape Memory Polymers Prepared with Variable Cross-Link Density"

Department of Biomedical Engineering, College of Engineering
By: Vanessa Page

Poly(e-caprolactone) (PCL) has been previously studied as a thermoresponsive shape memory polymer for numerous biomedical applications due to its biocompatibility and biodegradability. Grunlan and her co-workers have previously investigated the fabrication of "self-fitting" porous scaffolds using cross-linked PCL-diacrylate (PCL-DA) suitable for cranial defect repair. To maximize the utility of such scaffolds, varying PCL crosslink density may broaden mechanical and degradation profiles. Thus, in this study, PCL crosslink density was tuned by varying PCL-DA degrees of polymerization (n). The percent acrylation of PCL-DA macromers was confirmed to ensure crosslinkability. For the UV-cured PCL films and scaffolds, the impact of crosslink density (i.e. value of n) was measured with respect to thermal properties (i.e. crystallinity and melt temperature, Tm), mechanical properties (i.e. stiffness and strength), and degradation rate.

"Zen Routing"

Department of Electrical Engineering, College of Engineering
By: Justin Lewis & Pablo Dominguez

Driving induced stress is a problem inherent to contemporary living in urban areas. Traffic congestion, route unpredictability, and other factors cause undue stress to commuters daily. The project purpose is to alleviate driving related stress by offering alternative routes. This service will be provided in the form of a mobile navigation app. Currently, navigational apps provide options based on shortest estimated time of arrival or shortest distance. The planned application will analyze a number of other factors to suggest routes that are comparable in time to the fastest route, but less stressful. This will incentivize people to take alternative routes based on the benefits of stress reduction. The overall benefit to the user will hopefully take form in increased driving safety and overall well-being.

“Generalized Intelligent Behavior and Event Recognition Method for Nuclear Engineering Applications”

Department of Nuclear Engineering, College of Engineering
By: Zachary Hardy

In many fields of engineering it is desirable, and often required, to identify certain characteristics of processes, properties, and systems. This effort focuses on the development and demonstration of an intelligent behavior and event recognition method. Using a black-box approach, the method was generalized and applied to several different applications, such as quantum mechanics, nuclear supply chain management, and nuclear composition characterization. The method utilized data synthesis algorithms and genetic algorithms, an artificial intelligence method, to achieve the desired results.

“A Machine Learning Approach to Pitot-Static Error Detection and Correction”

Department of Mathematics, College of Science
By: Renee Swischuk

Aircraft guidance is dependent on various instruments which provide the aircraft and pilots with information on speed, altitude and location with respect to both the ground and the surrounding air. This in-flight data allows autopilot to autonomously fly an aircraft on a desired flight path while adapting to changing weather patterns found at high altitudes. The pitot-static system, Global Positioning Systems and inertial reference units are the main sources of information. The pitot-static system measures dynamic and static pressure to provide airspeed, vertical speed, temperature, mach number and altitude data. The system consists of three instruments, a pitot probe and a static port placed outside the aircraft, and airtight instruments found within the aircraft. The inertia reference units consist of a gyroscope, accelerometer and GPS to provide position and attitude data. These units are entirely on board the aircraft, not susceptible to outside interference. Being outside is what makes the pitot static system so vulnerable to failures. Erratic weather patterns and even insects can cause the system to become obstructed leading to erroneous air data. Autopilot software has not yet been developed to handle these situations and often disengages in piloted aircraft. For unmanned aerial vehicles, autopilot is the only source of guidance so disengaging and switching to manual pilot control is not an option. Having a constant stream of redundant data from internal reference units and pitot static systems, an aircraft can be trained to autonomously recognize errors in these instruments and learn to correct them. We focus on three main sources of failure from the pitot static system; a pitot probe block, a pitot drain block and a static port block. In a machine learning approach, we simulate various flight paths of a UAV and store library of different error signatures that can be found in flight. Using previous readings and surrounding weather stations, a real time estimate of wind can be made and in combination with highly reliable GPS data, the aircraft is able to make online predictions of airspeed by referencing the offline library. Thrust, engine power and the gyroscope can also be used to help confirm the predictions of airspeed and flight path. Having a fault resistant guidance system for an aircraft makes it possible to remain steady in flight and continue critical missions.

"Utilizing Chord Structure in Content-Based Music Recommendation"
Department of Computer Science, College of Engineering
By: Gregory Brandon Krupit

With the popularity of digital entertainment applications such as Pandora, Spotify, Amazon Music, etc., comes the need for sophisticated music recommendation algorithms. Many algorithms depend on collaborative filtering, determining relevant song suggestions for a particular user by analyzing similar tastes in the rest of the user base. This method comes with the cold start problem, such that new users do not have enough data to generate meaningful suggestions. A solution to this problem is a content-based method, utilizing the structure and features of the music itself to determine similar songs rather than user-based data. By using audio analysis tools and performing wavelet analysis on songs to extract relevant acoustic features (including chord progression), we will define a new measure of similarity between songs. Thus, the proposed research adds two new features to the content-based music recommendation model, namely the analysis of chord structure in determining suitable song suggestions and a weighting system to control how similar suggestions are to a given input song.

"A New Approach to Homomorphic Encryption"
Department of Electrical Engineering, College of Engineering
By: Kyle Loyka

Standard encryption protocols do not allow for native searching or modification of data. In these implementations, to find or modify information in an encrypted file, the file must be decrypted before any operations. In this scenario, whoever is performing the operations on this file must also have the encryption key. Homomorphic encryption aims to solve this problem. Using homomorphic encryption, an encrypted data file could be searched or modified without having to decrypt it. This feature would allow users to outsource their processing needs to third parties. These third parties would be able to perform operations on behalf of the user without attributing meaning to the input and output values.

The homomorphic encryption model proposed in this paper works with plaintext files by representing character using the ASCII encoding scheme. The characters will be encrypted using an affine cipher. This scheme supports search, substitution, and addition operations. Development on this experimental implementation is ongoing and conclusive results have yet to be determined.

“Effectiveness of Changing ID to Preserve Privacy in Vehicular Networks with Basic Safety Messages”

Department of Electrical Engineering, College of Engineering
By: Mason Rumuly

A proposed method to improve roadway safety is for each vehicle to broadcast and receive basic safety messages (BSM) over dedicated short-range communications networks (DSRC) in the 24GHz band at 100ms intervals containing the location, heading, and other information about the vehicle. This method as currently conceived would allow vehicles to be tracked far easier than with currently available methods. The current defense against this is to periodically randomize the vehicles ID tag on the BSMs; however, it is not clear this is effective. To find out, I analyzed a body of BSM data points from Ann Arbor, Michigan, to see just how effective of a defense this posed; this presentation will focus on those results.

Medicine; Surgery; Radiology; Pediatrics; Pathology; Obstetrics & Gynecology; Anesthesiology; Epidemology & Biostat; Env'tal & Occ Health; Health Policy & Mgmt; Health Promotion/Comm Health Sc; Public Health Studies; Pharm Sc; Pharm Practice; Nursing

“Role of Kir Channels in Regulation of Mesenteric Lymphatic Pump Function”

Department of Biomedical Sciences, College of Veterinary and Biomedical Sciences
By: Lena Ayari, Maryam Vessalpour, Naomi McCauley, Paige Donart, & Marissa Mitchell

"Inward rectifying K+ (Kir) channels play a critical role in repolarization and maintenance of the resting membrane potential of cardiac ventricular myocytes. Blockade of Kir channels leads to cardiac arrhythmias. Lymphangions, segments of lymphatic vessels between two adjacent sets of valves, function similarly to cardiac ventricles’ lymphangions contract to actively propel lymph. However, little is known about the activity of Kir channels in mesenteric lymphatic vessels. Therefore, the purpose of the study was to evaluate our hypothesis that blockade of Kir channels in mesenteric lymphatic vessels increases contraction frequency and decreases stroke volume of the lymphatic pump. Postnodal bovine mesenteric lymphatic vessel segments (~3 cm long) were isolated and cannulated in a custom-built isolated vessel bath. Vessel segments were perfused and superfused with 37°C PSS at a transmural pressure of 6 cmH2O. The vessel diameter was determined using video caliper software and recorded continuously during the experiment. After initial equilibration, spontaneously contracting lymphatic vessels were exposed to cumulative concentrations of Ba2+ (a Kir channel blocker, 1-50 ÂµM) by replacing bath PSS with PSS+Ba2+. Lymphatic contraction frequency and stroke volume were calculated from the recorded diameter. The role of Kir channels was confirmed by increasing the K+ concentration in the PSS to 15 mM, which is reported to open Kir channels. This research is the first to investigate the effects of blocking Kir channels on mesenteric lymphatic pump function. The findings of this study are expected to lead to the development of novel therapeutic strategies to treat lymphatic dysfunction and lymphedema.

“Effects of KV Channel Blockade on Mesenteric Lymphatic Pump Function”

Department of Biomedical Science, College of Veterinary and Biomedical Science
By: Madeleine Pohlmann, Charles Malone, Krislynn Rios, Jasmin Villarreal Ortega, Morgan M Anguiano, & Ranjeet M Dongaonkar

Spontaneous contraction of lymphatic vessels, necessary for active pumping of lymph, is the intrinsic property of the lymphatic muscle. It is well understood that voltage gated potassium (KV) channels play a critical role in repolarization and regulation of intracellular calcium concentration in cardiac myocytes as well as vascular smooth muscle cells. However, the role of KV channels in lymphatic muscle cells in regulation of lymphatic pumping has yet to be studied thoroughly. Therefore, the purpose of the study was to evaluate the hypothesis that blockade of KV channels in mesenteric lymphatic vessels increases both contraction frequency and stroke volume of the lymphatic pump. Segments of postnodal bovine mesenteric lymphatic vessels (~3 cm long) were isolated and cannulated in a vessel bath. The vessel segments were perfused and superfused with PSS warmed to 37oC and at 6 cmH2O transmural pressure. Vessel diameter was determined using video caliper software and recorded continuously during the experiment. After initial equilibration, KV channels in spontaneously contracting vessels were blocked by replacing bath PSS with PSS+4-AP (KV channel blocker). Lymphatic contraction frequency, stroke volume, and fractional lymphatic flow were calculated from the recorded diameter. These studies are the first to investigate the role of KV channels in regulation of mesenteric lymphatic pump function. Findings from these studies are expected to not only advance the field of lymphatic biology, but also lead to the development of approaches to manipulate lymphatic function in vivo.

"Dopamines effect on lymphatics"

Department of Biomedical Engineering, College of Engineering
By: Jay E Garza & Jackson Valencia

Development of the staged palliation procedures culminating in the total cavopulmonary anastomosis (Fontan) has significantly improved the survival of patients with single functional ventricle. However, protein losing enteropathy (PLE) is a well-known complication in patients with Fontan circulation. In PLE, serum proteins are lost into the enteral lumen resulting in edema, altered coagulation, disrupted calcium regulation, and poor growth and bone development. Recent clinical studies have reported that continuous infusion of dopamine is strongly associated with improvement in PLE symptoms. However, the mechanisms of effects of dopamine have yet to be investigated. Since mesenteric lymphatic pump failure has been commonly associated with PLE, we hypothesized that improvement in PLE symptoms following dopamine infusion were mediated by restoration of lymphatic pump function. Therefore, the purpose of the present study was to evaluate our hypothesis by characterizing mesenteric lymphatic pump function response to dopamine. Postnodal bovine mesenteric lymphatic vessel segments (~3 cm long) were isolated and cannulated in a custom-built isolated vessel perfusion bath. Vessel segments were perfused and superfused with PSS warmed to 37oC 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 principle of lymphatic mediated therapy for treatment of PLE are expected to lead to development of targeted lymphatic contractility agents to treat PLE and other diseases of impaired lymph flow.

Biology; Chemistry; Mathematics; Physics & Astronomy; Statistics

“Behavioral effects of microRNAs in Drosophila melanogaster”
Department of Biology, College of Science
By: Nicholas Johnson

Micro-RNAs (miRNAs) are short, non-coding ribonucleotide sequences that post-transcriptionally downregulate gene expression by binding complementary mRNA strands. The primary mechanisms by which miRNAs act include impeding ribosomal activity during translation, deadenylating mature mRNA strands, and inducing double-stranded RNA cleavage. miRNAs and the mechanisms by which they act are evolutionarily conserved, allowing them to be studied in many different genetic models. Drosophila melanogaster is a well-characterized model used to study the genetic underpinnings of neurobiology and behavior. Drosophila miRNAs have recently been implicated in the genetic regulation of complex behaviors, such as the self-righting response in larvae. Our lab conducted a single miRNA gene knockout screen to identify miRNAs that regulate performance of male sexual behaviors. Our behavioral analyses revealed significant differences in parameters such as courtship latency, courtship index, mating latency, mating success, and male-male courtship among miRNA knockout males.

“Title: NO Molecular Tagging Velocimetry and Thermometry in a Hypersonic Flow Field using seeded N2O”
Department of Chemistry, College of Science
By: Jason Kuszynski

Nitrous oxide (N2O), otherwise known as laughing gas, is frequently used for a variety of applications, including enhancing engine combustion and medical anesthesia. This reagent is also ideally suited for determination of velocities in hypersonic flow fields. When compared to similar gases such as nitrogen dioxide (NO2) or nitric oxide (NO) which can both easily react in air and water vapor to form toxic nitric acid (HNO3), nitrous oxide can be safely evacuated into atmosphere with minor concern for the local environment. In this experiment, nitrous oxide is seeded into nitrogen gas (N2) and passed through a de Laval nozzle, achieving a hypersonic flow at a temperature of 58 K. Then, a 193 nm laser dissociates this gas into a small amount of nitric oxide for tagging to measure the velocimetry. The small amount of NO produced by the photolysis of the N2O molecule is optimal for laser based thermometry within hypersonic flow fields. This NO tag is then probed by another laser at 226 nm with varying time delays. Fluorescence from the probed NO is captured by an iCCD camera where subpixel laser line center displacements were determined by fitting pixel intensity profiles to a Gaussian function and converted to a distance in mm. The calculated displacements were then divided by corresponding time delays to yield an average flow velocity measurement of 717 m/s. These results confirm the possibility of utilizing N2O in hypersonic flow field velocimetry.

“Mediated Sets”
Department of Mechanical Engineering, College of Engineering
By: Jacob Marshall Hartzer

Deciding nonnegativity of real polynomials is a key question in real algebraic geometry with crucial importance in polynomial optimization.

In 2014, Iliman and de Wolff introduced a new type of nonnegativity certificate based on sums of nonnegative circuit polynomials (SONC), which are independent of sums of squares (SOS). More precisely, the SONC cone and the SOS cone intersect, but they are not contained in each other. If a single circuit polynomials f is nonnegative, then it is a sum of squares if and only if a particular one of its exponents is contained in the maximal mediated set corresponding to the Newton polytope of f. Maximal mediated sets, which are purely combinatorial objects, were first introduced by Reznick in '89, but are not understood yet.

In this project de Wolff and I implemented Reznick's algorithm for the computation of maximal mediated sets in SAGE. Currently, we are building a database with thousands of these maximal mediated sets, which we will then investigate for common combinatorial patterns as a first step to understand these objects and hopefully derive new insights on the structure of the corresponding nonnegativity certificates.

“Methods for Finding the Completeness Limits for the ZFOURGE Data”
Department of Physics, College of Science
By: Miranda Apfel

In order to know the limits to which the data collected by the FourStar Galaxy Evolution Survey (ZFOURGE) is accurate, completeness rates must be calculated for the data. This includes detection threshold limits and magnitude limits. I use multiple methods to determine what the magnitude limit and threshold are for the three ZFOURGE fields in each of the ZFOURGE filters, as well as detail some future projects this data will be used for.

“Toxicogenomics in dissecting the BPA activity in endoderm derived organs”
By: Danila Cuomo

Toxicogenomics accomplished to standard toxicology are considered a powerful method for low-dose endocrine disruptor compounds (EDCs) testing.

In recent years, it has been developed a strong demand for reducing the use of small mammals in chemical testing. To meet this need, it is necessary to estimate the possibility of validly replace them with cellular and no-mammal models.

We explored this aspect investigating the activity of BPA as EDC in immortalized rat follicular cell line (FRTL-5), in primary pancreatic islets and hepatocytes, models for endodermal cells.

In FRTL-5 environmental doses of BPA induce the transcription of thyroid specific genes and their transcriptional regulators. Furthermore, we highlighted the activation of NF-kB pathway in thyrocytes after BPA exposure. Basic on our data, we developed a reporter cell line able to sense BPA at very low concentrations. By gene expression analysis, we revealed that thyrocyte transcriptome reacts dynamically to low-dose BPA exposure. Particularly, we uncovered its capability to weaken cellular response to a further stress factor.

Environmental exposure to BPA does not impact hepatocyte transcriptome. On the other side, the expression of few genes is altered in ex-vivo cultured pancreatic islets, leading to impairment of mitochondrial activity and apoptosis. Also in this case, the experimental activity highlighted that BPA exposure can alter cells ability to respond to damages.

Overall, we propose new mechanisms for BPA toxicity that are exerted, exclusively, in presence of further stressors. This observation suggests revisions in the development of experimental plans including multiple exposure conditions.

"Viral Mating of Lambda Ur and Lambda PaPa Sam7"

Department of Biology, College of Liberal Arts
By: Chandler James O'Leary

Bacteriophages (phages) are viruses that infect bacteria. They are the most numerous viruses in the world and can be found in almost every environment. Lambda is the most well-studied of these phages. Despite all that is known about lambda, little is known about the side tail fibers. This is because the isolate used in labs lacks side tail fibers. A detailed study of the side tail fiber requires the production of a large quantity of lambda with side tail fibers. However, the lambda variant that allows excessive phage production is encoded in a phage that lacks these tail fibers. I used a viral-mating approach to generate a hybrid lambda phage with tail fibers that will produce a sufficient quantity of the phage for further investigations.

"Embryonic Lethality in mice expressing conditionally-stabilized Ctnnb1 under the control of Vil-cre"

Department of Biomedical Sciences, College of Veterinary and Biomedical Sciences
By: Kishan Bharat Patel & Crystol Aneika Blair

Beta-catenin, encoded for by the Ctnnb1 gene, is regulated in the cell by a ubiquitin-dependent mechanism and becomes stabilized upon activation of the Wnt pathway, where it is a key transcriptional co-activator of WNT-responsive genes resulting in activation of cell cycle and division. Dominant-acting mutations in the gene leads to constitutive activation of the Wnt signaling and have been implicated in several forms of cancer, including colorectal cancer (CRC). In this study, mice carrying both a conditional stabilizing mutation of the Ctnnb1 gene (Ctnnb1tm1Mmt, hereafter called Ctnnb1F(Ex3)) and a Cre recombinase whose expression is under the control of the murine villin 1 promoter (Tg(Vil-cre)997Gum/J, hereafter called Vil-cre) thought to be specific to the colon and kidney, were expected to develop intestinal tumors but instead experienced embryonic or neonatal development. To isolate the time of death, pregnant dams were dissected from E10.5 days to E13.5 days, and the embryos were inspected for abnormalities and genotyped by PCR. Embryos were phenotypically normal and exhibited Mendelian inheritance ratio until E12.5 when the Ctnnb1F(EX3) Vil-cre double mutants had died and were being reabsorbed. The main focus of the research is now to isolate the cause of death which we suspect to be linked to defects in the development of the placenta. While the Vilin1 gene is expressed in the visceral yolk sac, it is not thought to be involved in placental development. Furthermore, identifying the molecular mechanisms underlying the cause of embryonic lethality will allow us to better characterize the role of canonical WNT signaling in placental development.

"Genetic Characterization of Single-stranded RNA Phage Lysis Genes"

Department of Biochemistry, College of Science
By: Jennifer Tran

Penicillin's discovery in 1928 revolutionized the way we treat bacterial infections. However, multi-drug resistant superbugs are now on the rise and becoming a serious medical problem. Bacterial viruses, or "phages" may provide a chemical antibiotic alternative. One specific subset of phages, single-stranded RNA (ssRNA) phages, are of particular interest because they have a single gene lysis system. They employ a single gene which causes the host cell to explode, or lyse. New antibiotic strategies or antibiotic targets could potentially be identified by studying these lysis mechanisms.

Three ssRNA phage lysis proteins are already known to block cell wall synthesis in Escherichia coli. Due to their high genetic diversity, it is likely that other of these phage lysis genes target different host proteins. Previously, only fourteen of these ssRNA phages were known, but recently over a hundred ssRNA phage genomes have been found by mining transcriptomic data. We annotated potential lysis genes from these sequences using a bioinformatic approach and have been synthesizing and testing these genes. We have found two novel lysis genes that are lytic in E. coli, one of which encodes the smallest known lysis protein at only 27 amino acids long, and are working towards identifying their lysis mechanisms.

"A Comparative Investigation of Neural Sodium Iodide Symporter (NIS) Expression in Teleost Fish"

Department of Biology, College of Science
By: Nick D. Holloway

Thyroid hormones regulate essential physiological processes, including metabolism, reproduction, and growth. A key constituent of all thyroid hormones is iodine. To obtain and concentrate iodine, vertebrates utilize a protein called the sodium iodide symporter (NIS). While most commonly associated with the thyroid and digestive tract, I have found preliminary evidence from a single fish species, Red drum (Sciaenops ocellatus), for a novel location of NIS expression: the brain. The objective of my research is to examine whether this expression exists in other teleost fish species and to more precisely identify the anatomical locations of neural NIS expression. Brains from several species of marine and freshwater fish, (tilapia; Oreochromis niloticus, channel catfish; Ictalurus punctatus, zebrafish; Danio rerio, and hybrid striped bass; Morone saxatilis) spanning three evolutionary orders (Cypriniformes, Perciformes, and Siluriformes), were collected and subjected to RT-PCR to identify any expression of NIS. With proof of its uniform distribution across these species, NIS may perform a novel, as yet undescribed role in iodine transport in the central nervous system. Localization of NIS expression within the brain is, therefore, a critical first step in elucidating its function.

“MonoTop Chirality”

Department of Physics, College of Science
By: Ian Taulli

Dark matter may be produced at the Large Hadron Collider (LHC) along with a single top quark in events called “MonoTop.” These events could demonstrate a new underlying interaction to explain the dark matter in the universe. Top quarks participating in new interactions would have a specific value of a property called chirality which can be either “left” (LH) or “right” (RH) handed. The ability to measure the chirality would allow top quarks produced in new processes to be distinguished from those produced by the standard model processes. Monte Carlo simulations were performed to evaluate what would happen at the LHC if there exists a model in which a new particle decays into a top quark and a dark matter particle. The chirality of the top quark is assessed through the ratio of the bottom quark (in the decay of the top quark) to the top quark’s energy. The simulation shows that the chirality of the top quark in such a model can be discerned to a high degree of accuracy at the LHC, providing a robust test of the model.

“Isolating and Purifying and Unknown Burkholderia contaminans MS14 Bactericidal”

Department of Biology, College of Science
By: Keren Herrera

Recently, the rapid pace at which bacteria can successfully evade antibiotics has alarmed public health officials, since they pose a great threat to human health. With this in mind, it is evident to see the value and urgency in discovering novel antimicrobials. This project’s focus is on the isolation and purification of an unknown bactericidal compound from Burkholderia contaminans MS14. While attempting to isolate and purify the unknown bactericidal agent, an interesting discovery was revealed. Ornibactin, a siderophore produced by B. contaminans, has been shown to play a significant role in the bactericidal activity of the unknown antimicrobial. These two MS14 products seem to be working in tandem in some way, which reveals an interesting mode of action for our target antimicrobial.

“New Lysis Functions in the Paradigm Bacteriophage Mu”
Department of Genetics, College of Agriculture and Life Sciences
By: Jacob Chamblee

Bacteriophage Mu is one of the classic paradigm phages, remarkable for its ability to replicate via high-frequency transposition. While much study has been devoted to the Mu transposition machinery, the Mu lysis system has been largely neglected. Previous analysis of the Mu genome successfully identified only one lysis gene candidate, the Mu endolysin, Lys. We report here a knockout analysis of Mu which identifies the missing lysis genes, including a holin and anti-holin with novel topologies. We present the discovery of a novel lysis regulatory protein, denoted "releasin", which is required for the function of Lys. Mutagenesis indicates that Lys is trapped in the membrane by three cytoplasmic lysine residues adjacent to its signal-anchor-release domain, which is resolved upon interaction with the releasin. The results are interpreted as evidence of a new lysis regulatory system in Mu, and possible biotechnology applications of the Mu anchor-releasin system are discussed.

“Electronic Transport Properties and Phase Transitions at
Transition Metal Oxide’s Lattice Interface”
Department of Physics, College of Science
By: Asim Ozmetin

We will investigate the electronic properties of 2DEG (two-dimensional electron gasses), and their phase transitions with magnetic fields in a temperature range of 300K-2K. The 2DEG is formed at the interface of layers of transition metal oxides. Preliminary data at hand shows, most promising samples available to us with different layer organizations are; [3LT0_10STO] x 4, [2OLTO_5STO] x 1, [3LTO_10STO_10YTO] x 4. While these types of materials themselves are insulators, at their lattice interface two-dimensional fermi gas is formed {1}, our goal is to measure the resistance and magnetoresistance of this structure.

“Exploring the Effects of the Gene SPX 2 in Dictyostelium Discoideum”
Department of Biology, College of Science
By: Jacob Basil Watson

Cancer is a collection of diseases that display abnormal cell proliferation with the potential to spread throughout the body. Much remains to be understood about the regulation of cell proliferation, but by using the model organism Dictyostelium Discoideum we have discovered that inorganic polyphosphate is acting as a signal to help regulate cell proliferation and cellular aggregation. This research project focuses on the construction of the gene knockout SPX 2 in Dictyostelium Discoideum and the construction of a profile of the gene's functions. The SPX 2 gene knockout has been constructed, and begun testing to create a detailed profile of the gene effects. My particular interest is to test the gene knockouts with polyphosphate. This is because SPX domains, which are found in eukaryotic phosphate transporters, have been observed interacting with a multitude of proteins to regulate inorganic phosphate uptake, transport, and storage in fungi, plants, and animals. My work will help to discover the mechanism whereby polyphosphate regulates cell proliferation and cellular aggregation in Dictyostelium. This research will then hopefully shed light on how cell proliferation and aggregation is regulated in mammalian systems. The effects on this regulation, in addition to the mechanism behind it in mammalian systems, may be learned and applied to areas such as cancer treatment.

“Novel Cationic Antimony Containing Compounds and their Catalytic Reactivity in Organic Reactions”
Department of Chemistry, College of Science
By: Nilanjana Pati

Organoantimony (V) compounds, especially cationic compounds, are known to be potent Lewis acids with applications in anion complexation and organic reaction catalysis. In this study, we will present the synthesis of several cationic antimony as well as their use as catalysts in the cycloaddition of oxiranes with isocyanates to yield oxazolidinones. Our results show that, in the presence of a nucleophile such as bromide, sterically encumbered stibonium cations such as the 9-anthryltriphenylstibonium cation are selective for the formation of oxazolidin-2-ones.

“Data quality monitoring software for data acquisition system on gas-electron multiplier muon detectors in CMS at the LHC”
Department of Physics, College of Science
By: Robert King

The Gas Electron Multiplier (GEM) detectors are novel detectors designed to improve the muon trigger and tracking performance in CMS experiment for the high luminosity upgrade of the LHC. Partial installation of GEM detectors is planned during the 2016-2017 technical stop. Before the GEM system is installed underground, their data acquisition (DAQ) electronics must be thoroughly tested. The DAQ system includes several industrial and custom-built electronic boards running custom firmware. The front-end electronics are radiation-hard and communicate via optical fibers. Software has been written to verify that the data produced by the detector electronics is valid, and that there are no hardware or firmware problems resulting from production. Once installed underground, the system must also be monitored to verify that no problems arise during normal data-taking operations. I discuss the software being developed to read out and process the data produced by the detectors, and the methods used to debug hardware and firmware problems using this information.

"Role of Lymphatic Endothelial Cell Caveolin-1 in Lipid and Fluid Transport"
Department of Biochemistry, College of Agricultural and Life Sciences
By: Bradley Dean Upchurch

The lymphatic system is a very complicated network of vessels, capillaries, nodes, etc. that span the length of our entire body. Specifically, the role of the lymphatic system lies in the structures called vessels and capillaries. Lymphatic vessels uptake and transport immune cells, fluid, and macromolecules from the interstitium for immune regulation and tissue fluid balance. Ultimately, the lymph is returned to the blood vasculature. How the fluid and solutes enter lymphatic capillaries has long been thought of as a passive paracellular mechanism in which macromolecules and fluid enter in through openings in the loosely overlapped cell-cell junctions. On the blood side, much research has shown that blood endothelial cells utilize both passive and active transport mechanisms to maintain barrier function yet allow necessary solutes to cross the endothelium. Recent studies have demonstrated that lymphatic endothelial cells (LECs) may utilize pore formation with membrane caveolae as an active transcellular pathway to uptake macromolecules from the interstitium. Caveolin-1 is a protein required for the formation of caveolae and transcellular transport processes. We hypothesized that LECs may also utilize active caveolar solute transport. To test our hypothesis, we utilized a mouse carrying loxP sites flanking exon 3 of the Cav1 gene. When crossed with mice expressing the enzyme Cre recombinase specifically in LECs, we generated mice lacking caveolin-1. Without caveolin-1, caveolae could not form in LECs. We utilized this mouse to identify changes in lymphatic uptake and transport of macromolecules over a range of size in vivo. We isolated and perfused lymphatic vessels from these mice to quantify changes in vessel permeability. In vitro, LECs from these mice, along with wildtype LECs treated with a caveolae inhibitor, demonstrated active barrier function to macromolecules. Our data thus identify mechanisms of lymphatic transport that actively regulate solute transport with implications in antigen transport and immune maintenance.

"Computing Central Values for Elliptic Curve L-Functions"
Department of Mathletics, College of Science
By: Meghan Shanks

We give an experimental method for calculating the central values of elliptic curve L-functions. We begin by providing some theoretical analysis of the method, and show that, on average, with appropriate choice of parameters, it can be expected to work well. In addition, we provide some data on elliptic curve L-functions of large conductor that support this method.

"Soft wall: a model of Casimir interaction between a quantum field and a conducting boundary"
Department of Physics, College of Science
By: Thomas Edward Settlemyre & Joseph Merritt

The presence of an electrical conductor changes the energy of the surrounding electromagnetic field. As a result, two nearby conductors attract each other in what is called the Casimir effect. In this project we study the case of only one conducting boundary. We further develop the Soft Wall's model studied by Fulling and others, which was the subject of Whisler and Murray's undergraduate thesis of 2015. In this model, the conductor is approximated by a potential that is a power of the distance into the wall. In the limit of large degree, the potential approaches a perfectly reflecting boundary. The soft wall model aims to solve the pressure anomaly's problem that comes out of a hard wall model with an ultraviolet cutoff. We report preliminary results from ongoing calculations of the stress-energy-momentum tensor both outside and inside the boundary.

"Characterize Endogenous Expression Patterns of Ghrelin Receptor in the Brain of Novel Reporter Mouse Line"

Department of Nutrition, College of Agriculture and Life Sciences
By: Aselin Puthenpurail

Ghrelin, acting through its receptor growth hormone secretagogue receptor (GHS-R), is an important energy sensor and metabolic regulator. However, the regulatory mechanisms of ghrelin signaling are largely unknown due to the limitation that the sites of expression of GHS-R are not fully documented. Due to the absence of specific antibody for GHS-R, study of GHS-R expression has been limited to RNA level by in situ and transgenic reporter, which shows great discrepancies. In this research, GHS-R expression is investigated using a GFP-Ghsr reporter mice, where GFP reporter is integrated into endogenous GHS-R gene, thus GFP expression precisely correlates with endogenous GHS-R expression. Immunohistochemistry and immunofluorescence staining is used to identify expression sites of GHS-R. Images were obtained using light microscopy and confocal microscopy, and detailed image analysis are performed for data collection. cFos expression was found to be higher in ghrelin treated group compared to saline treated group.

"Machine Learning on the Spin Glass State"

Department of Physics, College of Science
By: Humberto Munoz-Bauza

The existence of a spin-glass state in a field remains controversial. Most recently, machine learning techniques have found their way into condensed matter, as well as statistical physics, where neural networks have been trained to classify different phases of matter ranging from ice models to lattice gauge theories or strongly correlated electrons, to name a few. These promising results indicate that neural networks might also be able to discern if spin glasses -- model systems that do not display any spatial order but do have a finite-temperature phase transition into a glassy phase at zero field -- show signs of criticality when an external field is applied.

“Maximal Intensity Higher-Order Breathers of the
Nonlinear Schrodinger Equations on Different Backgrounds”

Department of Electrical Engineering, College of Engineering
By: Omar A. Ashour

In this work, we present fully periodic breathers of the nonlinear Schrodinger equation (NLSE) on both constant and elliptic dn backgrounds. The breathers can be generated by guaranteeing two conditions 1) the periods of the constituent breathers of the higher-order structures must be commensurate; and 2) the period of the constituent first order breather must be commensurate with the period of the background, an elliptic integral. Breathers on constant backgrounds of arbitrary order can be generated numerically using a fully systematic procedure, pointing to the possibility of generating them experimentally using frequency combs. The peak of such breathers can be calculated with ease using the Peak Height Formula (PHF) for solutions of the NLSE.

“Phosgene-free synthesis and characterization of linear
poly(tyrosol carbonate)s for biomedical applications”

Department of Chemistry, College of Science
By: Brooke Versaw

In recent years, the simultaneous pressures of increasing demand for high-performance plastics and heightened concern over sustainability have prompted substantial interest in naturally-derived polymers that achieve the performance benefits of their petroleum-based counterparts with minimal risk to human health or environmental sustainability. Tyrosol, a phenolic compound found abundantly in wine and olive oil, offers substantial promise as a natural product building block for polymer synthesis.

In this presentation, a phosgene-free synthetic strategy towards the synthesis of degradable linear poly(tyrosol carbonate)s will be described, wherein tyrosol is first converted into a difunctional monomer in two steps, then polymerized with AgF to afford linear polycarbonates with molecular weights up to 19 kDa. These polymers are anticipated to contribute to a growing library of naturally-derived engineering polymers with potential applications in biology and medicine.

“Evolutionary Climbing of the World's Highest Coastal Range”

Department of Wildlife & Fisheries Sciences, College of Agriculture and Life Sciences
By: Kelsea Lynn Anthony

Conquest of land from a marine ancestor has been a major leap in evolution, which has occurred independently multiple times in the history of life. A mainly coastal group, the oniscidean genus Ligia represents a promising model system to study evolution of terrestriality. Most Ligia species exhibit intermediate characteristics between ancestral marine and derived terrestrial isopods, and oniscideans, the most successful group of crustaceans to invade land, appear to have evolved from a ligiid-like ancestor. Few Ligia lineages, however, are strictly terrestrial, providing unique opportunities to understand evolution of terrestriality. We conducted molecular phylogenetic analyses to understand the origin of terrestrial Ligia found up to 2,400 meters above sea level in the Sierra Nevada de Santa Marta, Colombia, the world's highest coastal range (5,700 m). We tested the hypothesis that this terrestrial lineage is derived from a local coastal population that retreated into the mountainous mist forest.

Agric Econ; Agric Leadshp, Edu & Comm; Animal Sc; Biochem & Biophy; Bio & Agric Engr; Ecosys Sc & Mgmt; Entomology; Horticulture Sc; Nutrition & Food Sc; Plant Pathology & Microbio; Poultry Sc; Recreatn, Park & Tour Sc; Soil & Crop Sc; Wildlife & Fishrs

“What Are the Characteristics of School-Aged Children with a Low Healthy Eating Index?”
Department of Agricultural Economics, College of Agriculture and Life Sciences
By: Katherine Fisher

Today, nearly one in three children is overweight and one in five is obese which represent 31 percent and 17 percent of all children, respectively. Despite the increasing rates in obesity, there is also an alarming rate of food insecurity. The Hamilton Project conducted a study, concluding that almost one in five children lived in food insecure households in 2014. Nutrition and physical activity habits of school-aged children have previously been studied, with researchers looking for patterns among different groups. This study will add to this literature and examine factors affecting Healthy Eating Index (HEI) of school-aged children and physical activity habits. Some of the factors we considered include children’s characteristics, time spent in front of a television or PC, household income, household food security status, participation in food assistance programs, parent’s education level, head of household’s birth location and many other variables. This study makes use of the National Health and Nutrition Examination Survey (NHANES) dataset for 2011 through 2012 and cross-references it with the most recent HEI for the same two-year period. From a total of 9,756 observations from NHANES 2011-2012 data we selected only children of ages four through 19. The resulting sample consists of about 3,000 observations. Roughly 30% of observations in our sample are children of ages 4-7, 29% ages 8-11, 21% are 12-15 year olds and 19% are 16-19 year olds. The goal of this research is to identify ways to influence healthier eating habits in the future.

“Simulated effects of Indo-Pacific lionfish (Pterois volitans and P. miles) invasions on parrotfish (Scaridae family) populations on coral reefs in the Caribbean”
Department of Wildlife and Fisheries Sciences, College of Agriculture and Life Sciences
By: Jasmin Diaz-Lopez, Paola Camposeco, & Marissa Ortega

The introduction of invasive species in marine environments is rare but detrimental to the existence of native species. The Indo-Pacific lionfish species (Pterois volitans and P. miles) recently has invaded coral reefs across the Atlantic and Caribbean at an alarming rate. One keystone species currently being affected by the lionfish invasion is the parrotfish (Family Scaridae). The parrotfish plays a vital role in the stabilization of coral reef ecosystems by preventing a phase shift from coral to macro-algal dominated reefs. We proposed to study the dynamics of parrotfish populations in response to the lionfish invasion in the Caribbean. We reviewed the literature to obtain recent demographic parameters for both the lionfish and parrotfish, developed an age-/stage-structured population dynamics model for each species, and then integrate the two models in order to quantify the potential effects of lionfish on parrotfish population dynamics on coral reefs in the Caribbean. Our results suggested that an increase of Indo-Pacific lionfish population would cause a decrease in parrotfish populations.

“In Situ Determination of the Digestibility of the Bamboo Offered to Giant Pandas”
Department of Animal Science, College of Agriculture and Life Sciences
By: Katelyn Jane Franck

Giant pandas (Ailuropoda melanoleuca), are one of the most notable and powerful symbols of species conservation. Research on the species is sparse and especially lacking in the nutrition category. Although they contain a monogastric, carnivorous gastrointestinal tract, they primarily consume a highly fibrous diet of bamboo. In a previous in vivo study conducted at the Memphis Zoo, two Giant Pandas were fed four different species of bamboo across five months; July, January, March, May and October. For the present study, samples from each month’s diet were subjected to in situ microbial degradation inside bovine rumen for 48 hours. Fecal composites from each bear from each month were also digested. Dry matter (DMD) and organic matter (OMD) digestibility of samples was quantified and examined. When pandas consume bamboo, the pick a part the whole bamboo and consume each plant part individually. Primary plant parts analyzed included leaf, culm, shoot, and cover. As expected, the shoots had the highest value DMD (68.6%) and OMD (71.8%) while culms were lowest (9.1 to 28.0% and 8.3% to 27.8%, respectively). In most months, pandas preferred to consume culm plant part over the other components. It was observed that overall; DMD of culms consumed (average of 16.7% in January) was slightly higher than the digestibility of culm orts (feed refusals; which averaged 15.3% in January). For July; pandas preferred to consume culms although it was leaf season. In July, leaf ort DMD/OMD was actually higher (average 6%) than the overall value. Digestibility and diet selection followed the same trend for both bears utilized in this research. This analysis further solidifies the premise that giant pandas selectively consume their diets based on digestibility.

“Effect of Gin Selection and other factors on Lint Percent Yield in Upland Cotton”
Department of Industrial Engineering, College of Engineering
By: Oliver Guthmann

This presentation seeks to explore the possible sources of variation in lint yield by percent in Upland Cotton. Cotton samples will be ginned on three different machines and the lint percent attained will be evaluated. The emphasis is on pinpointing statistically significant sources of variation between the ginned samples. If variation is found significant due to the gin used, it can be accounted for in future projects.

“Malaria Mosquito Larvae in Competition for Limited Resources”
Department of Biomedical Sciences, College of Veterinary and Biomedical Science
By: Mackenzie Hartman

The mosquitoes of the Anopheles gambiae species complex are the primary vectors of malaria in Africa. These Anopheles species demonstrate large geographical overlap and their larvae inhabit the same small aquatic pools in nature. To understand how larval interactions between these mosquito species might shape their geographical distribution, I studied larval competition between four members of the An. gambiae complex: An. arabiensis, An. quadriannulatus, and two strains of An. coluzzii (Suakoko and Mopti) in resource limited conditions. To quantify competitiveness I measured larval and pupal survivorship and time to pupation/adult emergence. When raised on a limited food diet in isolation, An. coluzzii Suakoko demonstrated the highest larval survivorship. This was followed by the equally successful An. quadriannulatus and An. coluzzii Mopti and lastly An. arabiensis. Surprisingly, when I competed An. arabiensis against An. coluzzii Suakoko and Mopti in these same conditions, it outcompeted both with significantly higher survivorship. A possible explanation for these results may be that the species vary in multiple traits linked to larval success such as starvation tolerance and/or foraging efficiency. My current working hypothesis is that An. arabiensis has low starvation tolerance, which is why they do poorly when competing with one another in resource limited conditions. However, when put in competition with other Anopheles species, An. arabiensis is more successful, suggesting it may outcompete other Anopheles larvae in acquiring limited food. To begin testing this hypothesis I am measuring starvation tolerance in each of our Anopheles species.

"Set1 methylation of H3K4 in S. cerevisiae is required for cell survival under histidine starvation in presence of 3-AT and boron toxicity which is under the regulation transcriptional activator Gcn4 in the GAAC pathway"

Department of Genetics, College of Agriculture and Life Sciences
By: Nora McGuffey, Christina Higdon, Marvin Wirianto, & Victor Cardenas

Set1 is the only histone methyltransferase (HMT) that specifically targets the fourth lysine residue on histone H3 (H3K4) in the budding yeast Saccharomyces cerevisiae. Set1, a member of the multiprotein complex COMPASS, is capable of mono-, di-, and trimethylation of H3K4. Set1 H3K4 methylation was traditionally shown to lead to gene silencing, although more recent evidence shows its impact in activation of a number of genes involved in a variety of biosynthetic pathways that allow for stress response. These include ergosterol biosynthesis and Brefeldin A (BFA) resistance, as well as osmotic stress resistance. Set1 is shown to be involved in strain survival under the stress condition of the amino acid histidine starvation in the presence of 3-amino-1, 2, 4-triazole (3-AT) and the stress condition of boron toxicity. The observed survival under histidine starvation in presence of 3-AT was correlated with Set1-mediated monomethylation of H3K4 while Set1-mediated trimethylation of H3K4 needed under boron toxicity. Gcn4 plays a role as a transcriptional activator in the general amino acid control pathway (GAAC), historically related to amino acid starvation conditions. Recently, survival under boron toxicity through increased ATR1 expression, which encodes a boron efflux pump, is also shown to be transcriptionally activated by Gcn4. This study is the first to show a phenotype correlated to stress conditions that requires GAAC pathway response that is mediated by Set1 H3K4 methylation.

"How abiotic and biotic factors shape the coexistence of invasive species"

Department of International Studies, College of Liberal Arts
Yovana Marinkovic & Katherine Carbajal

Invasive species have had enormous, sometimes irreversible, impacts on biodiversity, human property, and economic activities throughout the world. Invasive plants can compete with native species for resources, disrupt evolutionary processes and hybridize with natives, reduce system productivity, alter disturbance regimes, and threaten native biodiversity. Theoretically, plant communities with high species diversity should be most resistant to invasion. While many empirical studies support this hypothesis, numerous other empirical studies suggest that communities with higher biodiversity tend to be invaded more easily. Hence, we aimed to understand the relationship between abiotic/biotic factors and the coexistence of invasive species. We analyzed an extensive dataset collected as part of the Forest Inventory and Analysis Program of the United States Department of Agriculture (USDA) Forest Service. We associated the data on coexistence of Chinese tallow, Chinese/European privet, and Japanese honeysuckle (SNIPET) with the data on landscape conditions, forest features, disturbance factors, and forest management activities (FIA Data and Tools) using the FIA plot identification numbers. We then checked the relationships. Our results indicated that some abiotic/biotic factors showed significant effects on the coexistence of invasive species.

"Comparing Systems of Forced Labor: Explanations for how the U.S. South's Slave Economy Became Prosperous"

Department of Sociology, College of Liberal Arts
By: Jasmine Zenn &Amy Elder

Throughout the 19th and early 20th centuries, the South surpassed the economic status of every country that used a similar form of coerced labor system. This research attempts to understand why the US South prospered using a system of labor that was economically detrimental to other nations. We propose that differences in spatial fixes, technical fixes, and colonial oversight are plausible hypotheses. The testing of these hypotheses will lead us to a better understanding of economic growth in the 19th century and give implications for current country economic development.

"Investigating Industry's Perspectives of Important Hiring Characteristics"

Department of Agricultural Communications and Journalism,
College of Agriculture and Life Sciences
By: Madalynn Kainer

Agricultural communications is an ever-changing field. Undergraduate students enrolled in agricultural communications programs are exposed to many different forms of communication (e.g., writing, digital media, television/radio production) and are encouraged to participate in high-impact learning experiences (e.g., internships, study abroad, research). However, many recent graduate are still ill prepared for the 21st century, global workforce. This research study will survey agricultural communications and journalism employers who are members of the

American Agricultural Editorial's Association, the ABM Agri Media Council, and the Livestock Publications Council. The questionnaire will ask participants to identify key characteristics of effective resumes, rank resumes based on those key characteristics, and place a monetary value on each resume. Conducting this survey will help us gain a better understanding of important hiring characteristics for agricultural communications and journalism students.

"Density-dependent phenotypic plasticity in Schistocerca lineata Scudder, 1899 (Orthoptera: Acrididae)"
By: Shelby Kerrin Kilpatrick

Locusts show an extreme form of density-dependent phenotypic plasticity known as locust phase polyphenism. Recent studies show that sedentary species related to locusts also exhibit some levels of density-dependent phenotypic plasticity. The spotted bird grasshopper, Schistocerca lineata Scudder, 1899 (Orthoptera: Acrididae), is widely distributed throughout North America. Populations of S. lineata have been found to be highly variable in coloration with at least four different known ecotypes. In Texas, the aposematic, or warning coloration, S. lineata ecotype feeds primarily on the toxic plant Ptelea trifoliata L., 1753 (Sapindales: Rutaceae) and derives chemical defense as a result. Individuals of this ecotype are bright yellow in color with striking blue eyes. Schistocerca lineata has previously been shown to exhibit density-dependent phenotypic plasticity, however the level density-dependent phenotypic plasticity that they exhibit has never been formally quantified. Here, we test the hypothesis that S. lineata nymphs reared from their first to sixth instar in either isolated or crowded conditions exhibit differences in their behavior, morphology, and color. The behavior, morphology, and color of individual S. lineata nymphs from each rearing condition was recorded, measured, and analyzed. Contrary to the previous report, we find no evidence of density-dependent phenotypic plasticity in S. lineata. Therefore, the threshold for sensing density appears to be very low for this species. It is probable that phenotypic plasticity in S. lineata is mediated by factors other than density, such as chemicals or other environmental stimuli, and further research is necessary to elucidate the components acting in this complex system.

"Evaluating the Effect of Snynthetic Estrogen (17 Î±-Ethinylestradol) Contamination Upon Foundation Darter (Etheostoma Fonticola) Population"
Department of Civil Engineering, College of Engineering
By: Andrew Richardson

Found in the headwaters of the Comal and San Marcos River, the fountain darter (Etheostoma fonticola) is on average three-centimeter length fish that feeds upon small invertebrates. Considered endangered by the United States and the International Union for Conservation of Nature (IUCN) The darter has been controversial due to its location in the Edwards Aquifer in south-central Texas, which is recognized worldwide for its aquatic species of flora and fauna, many of which are endangered or threatened like the fountain darter. The Edwards aquifer is also the sole water source supporting the industrial, agricultural, municipal, and recreational needs of nearly 2 million people. Because the darter generally poor competitor and is the first species affected by habitat disruption, the endangered fountain darter has been a focal point for controversies involving the endangered species act, state of Texas groundwater law, and private property rights. We developed an age-structured population matrix model for the fountain darter, calibrated the model within the constraints of published parameter estimates. We then integrated the available synthetic estrogen contamination data of fathead minnow (Pimephales promelas) into the model. We finally used the model to project population dynamics under scenarios of increased synthetic estrogen contaminations. Population projections indicated that a decrease in population growth due to increased synthetic estrogen concentrations were seen at a maximum of 1.0 ng/l. At higher concentrations, the population did not survive through its full life cycle.

"The hunt for the drivers of plant invasions: influencing factors and implications for mitigation of an invasive grass in forestlands of Tennessee"

Department of Ecological Restoration, College of Agriculture and Life Sciences
By: Lela Salome Culpepper

Invasions by non-natives contribute to the loss of ecosystem biodiversity and productivity, modification of biogeochemical cycles, and inhibit natural regeneration of native species. Japanese stiltgrass (Microstegium vimineum) is one of the most prevalent invasive grasses in the forestlands of Tennessee. Hence, we aim to identify potential determinants of invasion and quantify the relative importance of each factor. We analyzed extensive field data collected Forest Inventory and Analysis Program of the U.S. Forest Service to quantify the range expansion of Japanese stiltgrass from 2000 to 2011. We then identified potential factors influencing the likelihood of presence of Japanese stiltgrass using boosted regression trees. Our results indicated that the presence of Japanese stiltgrass on sampled plots almost doubled during this period (from 269 to 404 plots), spreading extensively, geographically. The probability of invasion was positively correlated with landscape features, forest features, and disturbance factors. Our results suggest that range expansion by Japanese stiltgrass will continue to expand in Tennessee. The efficacy of management practices can be guided by identifying these factors of invasions and reduce the likelihood of invasion.

"A Top Predator Returns: Effects of the Eastern Indigo Snake (Drymarchon couperi) on Herpetological Communities in Southern Alabama"

Department of Wildlife and Fisheries Sciences, College of Agriculture and Life Sciences
By: Hannah Gerke

Increasing focus has been placed on snakes and their role in the ecosystem. As a key predator of longleaf pine ecosystems, the eastern indigo snake (Drymarchon couperi) feeds on a variety of taxa, but recent studies have shown an innate preference for snakes. Once found throughout the southeastern United States, its decreasing range and numbers resulted in its extirpation from many areas. In 2008, reintroduction efforts for the eastern indigo were initiated in the Conecuh National Forest (CNF) in southern Alabama. Six years after its reintroduction, drift fences were constructed in control sites as well as sites where the eastern indigo was released to survey the herpetofauna. The objective of this study was to assess the effects of the eastern indigo snake on herpetological communities in Southern Alabama. Field data were collected from reintroduction and non-reintroduction sites within CNF to test the hypotheses that at reintroduction sites, (1) abundance of venomous snakes was reduced, (2) species diversity was greater, and (3) average sizes of snakes were larger. We found no significant difference in venomous snakes, species diversity, or size of females between the control and reintroduction sites. Surprisingly, the size (total length and mass) of males of the two most abundant species were significantly smaller in the reintroduction sites. When distance to wetland was plotted against catch per unit effort (CPUE) for all snakes in each site, the reintroduction sites had an R2 value of 0.793. However, difficulties in study design and sample size makes interpretation of these results uncertain.

International Affairs; Public Service & Administration; Accounting; Finance; Information and Operations Management; Management; Marketing; Business Administration; Business

"Elevator Impact on Egress of Heterogeneous Populations"

Department of Management Information Systems, Mays Business School
By: Kaitlin Wallace, Spencer Sullivan, Haoping Tan, Arijan Horvat

The continuance of both naturally occurring and human caused disasters emphasize the importance of evacuation planning for all people including individuals with disabilities. Though elevators are traditionally grounded during a disaster, the possibility of using them to speed up evacuations is gaining considerable attention. We use an agent-based simulation model to evaluate the impact of elevator use on evacuation times for heterogeneous populations, including individuals with disabilities, from large, critical infrastructure assets like airports. The results of these experiments can be used to inform policy makers of more effective, evidence-based evacuation procedures based on a better understanding of how elevator technology can influence evacuation performance from these structures.

Anthropology; Communication; Economics; English; Hispanic Studies; History; International Studies; Performance Studies; Political Science; Psychology; Sociology

“Iranian Nationalism on the Stage of Antiquity”
Department of International Studies, College of Liberal Arts
By: Rebecca Matlock

In the sixth century BCE, the Achaemenid Persian Empire stretched from the Nile River to the Indus Valley, incorporating the art of conquered civilizations into a collective Persian culture. In twentieth century Iran, the Pahlavi Shahs utilized this Achaemenid past in an attempt to fabricate a national identity. However, it is unclear how the role of antiquity in Iran has changed since the Islamic Revolution of 1979 that overthrew the Shah. My research will take an interdisciplinary approach, employing a modern perspective of nationalist theory in order to better understand the art of antiquity and how that antiquity has been employed in Iran since the beginning of Reza Pahlavi’s reign in 1925. This project seeks to add to the understanding of Iranian nationalism and to that of the politicization of history and ruins.

“Barriers to the Well-Being of Women in STEM: Ostracism and Incivility”
Department of Psychology, College of Liberal Arts
By: Kelly Dray

Science, technology, engineering, and mathematics (STEM) fields are essential to the U.S. economy, but there will be 2.4 million unfulfilled STEM jobs by 2018 (Office of Science and Technology Policy, 2016). One way to address this issue is to broaden the participation of women in STEM. The present study seeks to expand the literature on women’s underrepresentation in STEM by examining the extent to which subtle interpersonal maltreatment in the forms of ostracism and incivility’s affects job outcomes for early career STEM women and how these relationships differ as a function of the gender of the instigator.

Ostracism is defined as the interpersonal behavior of excluding or rejecting someone from a group. One example of ostracism is excluding others from group activities (Williams & Carter-Sowell, 2009). Incivility is defined as “intensity deviant behavior with ambiguous intent to harm the target, in violation of workplace norms for mutual respect.” (Andersson & Pearson, 1999, p. 457). Researchers have recently begun to examine ostracism in workplace contexts and found that it leads to lowered organizational commitment (Hitlan, 2006) and higher turnover intentions (Yin & Liu, 2013).

We formed the following hypotheses based on the above research.

Hypothesis 1: Greater experiences of ostracism and incivility are associated with more negative job outcomes (lower levels of self-efficacy, job satisfaction, career satisfaction, and satisfaction with their mentoring experiences, and higher need for mentoring).

Hypothesis 2: The effects of ostracism and incivility on negative outcomes are stronger when instigated by men than when instigated by women.

“Assessing the Agricultural Egalitarian Strategies of Economic Growth”
Department of Economics, College of Liberal Arts
By: Aastha Rajan, Jasmine Sausedo, Lexie Ford, & Aaron Ross

This research project aimed at testing the effectiveness of egalitarian institutions in the rise of economically wealthy nations based on the supposed success of dairy cooperatives in Denmark. It involved extensive case studies of agricultural productions in the United States of America and Canada, to be contrasted with Danish dairy production. The dairy production in all three nations and wheat production in USA and Canada were studied extensively using secondary sources. The agricultural histories provided weak support for the cooperative-based growth in USA and Canada, as the cooperatives formed later and were not focused on technological innovation. This led to the development of a new hypothesis about technologically-oriented cooperative activity acting as a potential substitute for the availability of newer arable lands. A statistical analysis of the impact of spatial expansion on productivity growth was conducted to assess whether the expansion into the frontier made more productive land available, thus, eliminating the need for a technological fix in the form of cooperative organization. The econometric study of stock and flow productivity variables of Canadian and American cases revealed a spatial pseudo-fix, meaning that expansion into new land or growing herds led to increased production, but not more productivity. These results were combined with the historical background on cooperative movement to conclude that the late rise of cooperatives was a probable reaction to the unsuccessful nature of the spatial pseudo-fix.

“Noble Lies: A Reexamination of Human Rights”
Department of Political Science, College of Liberal Arts
By: Lawson Hamilton

This project is an inquiry into the concept and political reality of human rights as a Platonic “noble lie.” It arises from a realization of the phenomenon that the rhetoric surrounding human rights does not match the reality of the human condition. Indeed, this project is built upon the assertion that human rights, rights every person is entitled to by virtue of their humanity, do not exist. This is not to deny that any rights exist nor is it necessarily a rejection of the possibility of human rights’ it is merely a summation of reality as it stands today. If one accepts such a conclusion, and that is a considerably large “if” then what exactly human rights are is an open question. In light of that question, what I suggest is a reexamination of human rights as a potential falsehood that is known by political leaders to be such, yet is presented as true for the supposed good of the community; in other words, as a noble lie.

The task ahead, then, is to articulate criteria for a right to exist and show how human rights fail to meet that standard. Then, it is critical to explore what human rights are, their historical development, and their modern character. Next, it is important to clarify what exactly a noble lie is. Finally, the task ahead is to present the argument that human rights are, in fact, a noble lie and discuss the implications of such a finding.

“James Joyce's ‘Ulysses’: The Creation and Development of "Oxen of the Sun"
Department of English, College of Liberal Arts
By: Hunter Corb

This essay proposes a manuscript analysis of the process by which Joyce appropriates phrases from texts, specifically Malory, and constructs his own narrative. Previous scholarship has focused on systematically categorizing these phrases, particularly of note being Robert Janusko’s “The Sources and Structures of â€˜Oxen of the Sun,” in which he argues that the Malory parody in the chapter contains, through “the power of the word,” the essence of Le Morte d’Arthur. Essentially, he refers to the literary form as concrete, where the physical word (containing both diction and grammatical structure) serve to present societal consciousness, However, Joyce’s conglomeration of literary styles in an evolutionary pattern serves to show the ephemerality of style and transcendent thought, where the literary form and the written word are nothing more than garments that enclose, and often restrict, the essence of societal consciousness, i.e. belief and thought. For example, when the Malory parody describes medical instruments in terms of the fantastical and imaginary (dragons and dwarves and the like), Joyce shows the extent to which we exchange the garments of earlier texts with our own, appropriating not just the language but the ideas and thoughts, reconfiguring them to fit our own societal contexts. This new historical approach is imperative to an understanding of Joyce’s reception of these older texts and his play with the ephemerality of style.

“Representation of Afro-Latino peoples in film and television”
Department of Communication, College of Liberal Arts
By: Danielle Hernandez

In this paper, I will examine the concept of Afro-Latinos and their presence in United States films and television shows. I am half Nigerian and half Puerto Rican, so this topic is something that is central to my life daily. Today, race in the United States is a sensitive topic and is mainly centered around if one is black or white. The idea of a person who is dark-skinned and Hispanic is inconceivable for many people. Those who are Afro-Latinos find it difficult to navigate in a society that keeps them marginalized. United States film and television should eliminate the invisible barriers such as age old stereotypes, gendered notions of being a Latino and Black in America, and simple marginalization that prevent Afro-Latinos from getting recognition in mainstream media.

In this paper, I will examine the idea of the Afro-Latino identity and explain how it has played out across different film and television shows in the United States. I will demonstrate how race in the US influences how Afro-Latinos are portrayed, especially considering color blind casting and colorism, particularly because many Afro-Latinos vary among skin tone. In particular, I examine how these portrayals affect the wider American public perception. In researching this topic, I evaluate popular films and well-known telenovelas with known Afro-Latino actors and utilizing articles that explore the Afro-Latino identity.

“The Interaction of Household Debt and Monetary Policy; What Does State-Level Data Say?”
Department of Economics, College of Liberal Arts
By: Hayden Parsley

I examine how monetary policy has various effects for states across the U.S. depending on the state's level of household indebtedness. Using panel regressions, I find that monetary policy has smaller stimulative effects on a state's output growth in states with high levels of debt. I then investigate the effectiveness of the same mechanism before and after the Financial Crisis of 2008. I also find that monetary policy after 2008 has a stronger effect on the growth of output and the growth of debt than monetary policy prior to 2008. These results suggest that policy makers should not rely on expansionary monetary policy, during times of high debt, to stimulate the economy, but instead should use other stimulative means such as fiscal policy.

“Don't put your religion/politics in my internet memes - Dissonance in Political-Religious Meme Discourse in the 2016 Elections”
Department of Communication, College of Liberal Arts
By: Cody Wolf, Katherine Dundas, & Katherine Arredondo

The paper presents research on religious and political Internet memes created during the 2016 Presidential election cycle. Memes combine visual and written forms of communication and often synthesize complex arguments in simplistic ways and spread these messages as they are shared virally across the Internet. A study of 24 case studies on specific candidates and core issues related to discussions around religion and politics in the 2016 elections generated 163 religious/political memes for analysis. We sought to investigate the ways religious and political ideas circulate and are framed through public discourse generated within contemporary Internet meme culture. Drawing on dominant genres and frames identified by Aguilar et al.’s (2017) work on religious Internet memes, we note “Religious Figure Memes” (invoking well-known religious figures and tropes) and “Reaction Memes” (memes reacting either to current social-political issues or current events) were most common. This shows that meme creators draw on recognized tools of memetic discourse, and popular assumptions about religion, when they seek to represent the relationship between religion and politics online. The majority of memes in this study can be classified as using the “Mocking” frame, where memes tend to attack a specific political leader, group, or religious ideology. This study demonstrates how Internet meme discourse about politics and religion mirrors the fraught relationship created by “political God talk” offline. It also highlights common stereotypes and ideological divides, supporting the claim mixing religion and politics creates noted contradictions and dissonance that can be rhetorically divisive in an increasingly technologically-dominant culture.

“Rhetorical Dehumanization in War and Combat”

Department of English, College of Liberal Arts
By: Olivia Oliver

I will investigate the rhetoric of dehumanization in regards to persons in opposition to the United States military during times of war from both the perspective of the soldier and the civilian. I will accomplish this through rhetorical analysis of literary works of non-fiction and fiction to thoroughly gage what has been experienced and stated, and what has been imagined about military life especially times in combat. I will also quote and analyze oral histories compiled from the After Combat: The Voices Project database. I will specifically look at diction (word selection), figures of speech, and tone as the main variables of my rhetorical analysis, as well as the setting and attitude of the persons and characters involved of the story being analyzed, to examine the trend of dehumanization within military culture. I will further extrapolate on the multiple meanings of the quotations and arguments by explaining their facility and why they constitute as dehumanizing statements. This research will be a means to evaluate whether or not the process of dehumanizing military combatants, or the “enemy” is a manifestation of particular military culture or a social exaggeration generated by civilians viewing war from an outsider’s perspective. Ultimately, the purpose of this thesis is gain a more detailed understanding of the origins dehumanizing rhetoric in the United States military and why is it still used in present combat.

“Impacts of Identity Externalization”

Department of English, College of Liberal Arts
By: James McLean Bell

Facebook has emerged as the most prominent social networking website in the world. Its electronic interface platforms news, networking, and communication. This thesis analyzes the impacts of identity externalization through Facebook. To analyze Facebook, a number of methods were undertaken. The first chapter analyzes the linguistic structures of Facebook drawing on prior research by scholars in the field of Rhetoric. Their scholarship provides a theoretical framework to understand the way language constructs identity. The second chapter aims to explain the neoliberal practices Facebook uses to construct their site. These practices are identifiable within the Social Graph, which is used to construct the Newsfeed. The third chapter analyzes the Newsfeed, which is where most of the information on Facebook is transmitted. Moreover, an analysis of the algorithm gives us a structural understanding of the way that the Facebook Newsfeed structures information. Finally, the last chapter interlays the research of all three chapter and explains how identity externalization through Facebook changes identity. From the research, it is concluded that Facebook stratifies identity by intensifying the impacts of language and neoliberalism. The Facebook algorithm makes people’s core value structures and beliefs narrower by presenting only reaffirming information.

"Restructure of Health Care Initiatives for Cultural Involvement and Integration in Low Resource Communities"

Department of Anthropology, College of Liberal Arts
By: Cade McGovern

Ensuring economic efficiency and cultural sensitivity in global health care delivery efforts have long been difficult tasks to the multitude of stakeholders involved in this dynamic process. The purpose of this project is to assess past health care delivery initiatives in low resource communities that have been impacted by natural disaster. Additionally, it will demonstrate the need for health care delivery efforts to place a higher priority on the sustainability of the project and the sociocultural forces inherent to the target population. If making a resilient, constructive change within a community is the end, the means should include innovative initiatives put into action on the ground without overlooking the importance of taking the necessary steps to ensure these can and will be maintained. Anthropology and public health can be applied to this problem by offering insights into the application of social networks and cultural resources important to the community's health following a disaster. A literature review was conducted to outline cultural factors that can be consulted as immediate and long-term health care delivery efforts are formulated and put into action. The research reviewed provides support for the effectiveness of communally sustainable health care initiatives that incorporate the cultural knowledge of the community over stand-alone ventures. Additionally, more active field work and surveying should be conducted to determine the different factors that should be assessed given different cultural, economic, and environmental circumstances.

"Predicting Serial Murder"

Department of Mathematics, College of Science
By: Bethany Grace Patterson

This paper uses regression analysis to examine the relationship between the number of murders a serial killer will commit and the number of years between a serial killer's first and last kill in the United States. The data comes from a large database that contains a global catalog of serial killers and variables pertaining to each killer. Other serial killer characteristics such as gender, level of education, reason for kill, if they killed in multiple states, and if they used multiple methods to kill are included as control variables. The regression yields significant results.

“Gender, Costs, and Non-Promotable Tasks: Breaking the Glass Ceiling with increased information”

Department of Economics, College of Liberal Arts
By: Adam James Williams & Ryan Mulvihill

We investigate whether introducing heterogeneous costs into a volunteer’s dilemma game reduces the gender difference found in Vesterlund et al. (2016). Specifically, we ask if telling subjects they have a low or high cost for completing a non-promotable task decreases the high propensity for women to volunteer for non-promotable tasks. Our initial evidence indicates that the same gender gap in volunteering persists among high cost individuals, but there is no gap among low cost individuals. Furthermore, our results are significantly related to risk preferences but risk preferences alone cannot explain the gender difference.

“Generation Y’s Need for Internet Memes”

Department of International Studies, College of Liberal Arts
By: Hanah Khan

It is important to discuss memes as a serious topic of online information. The underlying messages encoded in these seemingly trivial images of humor is often dismissed and discarded, due to the nature of memes being crude in content. Regardless, memes are highly relevant means of communication in millennial outlets, and it is vital that we examine the reasons behind them and better understand the relationship between young millennials and viral internet memes. We must critically analyze the phenomenon of memes by first understanding how a meme is created and the process a meme undergoes to become a viral sensation that results in its success and longevity in popularity, as thoroughly explained the research of Limor Shifman.

The research conducted on memes shows that memes are a reflection of how Generation Y responds to current events. The dependency of millennials for social media use is derivative of the predictions of Marshall McLuhan and the way in which millennials use memes as indirect expressions outside of interpersonal online interactions demonstrates the agency of users, which is tied to the writings of Stuart Hall. This paper further explains how users that are creating and sharing memes are doing so for more than a routine, but how that regular consumption of memes is a coping mechanism for the pressure millennials face with constant input of information through technology use. Memes are the byproduct of being part of a technological age fueled by digital information is the lack of relief from our devices when it no longer easy to simply “unplug.”

"Lemonade: A Gateway Drug to Activism in Popular Performance"
Department of Performance Studies, College of Liberal Arts
By: Nicole Green

The divide between the popular and the esoteric typically prevents virtuosic and overtly political material from reaching the masses, limiting its reach to more high-brow consumers of art. Beyoncé's 2016 release, Lemonade, however, exemplifies how a high level of artistry as well as social consciousness can have a place in popular art. Throughout her career, Beyoncé has been progressively moving farther from her girl-group roots towards the position of a socially-conscious and critical artist, all while maintaining "if not increasing" her popularity. Much of what sets Lemonade apart from other contemporary popular art is its interdisciplinary nature as well as several strategically placed cultural and historical references. I explore a mix of fan discussion and popular press produced around and against Lemonade, integrating this with scholarly writings on the black female body, high art, and authenticity in performance. By paying attention to how different audiences react to the work, I examine how reviewers receive Beyoncé's artistry and authenticity and ultimately how this promotes or hinders her accessibility as an activist to her audience. This study of Beyoncé will contribute to a discussion about how politically conscious and virtuosic art can be accessible and popular.

"Homework Effort and Course Performance: Evidence from a Field Experiment"
Department of Economics, College of Liberal Arts
By: Cecilia Moreira

We conduct a field experiment at Texas A&M in which students enrolled in an online course are provided information about the correlation of homework effort on exam scores via a one-time email. We use a differences-in-differences approach to test whether providing this information has an effect on student performance as measured by homework, quiz and exam grades.

"'Brotherhood' in War: A Rhetorical Approach to Understanding the Unity Among Soldiers"
Department of English, College of Liberal Arts
By: Jacob William Cotton

My research will elucidate the idea of "Brotherhood" as it relates to the soldiers fighting for our country. First, I will attempt to define a clear concept of brotherhood as it relates to the American Armed Forces. Then I will approach these questions: What does it entail to be enveloped in the overarching promise of brotherhood? What does it mean to be a "brother" to your fellow soldier? Where did this commitment to the brotherhood develop? Finally, is the brotherhood gendered? Looking at the idea of masculinity, I will decipher what it truly means to be a man in America as this relates to ideas of connectivity and friendship.

More importantly, I will ask the question, when does brotherhood truly begin to affect a soldier's life? I will investigate possible forms of initiation into this association within the American Armed Forces, whether explicit or not, to begin breaking down the rhetoric of the term. I will explore the rhetoric through the following guiding questions: Is the rhetoric of brotherhood coherent, or does its meaning possibly transform based on the combination of soldiers, battles, and various circumstances? More specifically, what is the precise language of the "Brotherhood?" I will investigate brotherhood as a possible form of propaganda, not only challenging the validity but also the very apparatus of the rhetoric surrounding the term "Brotherhood." I will also take time to illustrate the valuable interviews my team and I have conducted for After Combat: The Voices Project and how the voices of men and women returning home from deployment in Iraq and Afghanistan have helped shape my understanding of the "Brotherhood."

"Marginalized Philosophy: Rocky Horror Picture Show and the Unseen Influence"
Department of English, College of Liberal Arts
By: Nicole Schultz

When Rocky Horror Picture Show first aired, the film was unappreciated to the point of mass rejection and repulsion. Despite the popularity the film attracts today, the thematic complexity and meaning of the film is negated due to its cultish appeal. Though many have explained the film's effect upon the LBGT community, only a few have studied the film as a work of literature, and this only with focalization, not as a comprehensive study. I, in my research, seek to prove that through the background, the mies-en-scene, even cultish films can posses transcendent themes and existential influence.

"A Calculated Relationship: Rafael Correa and the Indigenous Movement"
Department of History, College of Liberal Arts
By: Juan Fernando Luna

This essay aims to unveil the mutualistic relationship formed between President Rafael Correa and the Ecuadorian indigenous movement that led to the incorporation of plurinationalism into the 2008 Ecuadorian Constitution. To this end, this essay will frame the political context between 2006 and 2008 within the larger history of plurinationalism, the indigenous movement and the Ecuadorian presidency. In order to accomplish this, the relationship formed between the Ecuadorian presidency and the indigenous movement between 1996 to 2003 will be closely analyzed. The historical development of plurinationalism and this relationship will reveal how the indigenous movement's extensive experience with presidential politics made it skeptical of President Correa's promises, and consequently ended the possibility of an electoral coalition with him in 2006. It will also bring to light how the three presidential overthrows between 1997 and 2005 forced President Correa into a mutualistic relationship with the indigenous movement to secure his tenure as president. Finally, by analyzing the political context between 2006 and 2008 as a product of its history, this essay will demonstrate how the indigenous movement maneuvered the political system and joined President Correa's push for a new constitution only when it was most beneficial for it "after the 2006 elections" thus creating a relationship between two opposing forces with different agendas.

“Blooming in the Distance”
Department of English, College of Liberal Arts
By: Marc Schneider

The thirteenth episode of Ulysses, “Nausicaa,” is especially difficult to interpret, as is demonstrated by the vast amount and the diversity of secondary literature concerning its narrative voice alone. The episode is written in what Joyce called a “namby-pamby jammy marmalady drawersy (alto l’!) style with effects of incense, mariolatry, masturbation, stewed cockles, painter's palette, chitchat, circumlocutions, etc. etc.” (SL, 246). Many scholars thus read the narrative as free indirect discourse, meaning that Gerty’s consciousness shapes the style. However, Joyce himself, in response to his friend Arthur Power’s inquiry into Bloom’s encounter with Gerty, curtly stated, “Nothing happened between them.” It all took place in Bloom’s “imagination” (Power, 32). This contradicts the notion that Gerty’s mind conditions the narrative, and suggests instead that it is fully determined by Bloom’s. The purpose of this paper, then, is to expound issues with various possible interpretations of the Nausicaa episode, then to determine the most viable and comprehensive method for interpreting it. Overall, I maintain that what we are reading is the projection of Gerty’s consciousness as imagined by Bloom, who fantasizes from a distance.

“On Access and Excess: Birth Interventions for Latinas in the U.S. & Mexico Border Region”
Department of Sociology, College of Liberal Arts
By: Amanda Gomez

The United States southern border is expanding rapidly. Already home to over 7.2 million people, this region also contains two of the nation's top ten fastest growing cities (McAllen, Texas and Laredo, Texas) (DHHS 2009; USMBHC). Additionally, the border is culturally distinct from other places in the United States. Many border residents are Latino with low socioeconomic status and limited access to healthcare (USMBHC 2003). Latinas face particular challenges in this environment as individuals with at least two marginalized identities. Given our nation's history of forced sterilization, Latinas also have a history of coerced birth interventions made possible through gender, ethnic, lingual, and socioeconomic power differentials (Valdes 2016). Using Childbirth Connection's Listening to Mothers III survey, border Latinas' rates of birth interventions will be compared to two groups: 1) border non-Latinas and 2) non-border Latinas. The birth interventions of interest are cesarean section, episiotomy, epidural/drug-facilitated pain management, induction, and assisted delivery. Drawing upon intersectional theory, rates will also be compared according to socioeconomic indicators (educational attainment and private health insurance status) and geographic region (border region versus non-border region). These rates will be contextualized with qualitative data about these women's hospital experience. This study will provide insight into how many of these women receive these interventions, why they are done, and who makes these decisions.

"Stereotype Threat Differences for African-American Students
from Various Socioeconomic Backgrounds"
Department of Economics, College of Liberal Arts
By: Chandon Adger

Understanding the variation in performance amongst African-American students on academic aptitude tests has been a hard-pressed task for a while. Despite stereotype threat becoming more documented in relation to academic aptitude tests as an explanation for such variation across racial lines (Steele and Aronson 1995), the source of racial differences in intellectual ability has not been agreed upon in the literature, there has been some deal of evidence that environments can affect intellectual ability (Kaplan 2015, Sesardic 2010). This study looks to find differentiated effects due to negative stereotypes dependent upon various measures of low SES of African-American students as predicted by (Johnson Richeson Finkel, 2011). These results will help to better understand the mechanism(s) by which the threat caused by stereotypes affect the performance of African-American students on intellectual ability tests.

"Has Fear from Concealed Carry on College Campuses Led to Negative Externalities?"
Department of Economics, College of Liberal Arts
By: Katherine Bornman

Laws protecting the right to carry a concealed handgun on college campuses have been passed in ten states, and more states are considering similar legislation. A primary intent of these laws is to allow one to utilize one's second amendment right to bear arms to protect one's self from mass shootings on college campuses. However, there may be an unintended consequence from these laws permitting guns on college campuses: has permitting college students with licensed concealed handguns on campuses created a sufficient amount of fear in the participating university administrations to create a positive shift in the average grade distributions? To phrase more simply, are professors more likely than not to provide better grades for fear of students' carrying a permitted firearm?

"Triangular Arbitrage with Bitcoins:
Department of Economics, College of Liberal Arts
By: James Andrew Barker Jr.

Bitcoins are bought and sold with most major currencies, and the resulting prices are "exchange rates" of currencies per Bitcoin. The price of Bitcoins in national currencies have been quite volatile over the brief period of Bitcoin's existence. Among national currencies, the possibility of triangular arbitrage leads to near equality of bilateral exchange rates and exchange rates obtained via triangular trade. We explore the relationship between a bilateral exchange rate of two major national currencies and the exchange rate that can be obtained via triangular trade through Bitcoins. Features of the Bitcoin exchanges make it difficult to meet conditions necessary for strict (risk-free) arbitrage, but market pressures from the threat of arbitrage constrain the national currency prices of Bitcoins to adjust toward the bilateral foreign exchange rate obtained in the traditional foreign exchange market. In this paper, we compare the Bitcoin implied exchange rate between the US Dollar and the Chinese Renminbi to the market US Dollar/Renminbi exchange rate, and show that the Bitcoin implied rate adjusts toward the FOREX market rate due to market pressures from the threat of triangular arbitrage. One implication is that the bilateral rate and the triangular trade rate obtained from trade in Bitcoins are cointegrated, and we study the adjustment process when these exchange rates are misaligned.

"Testing the Cursor Trajectory and Emotion of Potential Adult Attention-Deficit/Hyperactivity Disorder in the Go/No-Go Task"

Department of Psychology, College of Liberal Arts
By: Stanley Sun

Attention-deficit/hyperactivity disorder (ADHD) is a common and underdiagnosed mental disorder that is highly prevalent amongst children and adults around the world. However, the diagnostic methods used today are designed for adolescents; as a result, primary care physicians encounter significant difficulties when diagnosing ADHD in adults. In the proposed project, I aim to clarify main characteristics of adult ADHD by analyzing their symptoms with respect to a group of higher order cognitive abilities known as executive function by scrutinizing the relationship among impulsivity, emotion, and motions. It is known that ADHD patients have a noticeable deficiency in the ability to inhibit emotions, also known as emotional impulsivity. Research indicates that people's emotional states are reflected in their body motions. In this regard, I hypothesize that executive control is manifested in body motions (e.g., directed hand movement) in adult ADHD patients. To test this hypothesis, I will measure the movements of the computer cursor in the go/no-go task, and compare the cursor movement patterns of those who are vulnerable to ADHD and those who are not. If found successful, it would help primary care physicians better diagnose ADHD for adults.

"Feeling and Experiences of non-Heterosexual Men in the Workplace"

Department of Sociology, College of Liberal Arts
By: Shelby Chapman & Payton Martinez

In this research paper, we analyze the differences in experiences between heterosexual and non-heterosexual men in the work place. Previous research has shown there to be discrimination against non-heterosexual men in our nation (Bostwick, Boyd, Hughes, West, & McCabe, 2014; Holland, Rabelo, Gustafon, Seabrook, & Corina, 2016; Lombardi, Wilchins, Priesing, & Malouf, 2002; Rabelo & Corina, 2014). We concentrate specifically at the differences in the work place. We focus on two different types of work outcomes. The first is based on the feelings of men, which include job satisfaction and feelings about work. The second is based on the experiences of men, which include promotion, demotion, future job outlook, and reasons for not working. We hypothesize that non-heterosexual men have more negative feelings about their jobs and more negative experiences at work as compared to heterosexual men. We use the Kaplan Longitudinal and Multigenerational Study (KLAMS) data set, which is a collection of 5,449 interviews between the years of 1994 and 1998 of 35 to 40 year old people living mainly in Houston, Texas. Using this data set, we compare the work feelings and experiences of heterosexual to non-heterosexual males. We control for race, class status, education, marital status, job status, and type of work. We expect non-heterosexual men to report a more negative experience at the work place based on how well they perform, how they feel, and if they have moved up on the leadership ladder.

“The Experiences of Non-Heterosexual Women in The Workplace
Department of Sociology, College of Liberal Arts
By: Humza Khalid

As a country, we have progressed much in the way of civil rights. We live in a time with more equality for all people than has been previously seen. However, we are still at a distance between how we treat others whose views and lifestyles differ from our own. The purpose of this analysis is to look at the workplace through the eyes of non-heterosexual women. Small-scale studies of only lesbian women have analyzed the effect of disclosing lesbian identity at the workplace (Driscoll, Kelley, and Fassinger 1996; Boatwright, Gilbert, Forrest, Ketzenberger 1996; Smith and Ingram 2004). Ragins (2004) calls for more systematic studies about the experiences of LGBT population at the workplace. We focused on positive and negative workplace experiences, as well as the emotions about these occurrences. We hypothesize that non-heterosexual women have more negative occupational experiences, as well as more negative feelings towards their workplace than heterosexual women. We use the Kaplan Longitudinal and Multigenerational Study (KLAMS) data to test these hypotheses. In particular, we use the in-home and phone interviews (a total of 5,449 interviews) from Generation 1, Time 7 collected between 1994 and 1998 when the respondents are 35 to 40 years old. Our outcomes include job satisfaction, negative work feelings, and occupational elevation. We control for race, class status, education, marital status, job status, and type of work.

“Building or Dismantling Networked Individualism? How Social
Good Apps Contribute to Social Good”
Department of Telecommunication MediaStudies, College of Liberal Arts
By: Lauren Mathews

This presentation explores the traits of apps designed to encourage the building of social good found on iTunes and consider what kind of actions they promote and the extent to which these traits match features of “networked individualism.” While some argue social networks promote individualized behaviors that can be viewed as self-serving, this study suggest that network focused action promoted through certain mobile apps can encourage pro-social behaviors that build the common social good in a network society. Social good can be defined as doing something that provides some sort of help to the general public. Through the pilot and then full study 151 apps were analyzed, and five genres of social good apps identified, including: educational-based, activism and initiative-based, organizational-based, practice-based, and entertainment apps. These genres of apps were then studied in relation to dominant characteristics of networked individualism, as identified by Raine & Wellman (2015) and whether such correlations encourage or discourage the generation social good amongst users. Overall this study demonstrates that while certain apps for social good demonstrate key characteristics of networked individualism, these actually support behaviors that Derrick

Feldmann argues are essential for building positive and sustaining social movements. Thus we suggest digital tools, such apps, which may be seen as promoting highly individualized actions can be seen as key contributions to building social good in ways that encourage “networked altruism” and benefits society.

“College Students' Portfolio Construction for Elective Courses”

Department of Business Administration, Mays Business School

By: Yan Bai

We derived the dominant strategy for students selecting elective courses by constructing a game structure according to similar problems. The results under conditions of perfect information and imperfect information indicate that students are not simply following the crowd. We have also come up with possible solutions for the waste of resources as a result of current elective courses' selection rules.

Veterinary Integrative Biosciences; Veterinary Large Animal Clinical Sciences; Veterinary Pathobiology; Veterinary Physilogy & Pharmacology; Veterinary Small Animal Clinical Sciences

“Artificial Vertical Transmission of Avian Bornavirus in Mallard Duck Eggs”

Department of Biomedical Sciences, College of Veterinary Medicine and Biomedical Sciences
By: Serene Yu

Avian Bornavirus (ABV) causes Proventricular Dilatation Disease (PDD) in over 50 different bird species but clinical symptoms are most severe in psittacines, which can jeopardize conservation efforts and negatively impact pet bird health. The virus is most likely transmitted through a horizontal mechanism, when uninfected birds come into contact with infectious feces/urine. However, the likelihood of vertical transmission, from mother to egg, has not been studied as extensively. This study experimentally inoculated mallard duck egg embryos with ABV genotype 2 to mimic vertical transmission. The aims of in ovo inoculation were to determine if infected eggs will produce ducks that are infected, if infected ducks will shed the virus in their fecal/urine samples, and if there are grossly obvious pathological/neurological symptoms as a result of being infected. Findings from this study would illuminate methods of improving husbandry and reproduction control for captive bird populations in order to decrease ABV and PDD prevalence.

“Using Automated Enrichment to Improve the Human Animal Bond”

Department of Biomedical Sciences, College of Veterinary Medicine and Biomedical Sciences
By: Jane Joy Varkey

Stress has been shown to have negative mental, physical and social effects on animals. Early socialization through positive association or positive reinforcement has been shown to decrease an animal’s stress to certain stimuli. For a pray animal like the birds we house in the Schubot Center at Texas A&M University, a new person coming and interacting with them could be a stressor alone. Because these birds are in captivity, they will come into contact with people, just like a companion bird would. In order to attempt to habituate the birds to a new person, a tablet was used to associate a video of the visitor to a primary reinforcer of dietary treats. This experiment will use the concepts of behaviorism and positive reinforcement to train the birds to change their response of fear to the unknown person to a more comfortable state. The time it takes for each of the birds to approach the visitor before and after the study will be analyzed by counting stress related behaviors. A total of thirteen birds participated in this experiment for three weeks. All the birds were housed in their regular housing in the aviary in compatible male-female pairs. The tablet could not be destroyed by the birds, did not interfere with the bird’s normal feeding schedule and would give treat crumbs when the video of the experimental person appeared on the screen at programmed scheduled times. The birds overall showed less stress and were more social to new people. After providing automated enrichment, the birds not only displayed the benefits of decreased stress, but the visitor himself also showed clear satisfaction with the improvement of the human-animal bond.

“Mapping the Causative Genetic Mutation for Cataracts in Russian Blue Cats”

Department of Zoology, College of Science
By: Colton D. Wayne

The Russian Blue cat breed is an intelligent and playful breed and is characterized by an attractive plush blue coat and wideset green eyes. Unfortunately, this breed is susceptible to a congenital form of cataracts leading to a loss in quality of life for the pet. This trait is known to be recessive within Russian Blue cats, but the causative genetic mutation has yet to be identified. In order to identify the genetic variant that causes cataracts in this breed, we conducted whole genome sequencing for 10 Russian Blue cats (5 with cataracts, 5 without). These sequence data were mapped to the domestic cat reference sequence, and variants were called using the samtools/bcftools pipeline. We identified a region within the C1 chromosome for which all sequenced cats with cataracts were homozygous for a shared haplotype that was not present in those cats without cataracts. Two genes within this region are promising candidates for further investigation: OLFM3 and Col11a1. OLFM3 is expressed in the eye and has been implicated in glaucoma while mutations in Col11a1 have been associated with Marshall Syndrome, a genetic disease in which those affected often develop cataracts. We are currently sequencing more Russian Blue cats to narrow down the region of interest and identify the causal genetic variant responsible for cataracts within this breed.

“Trilineage Differentiation and Immunophenotyping of MSCs Isolated in Platelet Lysate as an FBS Alternative”

Department of Biomedical Sciences, College of Veterinary Medicine and Biomedical Science
By: Rebecca Thornton & Michelle Hoathian

Mesenchymal stromal cells (MSCs) are used in stem cell therapy. Fetal bovine serum (FBS) is used for the proliferation of MSCs because it contains growth factors, but it also contains xenogens that could result in adverse immune reactions. Platelet lysate (PL) has been suggested as an alternative to FBS because it contains growth factors and can be manufactured from autologous or allogenic blood. However, the effectiveness of PL as an FBS substitute is not yet established. We hypothesized that equine MSCs grown in media containing 10% PL will maintain the same surface markers and trilineage differentiation capabilities as MSCs grown in media containing 10% FBS. MSCs were grown in three conditions: media containing FBS, media containing PL and heparin, and media containing FBS and heparin as a control. Trilineage differentiation was performed on each condition by supplementing MSC media with additives to induce differentiation into adipocytes, osteoblasts, and chondrocytes. Immunophenotyping was performed using flow cytometry for cell surface markers MHCII, CD90, and CD45. We observed lipid droplet, calcium, and proteoglycan accumulation in all MSC lines. MSCs were MHCII negative (0.985% - 1.280%) in all but one cell line. All cell lines were positive for CD90 (64.40% - 88.10%) and CD45 (0.28% - 5.20%). Based on our results, PL is an effective substitute for FBS for the expansion of equine MSCs, but more research should be conducted to determine if PL can completely replace FBS.

"Don't Be Fooled by Tick Saliva"
Department of Wildlife & Fisheries Sciences, College of Agriculture and Life Sciences
By: Jalyn Aliah Golden

Ticks are thought to secrete complex proteins when feeding to evade host defenses transmitting disease agents to humans and animals. Instead of using acaricides to control tick populations and decrease disease transmission there is a better alternative, vaccines, but to successfully develop these vaccines, the biology of tick feeding needs to be investigated. Inflammation and hemostasis are part of the host's first line of defense in tick feeding. These systems are in part serine proteinase-mediated and are tightly controlled by their endogenous inhibitors, in the serpin superfamily (serine protease inhibitors). Many serpin sequences have been identified in the Ixodes scapularis genome, but the functions of these serpins are still being discovered and verified. As part of a long-term goal to understand the role(s) of I. scapularis serpins in tick feeding regulation, the purpose of this research was to produce a recombinant (r) of an I. scapularis serpin 1A in Pichia pastoris, as well as to verify the transcriptional profile of this serpin through tick development.

"Expression of a Recombinant Tick Saliva Serine Protease Inhibitor"
Department of Biomedical Sciences, College of Veterinary and Biomedical Sciences
By: Grace Oluwatimilehin Adeniyi-Ipadeola

The Ixodes scapularis tick is a medically important vector of five of the 14 human tick borne disease agents, making it a great concern to public health. In order to create vaccines against tick borne disease agents, it is imperative to understand the mechanisms of tick feeding. During feeding, ticks inject saliva serine protease inhibitors (serpins) into the host. Serpins are the largest superfamily of protease inhibitors. They are believed to aid the successful transmission of disease agents into a host by allowing ticks to evade host defenses during feeding. Tick serpins inhibit proteolytic defense pathways like coagulation, inflammation, hemostasis, and much more. In this study, yeast recombinant protein expression constructs of serpin 1B, was prepared using Pichia pastoris expression system. Subsequently, a large-scale expression of serpin 1B will be performed, and the protein will go through purification and substrate hydrolysis experiments.

"Effects of Blocking BKCa Channels on Mesenteric Lymphatic Pump Function"
Department of Biomedical Sciences, College of Veterinary and Biomedical Science
By: Sasha Adams, Benjamin Becker, Carley Hagar, & Laureen Gbordzoe

Lymphatic system plays a major role in regulation of interstitial fluid volume by spontaneously contracting and relaxing to actively pump excess interstitial fluid. Large conductance calcium activated potassium (BKCa) channels are activated by an increase in intracellular Ca2+ concentration and membrane depolarization during contraction. The resulting efflux of K+ leads to membrane repolarization, decrease in intracellular Ca2+ concentration and vessel relaxation. Blockade of BKCa channels in the heart has been reported to decrease heart rate. Activity of

BKCa channels in lymphatic muscle have yet to be investigated thoroughly. Therefore, the purpose of the present study was to characterize the effects of blocking BKCa channels in mesenteric lymphatic vessels on lymphatic pump function. Segments of postnodal bovine mesenteric lymphatic vessels (~3 cm long) were isolated and cannulated in an isolated vessel bath, and were perfused and superfused with PSS warmed to 37 degrees C. Vessel diameter and transmural pressure were continuously recorded during the experiment. After initial equilibration with transmural pressure set at 6 cmH2O, BKCa channels in spontaneously contracting lymphatic segments were blocked by replacing PSS in the bath with PSS+ iberiotoxin. The role of BKCa channels was confirmed by adding NS1619 (BKCa channel opener) into the bath to block the effects of iberiotoxin. Lymphatic contraction frequency, stroke volume and fractional lymph flow were calculated from the recorded diameter. These studies are the first to study the role of BKCa channels in mesenteric lymphatic pump function.

Atmospheric Sciences; Geography; Geology & Geophysics; Oceanography

“Mapping the Geologic Framework of Padre Island National Seashore Using Geophysical Surveys”
Department of Geology, College of Geosciences
By: Larry Fisher Tuttle II

Framework geology has been demonstrated to influence barrier island geomorphology and resiliency. It is vital that we understand the framework geology before we can accurately assess the vulnerability and resiliency of the coast. Ground-penetrating radar (GPR) and electromagnetic inductance (EMI) surveys were collected along Padre Island National Seashore (PAIS) to map variations in the subsurface geologic framework. The most extensive published survey of PAIS framework geology was conducted in the 1950s as part of dredging the Intracoastal Waterway through Laguna Madre. Using cores and seismic surveys, the previous study identified a series of relict infilled paleochannels in dissecting PAIS. The GPR and EMI surveys presented in this poster were collected in fall 2014 and 2016. Utilizing both surveys will be useful in more precisely locating paleochannels in the subsurface of PAIS for further geologic study (e.g. sediment cores). Validating subsurface framework geology features (i.e. infilled paleochannels) is valuable to accurately predicting future changes affecting the environmental and economic longevity of PAIS. Therefore, future research needs of this project include sediment core collection and analysis from areas on the island surveyed here in an effort to assess how other island factors (e.g. vegetation dynamics and hydrology) operate in conjunction with the geologic framework to influence coastal geomorphology. Sediment cores collected in spring 2017 will be used to both validate the geophysical survey data and provide valuable insight into the geochronological evolution history of PAIS and similar barrier islands.

“Coastal dune management: How definition drives application”
Department of Geology, College of Geosciences
By: Alexander Medlin, Caleb Taube, Stephanie Thompson, & Jacob Lehner

Coastal dunes serve a vital purpose in protecting inland areas from wave erosion during storms. Dune morphology directly impacts future barrier island transgression patterns in response to sea level rise. Most current methods to assess changes in beach and dune morphology require manual editing and are time-intensive. Predicting future change along the coast is challenging due to a highly dynamic coastal morphology, with potential changes daily. As a result, current methods cannot create up to date information. Given the demand for rapid post-storm assessment, there is a need for more automated and objective methods based on dune features (dune toe, dune crest, and dune heel). Objective approaches to defining dune features require the ability to consistently and quantitatively identifying where the dune begins and ends. Current methods delineate only the foredune, whereas future approaches should be more holistic in identifying small and large features. The more efficiently and consistently we adapt the approaches to extract dune features, the more effective coastal management can respond to large and small scale coastal changes. Up to date models will allow for identification of landscape change thresholds in response to sea level rise and climate change. Quantifying multiscale landscape changes has potential application across multiple disciplines.

“Geography of Historical Racial-Ethnic Segregation:
Comparing Charleston SC and Buffalo NY in 1940”

Department of Geographic Information Science & Technology, College of Geosciences
By: Laura Everett

Spatial distribution patterns of social groups can be studied through the use of digital “boundary” files, or “shapefiles” and data from the U.S. Census. Using QGIS, an open-source Geographic Information System, shapefiles were created to represent the enumeration districts of Charleston, South Carolina and Buffalo, New York using archived photos of enumeration district maps used in the 1940 U.S. Census. These shapefiles, in combination with newly released historical census data from 1940, allow visual representation and spatial analysis of the socio-economic and racial distribution patterns present in these two cities. As comparable maps do not currently exist, the shapefiles and maps constitute new and valuable resources for the study of ethnic segregation and urban population distributions in major US cities in 1940. In addition to this comparative analysis, the shapefiles will be available for several other research projects that are underway using the 1940 data at the Texas Federal Statistical Research Data Center at Texas A&M University, allowing the data and findings to contribute to future projects investigating residential distributions of racial and ethnic subpopulations within these cities.

“Exploring Ultraviolet Photooxidation of Pyrite in the Paleoarchean Era”

Department of Geophysics, College of Geosciences
By: Merna Hanna & Cooper Young

Pyrite survived extensive redox weathering in the Archean (4.0-2.5 Ga) due to lack of readily available atmospheric oxygen in coastal, shallow-water environments. However, instances of oxidized detrital pyrite are still found that date as far back as 3.22 Ga. Three hypotheses have been proposed to explain oxidation of pyrite in the Paleoarchean (3.6-3.2 Ga): (1) Oxygenic photosynthesis, (2) Anoxygenic phototrophy, and (3) Photooxidation. Each of these three hypotheses provide ample, yet debatable amount of evidence to support pyrite oxidation. In this research, we will investigate pyrite photooxidation in the presence of catalyst such as rutile to test whether catalyst-aided photooxidation was the primary pathway for pyrite oxidation in the Paleoarchean era.

“Quantifying the interaction of vegetation and geologic framework along a Texas barrier island”

Department of Geophysics, College of Geosciences
By: Jessica Martin, Bri Ferguson, Larry Tuttle, Dawan Taylor, Nick Smart, Jacob Lehner, Matthew Tran, Cassie Mohkami, Laura Gloria, & Phillipe Wernette

Traditional models used to predict the impact of a hurricane or other storm are limited to simple systems, neglecting several external forces, such as geologic framework. Spatial patterns in the geologic framework, such as paleo-river channels, influence beach and dune morphology and are considered a forcing factor on island morphology. Spatial autocorrelation demonstrates that there are areas of highly variable shoreline change rates, as well as long-term shoreline change rates. This advances the understanding of coastal morphodynamics by quantitatively demonstrating the influences of offshore and subsurface framework geologic structures. This establishes reason to believe that spatio-temporal scales demonstrate the development of barrier island geologic structure. Vegetation serves two dynamic roles: dune building, and dune stabilization. Collecting in situ information about vegetation abundance and distribution patterns is also essential to enhancing the vegetation models by providing tacit insight into how vegetation influences the barrier island dune system. Refining the temporal and spatial scale of dune vegetation to better understand how geologic inheritance and vegetation dynamics influence future coastal changes, an important role for coastal managers to predict shoreline change and maximize recovery. This poster is part of an ongoing research at Padre Island National Seashore seeks to quantify the vegetation and geologic framework on barrier island morphology.

"Barium Concentrations as a Proxy for Equatorial Pacific Productivity During the Past 140,000 Years"
Department of Geology, College of Geosciences
By: Oluwaseyifunmitan Olaniyi-Sholanke

The accumulation of biogenic sediments in the deep ocean may yield important information about past ocean productivity and its relationship to climate change. Sediments, sampled at approximately millennial resolution, have been obtained from a core (ML1208-17PC) retrieved from the central equatorial Pacific Ocean (0.48°N, 156.45°W, water depth 2,926 m). The main objective of this research has been to use concentrate ions of barium in the sediment record as a proxy for past ocean export production, and to determine how past changes in productivity are related to climate and, specifically, variability of dust fluxes on glacial-interglacial timescales. Ba concentrations on complete digestions of bulk sediment have been measured by inductively-coupled plasma mass spectrometry. Sediments ranging in age from late Holocene to 130 kyr have yielded bulk barium concentrations that range from about 305 to 670 ppm. The authigenically-derived portion of the total barium, thought to be correlated with export production, is denoted as the excess barium (xsBa). The xsBa is estimated by subtracting the lithogenic Ba from the total Ba. Here lithogenic Ba contents have been calculated using published thorium concentrations in the same samples (Jacobel et al., 2016). The xsBa makes up greater than 97% of the total Ba. Using accumulation rates derived by Jacobel et al. (2016), we find xsBa accumulation rates that range from about 0.5 to 1.0 mg cm-2 kyr-1. Over the past 120 kyr, there is a positive relationship between productivity and warm interglacial periods which, in turn, are anti-correlated with dust fluxes determined by Jacobel et al (2016). Thus, high xsBa accumulation rates correspond to less dusty warm periods, and vice versa. Productivity is apparently not a function of dust fertilization in the central equatorial Pacific, and we discuss the implications of these findings.

“Modeling the CSEM response of Upheaval Dome”
Department of Geophysics, College of Geosciences
By: Andrea Darrh

There are currently two different theories for the formation of Upheaval Dome, an enigmatic circular geological formation comprising a tilted rim structure that encloses a central uplifted region. The first theory is that Upheaval Dome, located in Canyonlands National Park, Utah, was formed as a result of uplift caused by the diapiric rising of the buoyant Paradox Salt through the overlaying strata. The second theory is that the formation was caused by a meteorite impact. The objective of this project is to develop geoelectrical models corresponding to each of the two suggested explanations of Upheaval Dome. Through the adaptation of the governing Maxwell equations, as found in Everett [1990], Kauahikaua [1978], Ryu et al. [1970], and Morrison et al. [1969], software will be developed based on an impedance recursion equation that can accurately simulate the response of a layered geoelectrical model to transient controlled-source electromagnetic (CSEM) excitation. With this equation it will be possible to further develop code that will be used to test and evaluate geological models representing a variety of possible subsurface conditions beneath Upheaval Dome. The best-fitting models will be validated through geophysical field work with the intent of resolving subtle resistivity contrasts between deeper layers in the model. With this application, the range of possible uses for CSEM will be expanded to geological structural mapping in rugged, highly resistive terrains, and it will be possible to provide some insight to which geological process resulted in the formation of Upheaval Dome.

“Variation in aeolian bedform wavelength on Mars”
Department of Geographic Information Science and Technology, Department of Geosciences
By: Matthew Ballard

Wind-blown bedforms are ubiquitous across the surface of Mars and are found in ancient sedimentary deposits of Mars’ rock record. The morphologic characteristics of the modern dunes, transverse aeolian ridges (TARs), and ripple are recognized to vary with spatially changing envrionmental boundary conditions across Mars. Dunes shape, for example, is affected by the frozen and sediment availability-limted conditions of Mars’ north polar region. Ripple wave-length was found to scale with variations in pressure found at high-altitudes on Mars. Understanding how bedform morphology varies with different boundary conditions in Mars’ modern environment could help interpret aeolian stratification and, in turn, changing climate conditions in Mars’ deep past.

“Stratigraphic Variation and Depositional Proccesses of the Permian (Leonardian) Avalon Shale and Bone Spring Formation in the Southwestern Delaware Basin, Reeves County, West Texas, U.S.A.”

Department of Geology, College of Geosciences
By: Christopher Douglas Garza

Environments of deposition, thickness variation, and lithologic lateral variation may vary as a member is deposited basinward of the shelf margin. Such stratigraphic characteristics of the Leonardian (Lower Permian) Bone Spring Formation of the southwestern region of the Delaware Basin in West Texas remains understudied. Wireline log data of the Bone Spring Formation in Reeves County, West Texas, gives a good opportunity to examine a mixed carbonate and siliciclastic slope-basinal system, with varying stratigraphic characteristics. Members of the Bone Spring Formation are thought to be deposited by reciprocal sedimentation caused by relative sea level change. Transgressions during relative sea level highstands deposited carbonates, while regressions during relative sea level lowstands deposited siliciclastics. Processes of turbidites, debris flows, suspension of siltstones and shales, as well as channelized deposition contribute to the development of Bone Spring Formation basin restricted carbonate-siliciclastic mixed strata. Wireline log analyses and correlation of Bone Spring Formation members; First Bone Spring Carbonate (FBSC), Avalon Shale (Avalon SS) (within the First Bone Spring Carbonate), First Bone Spring Sandstone (FBSS), Second Bone Spring Carbonate (SBSC), Second Bone Spring Sandstone (SBSS), Third Bone Spring Carbonate (TBSC), and Third Bone Spring Sandstone (TBSS), reveal such processes, as well as changes in the members’ environments of deposition, stratigraphic thickness, and lithologic variation across the basin. Future work on the Bone Spring Formation in the southwestern area of the basin would need to integrate further data, specifically core, seismic, and petrographic data to better understand the depositional processes, and patterns that affected the Bone Spring’s environments of deposition, variations in thickness, and lithologic lateral variations throughout the southwestern region of the basin.

“Does inclusion of storm surge improve the accuracy of the SGHOPM Power Outage Model?”

Department of Environmental Studies, College of Geosciences
By: Danyelle Yezak

Electric power utilities are involved in making critical decisions in the days surrounding hurricane landfall that are based on the estimated impact to their coverage area. Accurate forecasts of the consequences of an approaching hurricane within the impacted area are critical for utilities to balance the costs and better understand resource use and management. The Spatially Generalized Hurricane Outage Prediction Model (SGHOPM) utilizes tropical cyclone wind-speed and duration of strong winds, along with power system and environmental variables (e.g., soil moisture, long-term precipitation), to predict the magnitude and location of power outages, but is distinctly lacking inclusion of storm surge and significant wave data. This project assesses whether including storm surge data would improve the accuracy of the SGHOPM model. Error analysis will distinguish the utility of storm surge data in making model predictions of outages; in our study an error is defined as the fractional difference in the model prediction versus the observation. Our hypothesis is that adding information about storm surge will reduce model error.

Architecture; Construction Science; Landscape Architecture & Urban Planning; Visualization

"The Relationship Between Crime and Vacant Buildings in the City of Chicago"
Department of Urban and Regional Planning, College of Architecture
By: Madison Moore

I am addressing the correlation between vacant buildings in neighborhoods and their negative effects, especially crime rates, in Chicago, Illinois. This is an important issue to address because urban planners and city officials need to understand the effect an abandoned structure can have on not only its immediate vicinity but the entire area. I plan to show that vacant buildings have a negative effect on their area and promote certain types of crimes.

"Behavioral Study on Pedestrian's Decisions at a Midblock Location"
Department of Urban and Regional Planning, College of Architecture
By: Madison Danielle Graham

Many factors can affect the behavior of a walking individual. The number of pedestrians has increased over the past decade, but so has the number of pedestrian crashes. Studying pedestrian behavior is a way to obtain a better understanding of the choices people make. This study provides an examination on pedestrian's walking path choices along a roadway segment heavily used by new students and their families attending a summer conference. Crossing behaviors for 2,676 pedestrians were collected along with behavioral characteristics and physical features (such as age and gender).

An influential factor for pedestrian's crossing behavior was the behavior of the group or individual ahead of that pedestrian. It was found that 51 percent of the pedestrians crossing midblock followed other pedestrians that also crossed at a midblock location. It was also determined that if a train was present, use of the underpass increased to 70 percent, compared to only 13 percent of the pedestrians using the underpass when the train was not present.

"The Saving Grace Project: Reducing Social Vulnerability in a Flood Prone Area"
Department of Landscape Architecture, College of Architecture
By: Laura Ruiz, Vanessa Ngo, Leticia Meza, & Francisca Yañez

The 97 acre site is located along Clear Creek, is highly susceptible to flooding, and is the most socially vulnerable area in League City, TX. Social vulnerability is the resilience of communities when confronted by external stresses on human health such as natural or human-caused disasters. Reducing social vulnerability can decrease human suffering and economic loss. Low income, minority, and elderly populations are typically forced within flood hazardous areas; these populations typically lack the necessary resources to handle flooding, disabling many housing, educational, and employment opportunities afforded by other communities. Our focus was to design a district that bridged the cultural gap between surrounding communities while addressing flood issues and impacts from future sea-level rise.

"The Reznor District" enables multi-income residents to interact, creates a sense of community, and provides increased housing and job opportunities. Programs such as skills workshops, open spaces, an art district, and interactive areas create unity within a diverse population. League City is a bedroom community, a place comprised of residents that have to travel to other places for work. By increasing employment opportunities, live-work commute time will decrease significantly. Simultaneously, emphasizing spaces for interactivity increases social integration.

With the intent to decrease social vulnerability, the design of the Reznor District projects to offers many opportunities. Compared to typical communities, housing amounts are increased by 20%, with five different housing types ranging approximately $1.25 per square foot. Educational space occupies 25% of the site with six indoor and outdoor areas and workshops that enables residents to specialize in new trades for future employment. Job opportunities occupy 20% of the design with over twenty different positions; this also increases walkability through live-work integration. Open social space occupies nearly 50% of the site, providing social integration opportunities and protecting the neighborhood from flood impacts and sea level rise.

Education, Admin., & Human Resource Dev.; Educational Psychology; Health & Kinesiology; Teaching, Learning & Culture

“The Decision to Donate”
Department of Biomedical Sciences, College of Veterinary Medicine and Biomedical Sciences
By: Michael Boachie-Mensah

The aim of this study was to examine the effects that personality and decision-making behavior have on charitableness. We first assessed the personalities of our participants by running a series of personality tests based on psychometrics such as the Big Five personality traits. Participants then completed three decision-making tasks: the Delayed Discounting Task (DDT), the Iowa Gambling Task (IGT), and the Su-Chow Gambling Task (SGT). In each of these tasks, the options the participant chooses are correlated with certain rewards which accumulate as the participant continues to win. Lastly, participants were given the opportunity to donate a portion of their winnings to the Brazos Valley Food Bank, an operationalization of charitableness. There are no significant correlations between SGT or IGT net score and donation amount or decision to donate (p>.30). However, a logistic regression with the Big Five personality traits predicting decision to donate, revealed a significant main effect of agreeableness (ÃŸ=-19, p=.02), extraversion (ÃŸ=.16, p=.02), and a marginally significant effect of openness (ÃŸ=-.09, p=.055). A logistic regression for substance abuse predicting donation decision revealed a significant main effect (ÃŸ=.04, p=.04). There is also a marginally significant correlation between donation amount and substance abuse (r=-.22, p>.09). These results suggest that prosocial behavior, such as donating to charity, is impacted more by automatic, unconscious ways of thinking, embedded in our personality, than by the more effortful and complex thinking required in decision-making. When these ways of thinking are altered, by substance abuse for example, deviations from normality may occur.

“Liver AhR Concentrations are not Affected in Male Mice Fed a High Fat/High Sugar Diet”
Department of Community Health, College of Education and Human Development
By: Jeremiah Velasco, Victor A Garcia, Ayland C Letsinger, Jorge Z Granados, Kat Stiegel, & J. Timothy Lightfoot

Background: The current widespread of obesity and growing chronic health problems such as Type II Diabetes and cardiovascular disease are attributed to both physical inactivity and hypercaloric diets (e.g., high fat/high sugar diets). Our lab has shown that a high fat/high sugar (HFHS) diet will decrease voluntary physical activity (VPA) in C57BL/6J mice by 62%. However, there continues to be insufficient information regarding physiological mechanistic interactions between VPA and HFHS diet. The aryl-hydrocarbon receptor (AhR) may have an influence in the mechanistic interaction between VPA and HFHS diets as suggested by a growing body of literature, in which a decrease in AhR gene expression resulted in increased VPA.

Purpose: Determine if a HFHS diet affected liver AhR concentration levels in male C57BL/6J mice.

Methods: All procedures were approved by TAMU IACUC. C57BL/6J mice were bred and the male offspring were weaned at three weeks of age and randomly assigned to either a control chow fed diet (CFD) group or high fat/high sugar diet (HFHS) group for 9 weeks. HFHS diet group (n=4) consisted of 35% carbohydrate, 45% fat (6% soybean oil and 39% lard), and 20% fructose drinking water, while the CFD (n=4) consisted of 25.2% protein, 39.5% carbohydrate, 3.3% crude fiber, 10% neutral fiber, 9.9% ash, and normal drinking water. Mice were sacrificed between the times of 9:00-11:00 AM for elimination of circadian cycle influences of sex hormone levels. In conjunction, liver tissues were harvested and snap-frozen immediately post sacrifice for later analysis of AhR concentrations via immunoblotting. Data was analyzed using t-tests for each diet group.

Results: Immunoblotting revealed no significant differences in cytosolic AhR concentrations between the HFHS (339.7 Â± 78.5 Au) and the CFD (303.7 Â± 117.9 Au) diet groups (p=0.5).

Conclusion: Although no differences in AhR concentrations were observed in the liver, it is possible that there is up/down regulation of AhR taking place in other organs that play a role in managing PA such as the nucleus accumbens of the brain. More research is needed in other organs and possibly the nucleus of the liver cells, given that it is where AhR is translocated from the cytosol and acts to modify expression of other genes.

“Performance ratings: Does case law reveal more harm than good?”

Department of Psychology, College of Liberal Arts
By: Anjelica Mendoza & Wheeler Nakahara

"Exceeds expectations.” “Needs improvement.” “Satisfactory.” Each year, billions of employees are evaluated by their supervisors. Politics, biases, negative feedback, logistical constraintsâ “among other things”make the evaluation process challenging and undesirable. As a result, popular press authors have advocated for abolishing performance appraisal (e.g., Coens & Jenkins, 2000), numerous companies have actually done away with it (Buckingham & Goodall, 2015) and Industrial/Organizational (I/O) psychologists debate the pros and cons of doing so (Adler et al., 2015). In light of all this criticism, when are performance ratings most valuable?

Despite the recent trend of organizations to do away with performance appraisal, performance ratings are frequently used in court cases involving discrimination, where an employer is accused of committing an unjust decision or action. Thus, from a legal standpoint, doing away with performance appraisal seems like a dangerous endeavor. We review the last five years of case law to chronicle the characteristics of the cases involving performance appraisal. The purpose of this research is to systematically review case law to determine how performance appraisal is used in discrimination lawsuits. This research may also increase our understanding of discrimination in the workplace. By examining how performance appraisals are used in discrimination cases, we may gain insight on how discriminatory practices can be monitored and discouraged using performance appraisals.

“Experiences of Teachers and Students in STEM Summer Camp”

Department of Mathematics, College of Science
By: Devyn Chae Rice & Cassidy Caldwell

Research showed that students’ background differences such as gender, ethnicity, and SES could influence their interest in STEM careers. It is important for society to have diversity in STEM fields because of the different perspectives and unique solutions to problems each individual brings to the situation. The purpose of this project is to examine the effects of STEM Summer Camp on students’ STEM interest in a diverse middle and high school student population. Students participated in a two-week long summer STEM camp, and teachers participated in professional development directly related to the activities and experiences in the student camp. Those experiences lead teachers to adopt additional teaching methodologies and strategies to engage a more diverse student population in STEM content. The pre- and post-test results showed an increase interest in STEM subjects and careers and more importantly the achievement gap due to the ethnic and gender background differences was reduced. Informal experiences can have potential to increase interest in STEM fields and result in promoting diversity in the STEM workforce.

“Water and Alcohol Aboard 17th Century Ships”

Department of Health, College of Education and Human Development
By: Sarah Ann Bankhead

Mariners of the 17th century consumed a steady supply of salted provisions and alcohol. It is a mystery how these men remained properly hydrated without a fresh source of clean water (being surrounded by ocean or sea water), and ingesting a diet high in sodium and alcohol. Most ships rationed each man a gallon of beer a day and several pounds of salted beef or pork, while ship lists mention limited quantities of water being brought on board. This paper gives a brief analysis of the beverages on ships that seamen drank, and how these drinks affected the menâ€™s overall health and quality of life. The goal is to understand the types of diseases to which they were susceptible given their high-salt low-water diets, and to clarify whether or not these men were truly dehydrated or not because they clearly survived such voyages. Based off of preliminary research, it is assumed that the heavy sodium and alcohol consumption would lead to prolonged dehydration, resulting in increased susceptibility of disease and shorter life expectancy. Yet the dilution of alcohol with water resulted in a much weaker distillate that could have possibly helped sanitize the water and fight off disease.

Undergraduate Posters

Biology; Chemistry; Mathematics; Physics & Astronomy; Statistics

“Development of a 1-Hydroxypyrene Quantification Method for Use in Assessment of Polycyclic Aromatic Hydrocarbon Exposure”

Department of Chemistry, College of Science
By: Allison Van Cleve

A common phenolic metabolite of pyrene, 1-hydroxypyrene (1-OHP), is often used as a biomarker to assess polycyclic aromatic hydrocarbon (PAH) exposure. The developed high-performance liquid chromatography with mass spectrometry (LC-MS) method showed sufficient sensitivity to quantify 1-OHP in non-smoker urine samples, obtained in an ongoing project studying the effects of traffic related air pollution exposure in a population of pregnant women in South Texas. Data obtained through the developed method will be used to assess the effectiveness of 1-OHP as a biomarker for PAH exposure and will be compared to urinary concentrations of nitrated pyrene metabolites and airborne pyrene concentrations, collected through the use of personal monitoring devices. Success of the project will be determined by the specificity and sensitivity of the proposed method in quantification of 1-OHP concentrations and its application to the overall aims of the ongoing project.

“The role of ERBB receptors in colon tumor development”

Department of Biology, College of Science
By: Jorge Jaimes-Alvarado, Carolina Mantilla Rojas, Marien Lara, & Estefania Barba

Colorectal cancer (CRC) is the third most cancer in the United States with an estimated 134,000 cases in 2016. Initiation of this form of cancer often involves a mutation in the APC gene, a tumor suppressor that plays a role in numerous cellular processes including cell cycle regulation and division. We used the ApcMin/+ mouse model, which carries a truncation mutation at codon 850 of the Apc gene, to promote initiation of tumors in the small intestine and colon. Overexpression of ERBB family member (Egfr, Erbb2, Erbb3, Erbb4) has been associated with the development of solid tumors. The aim of this study is to evaluate the effects of ERBB in the development of polyps in the small intestine and the colon. Our model utilizes the Cre-lox system to promote conditional knockouts of the specified genes (Egfrf/f, Erbb2 f/f, Erbb3f/f, Erbb4f/f) within the intestinal epithelium (Villin-CreTg), DNA is extracted from ear punch tissue, and polymerase chain reaction (PCR) is then performed to determine the genotype of each mouse. Mice are euthanized at 100 days of age for tissue collection, and the intestines are splayed open to visualize tumors. Colonic tumors are bisected, with a portion flash frozen for molecular analysis and the remainder used for histological analysis. Normal colonic tissue is frozen separately for comparison. The remainder of the colon, along with the small intestine, is formalin-fixed for histological analysis. Preliminary data shows a reduction of tumor count in animals with a conditionally knockout of Erbb4 (Erbb4f/f, ApcMin/+, Villin- CreTg) compared to ApcMin/+ controls, suggesting that Erbb4 is involved in tumor initiation and/or progression. Histological assessment is ongoing. Our ultimate goal is to better understand the role of ERBB kinases in CRC development, which will have implications for gene targeting therapy.

“Effects of Bisphenol an Exposure on Central Nervous System Development”

Department of Biomedical Sciences, College of Veterinary and Biomedical Science
By: Centura Anbarasu

Bisphenol A (BPA), a common environmental toxicant and endocrine disrupting chemical, is becoming increasingly important due to its potential carcinogenicity. The aim of this research project is to study the effects of BPA exposure on the developing central nervous system. Recent studies have characterized the effects of BPA exposure on reproductive and cardiac systems. However, the neurobiological deficits of BPA exposure are largely unknown. Using zebrafish as a model organism, embryos will be raised beginning 6 hours post fertilization (hpf) in medium containing varying concentrations of BPA from 1ÂµM to 75ÂµM. During this time period until 72hpf, length, movement, hatching, and mortality will be measured. Once the embryos have matured to 72hpf, they will be euthanized, fixed, and sectioned for immunohistochemistry procedures to study the expression patterns of myosin, PCNA (a marker of cellular proliferation), and caspase-3 (a marker of apoptosis). Additionally, this study aims to investigate whether BPA exposure interferes with dopamine pathways by examining the expression patterns of tyrosine hydroxylase, using immunohistochemistry procedures and gene expression analyses. These data can then be applied to human exposure to BPA, to elucidate its potential negative effects on neurological development and health.

“Liver AhR Concentrations are Significantly Reduced in Female Mice Fed a High Fat/High Sugar Diet”

Department of Biomedical Sciences, College of Veterinary and Biomedical Sciences
By: Victor Armand Garcia, Jeremiah D Velasco, Jorge Z Granados, Ayland C Letsinger, Kat Stiegel, & J. Timothy Lightfoot

Background: Current literature has shown that both physical inactivity and high fat/high sugar (HFHS) diets are associated with the growing problem of obesity, along with correlated illnesses, such as Type II Diabetes and cardiovascular disease. We have demonstrated that exposure to a HFHS diet will drastically decrease voluntary physical activity (VPA) in C57BL/6J mice by 62%; however, the physiological mechanisms between HFHS diets and VPA are not fully understood as there continues to be a lack of information to explain such a mechanism. As suggested by previous findings, the aryl-hydrocarbon receptor (AhR) is a possible contributor in the interaction between VPA and hypercaloric diets, in which a decrease in AhR gene expression resulted in increased VPA.

Purpose: Determine if AhR concentration in the liver of female C57BL/6J mice is affected by a HFHS diet.

Methods: All procedures were approved by TAMU IACUC. At three weeks of age, C57BL/6J male mice were randomly assigned to either a control chow fed diet (CFD) group or high fat/high sugar diet (HFHS) group for 9 weeks. HFHS diet group (n=4) consisted of 35% carbohydrate, 45% fat (6% soybean oil and 39% lard), and 20% fructose drinking water, while the CFD (n=4) consisted of 25.2% protein, 39.5% carbohydrate, 3.3% crude fiber, 10% neutral fiber, 9.9% ash, and normal drinking water. Mice were sacrificed during the proestrus stage of their estrous cycle (determined via vaginal lavages) to minimize influences of sex hormone levels. Immediately following sacrifice, liver tissues were snap-frozen for further examination of AhR concentrations via immunoblotting. A one-way analysis of variance (ANOVA) was utilized to determine differences between diet groups.

Results: A 4-fold reduction was observed in the cytosolic AhR concentrations of the HFHS diet (81.3 Â± 16.8 Au) compared to the CFD diet (205.0 Â± 67.1 Au) group (p=0.03).

Conclusion: The decreased liver AhR concentration observed in the HFHS group would suggest that the HFHS group should exhibit elevated VPA; however, the decrease in AhR observed in this study may be due to increased ligand binding and subsequent translocation of available AhR into the nucleus. Future research approach: Analyze the amount of aryl-hydrocarbon receptor nuclear translocator (ARNT) in the nucleus of the cell, as this would answer the question of whether more AhR is being transferred into the nucleus.

"VENOM and the Determination of dominant relaxation pathway for NO (A 2Î£+)"

Department of Chemistry, College of Science
By: Madison H. Mcilvoy

VENOM (Vibrationally Excited Nitric Oxide Monitoring) is a technique previously demonstrated by this group, which simultaneously measures temperature and velocity in a high-speed gas flow and allows for the simplification of the Navier-Stokes turbulence equations. The understanding of the relaxation of NO (A 2S+1/2) is vital to these measurements particularly in flows which contain high amounts of quenching. The effects of electronically excited NO (Nitric Oxide) on the flowfield have not been well characterized and therefore determining if fluorescence or collisional quenching is the dominant pathway is imperative to the quantification of the amount of rotationally excited NO present in the system. This study hopes to monitor both the long and short term temperature rises in the flow in order to properly characterize the perturbations taking place based on temperature profiles in order to determine the benefits and limitations as it applies to both chemical and aerospace challenges.

"Embryonic Lethality in mice expressing conditionally-stabilized Ctnnb1 under the control of Vil-cre"

Department of Biomedical Sciences, College of Veterinary and Biomedical Sciences
By: Kishan Bharat Patel

Beta-catenin, encoded for by the Ctnnb1 gene, is regulated in the cell by a ubiquitin-dependent mechanism and becomes stabilized upon activation of the Wnt pathway, where it is a key transcriptional co-activator of WNT-responsive genes resulting in activation of cell cycle and division. Dominant-acting mutations in the gene leads to constitutive activation of the Wnt signaling and have been implicated in several forms of cancer, including colorectal cancer (CRC). In this study, mice carrying both a conditional stabilizing mutation of the Ctnnb1 gene (Ctnnb1tm1Mmt, hereafter called Ctnnb1F(Ex3)) and a Cre recombinase whose expression is under the control of the murine villin 1 promoter (Tg(Vil-cre)997Gum/J, hereafter called Vil-cre) thought to be specific to the colon and kidney, were expected to develop intestinal tumors but instead experienced embryonic or neonatal development. To isolate the time of death, pregnant dams were dissected from E10.5 days to E13.5 days, and the embryos were inspected for abnormalities and genotyped by PCR. Embryos were phenotypically normal and exhibited Mendelian inheritance ratio until E12.5 when the Ctnnb1F(EX3) Vil-cre double mutants had died and were being reabsorbed. The main focus of the research is now to isolate the cause of death which we suspect to be linked to defects in the development of the placenta. While the Vilin1 gene is expressed in the visceral yolk sac, it is not thought to be involved in placental development. Furthermore, identifying the molecular mechanisms underlying the cause of embryonic lethality will allow us to better characterize the role of canonical WNT signaling in placental development.

"Discovering Novel Antitubercular Compounds Through Pks13 Inhibition"

Department of Chemistry, College of Science
By: Stephanie Leon Quinonez

Frontline tuberculosis drugs have become inefficient due to the emergence of multi-drug resistant Mycobacterium tuberculosis strains, creating an urgent problem that needs to be solved. Mycolic acids (MAs) are the major constituents of the Mtb cell wall, providing the permeability barrier that contributes to the antibiotic resistance of the organism. The last condensation step in the MAs synthesis is done by polyketide synthase 13 (Pks13). Although many potential drug targets have been investigated, no major research has been done for Pks13. This research strives to discover potent Pks13 inhibitors by performing in vitro studies on a series of novel Pks13 analogs, assessing their inhibitory relationship with Pks13, and utilizing this information to modify the physicochemical properties of the compounds and increase their potency. Success will result in the selection of a compound able to inhibit Pks13, disrupt the synthesis of MAs, distort the cell wall, and eliminate the Mtb bacteria for pre-clinical and clinical studies in the path to becoming an antitubercular drug.

"Vanadium Dioxide Coatings with Additives for Fenestration Elements"

Department of Chemistry, College of Science
By: Kelly Nieto

Smart windows are on the rise as a method of reducing energy consumption across the world. These smart windows are able to reflect and transmit infrared (IR) light in response to ambient temperature, while also retaining the ability to transmit daylight. Vanadium dioxide is a prime candidate to be used in the coatings of these smart windows due to the fact that its transition temperature of 67°C is far closer to room temperature than is typical of materials exhibiting this type of transition and it can be further depressed by introducing dopants. Above this transition temperature, vanadium dioxide switches from an insulator to metal and is able to reflect IR light. This characteristic would efficiently cut down energy consumption, as the smart windows would be able to regulate temperatures inside of buildings with reduced aid of air conditioning systems. Vanadium dioxide alone produces a very poor film and therefore must be interfaced with a different material for practical application. Previously, our group found that silica matrices could be utilized to form films with VO2 via a modified Staber method. These films were formed utilizing spray coating, and though somewhat successful, the method did not provide very scalable or consistent films. Later, VO2 was dispersed in thickening agents to further stabilize dispersions and casting was performed with a casting knife, which improved film consistency. In this work we are focusing on fluorinating the surface of VO2 or VO2@SiO2 in solution that will work in tandem with fluorinated surfactants. Fluorination of the VO2 will protect the material from oxidation as well as allowing a surfactant to reduce agglomeration, which has risen as a problem in previous work, and result in more even distribution of particles within films.

"Formation of secondary precursors to nucleotides in interstellar media"
Department of Chemistry, College of Science
By: Jessica Anderson

It has been suggested that biological molecules evolved from collisions between prebiotic molecules in interstellar space. One mechanism by which these molecules could have formed is recombination, the amalgamation of atoms to form abiotic molecules, which eventually grow to form precursors to organic matter, and finally, organic matter itself. The origins of nucleotide formation are especially interesting to scientists.

Because of the complexity of interstellar recombination, scientists often use simulated conditions on earth to determine possible synthetic pathways to organic molecule formation. One approach pursued here focused on simulating impacts in interstellar space by using mass spectrometry, where inorganic material was bombarded with carbonaceous moieties to determine whether recombination had occurred, i.e. the formation of known secondary precursors to nucleotides. For these experiments, we used 80% enriched 13C60 to bombard separate samples of NH4NO3, 15NH4NO3, and NH415NO3 to study the formation of CN and CNO. The observed emission of 13CN and 13CNO was used to investigate recombination between projectile and target. Similarly, the effect of the initial oxidation state of the nitrogen to form C15N and C15NO was also considered.

It was found that direct recombination occurs between the carbonaceous impacter and the inorganic target. This recombination decreased as impacter velocity increased from 79 to 111 km/s. The effect of initial oxidation state of the nitrogen did not affect the rate of recombination because complete atomization occurs at the impact site, resulting in the recombination of atomic nitrogen and carbon.

"Building and Testing of an Auger Electron Spectrometer"
Department of Chemistry, College of Science
By: Gabriel D Shuffield & Mena Kozman

This work describes the design, assembly, and testing of an ultra-high vacuum chamber capable of reaching 10-11 torr and an Auger electron spectrometer (AES) for analysis of elemental composition of surfaces to an average depth of 10 nm. An air lock sample introduction system is incorporated to allow for changing samples without leaking the entire chamber. The custom built sample dock is attached to a translator and rotator, to provide for control over the distance between the AES and the sample and the angle between them. Varying the angle allows for even shallower measurements of the surface. An argon gun is attached in order to sputter the surface prior to analysis, thereby cleaning it of any dust or desorbed gases that might show up in the AES spectrum. The instrument is tested by analysis of a p-type silicon (100) wafer and stainless steel reference material, both of which have well known elemental compositions.

“Are Copper Pennies Really Made of Copper?”
Department of Chemistry, College of Science
By: Yasmin Pajouhafsar & Mallory McCarthy

The overall goal of our research is to set up a PIXE (Particle Induced X-Ray Emission) apparatus in the Cyclotron Institute at Texas A&M University. PIXE is a non-destructive elemental composition technique that has been used in the last decades for various analytical tasks, such as art authenticity and aging. The X-Ray, which is a type of electromagnetic radiation, is emitted when an electron transitions from an outer to a lower energy level caused by a vacancy in the atom’s electron configuration. The X-Rays produced are unique to each element and can be analyzed with reference to known elements’ energies. For this reason, being able to identify unique elements is a powerful tool to study aging in objects, which is the PIXE application we are currently interested in. Our setup includes a PX2T-CZT Power Supply and Amplifier for the XR-100T CdTe/X-Ray Detector and a Pocket MCA-800D (Multi-Channel Analyzer). In order to perform the energy calibration, three known isotopes are analyzed: 241Am,57Co and 133Ba. Their peaks in channels are made corresponding to their known energies. We looked into the composition of old versus new pennies confirming that it has in fact changed over time.

“Adipose Tissue VEGF-D Overexpression Increases Lymphatic Vessel Density and Protects Against Inflammation and Insulin Resistance in Obesity”
Department of Biomedical Engineering, College of Engineering
By: Gabriela Maria Lammoglia

Lymphatic vessels modulate tissue fluid balance and inflammation and provide a conduit for lipid and immune cell transit: all mechanisms that could potentially regulate adipose tissue physiology in obesity. The growth of new lymphatic vessels in is mediated through vascular endothelial growth factor receptor-3 (VEGFR-3) signaling. We took advantage of the unique binding of murine VEGF-D to VEGFR-3 and generated mice capable of inducible, tissue-specific expression of murine VEGF-D under a tightly-controlled tetracycline response element (TRE) promoter to stimulate lymphangiogenesis. Crossed with adipocyte-specific adiponectin-rtTA mice (Adipo-VD), VEGF-D overexpression by adipocytes induced de novo lymphangiogenesis in murine white adipose tissue and a massive expansion of brown adipose tissue lymphatics. Upon removal of the doxycycline stimulus, VEGF-D expression returned to normal and the expanded adipose tissue lymphatics regressed. As a chemokine, VEGF-D recruited macrophages and caused fibrosis in adipose tissue on chow diet, but no negative systemic metabolic consequences were identified. The new white adipose lymphatic network provided a route for increased glycerol flux during lipolysis. On high fat diet feeding, Adipo-VD gained equivalent weight with more adiposity, but were more insulin sensitive. White adipose tissues in Adipo-VD mice were full of lymphatics, but exhibited less fibrosis and contained fewer crown-like structure macrophages. Infusion of CD45.1+ leukocytes into CD45.2+ Adipo-VD mice identified fewer immune cells accumulating in the Adipo-VD subcutaneous adipose with more trafficking out and into the inguinal lymph node. The increased lymphatic density thus reduces local inflammation in adipose tissue, manifesting as decreased liver triglyceride, increased insulin sensitivity, and overall healthier obesity highlighting the roles of lymphatic in regulating inflammatory pathologies and VEGFR-3 signaling as a potential target in the metabolic syndrome.

"Identifying Human Decomposition products in Soils for Two Criminal Cases in Texas"

Department of Plant & Environmental Soil Science, College of Agriculture and Life Sciences
By: Stephen Christopher VanSile

One question asked by agencies in Texas is â€œdo these soils contain evidence of human decompositionâ€• . Two agencies presented samples to the Nutrient and Water Analysis (NaWA) laboratory with that question. Typically, dissolved organic carbon (DOC), organic nitrogen (DON), NO3-N, PO4-P and electrical conductivity are significantly increased in grave soils. If the release of decomposition fluids into the soil is recent then NH4-N rather than NO3-N is significantly higher in the grave soil. One set of soils (Texas 1) was taken from a crime scene of scattered remains and the agency wished to identify the cadaver decomposition island (CDI). The second set of soils (Texas 2) was from a 27 year old cold case where the potential grave was beneath the foundation of a home. Soils were sieved to 2 mm and extracted with ultra-pure water prior to analysis for pH, electrical conductivity (EC), NO3-N, NH4-N, PO4-P, DOC and DON. Soils were also scanned using UV-Vis-NIR spectroscopy to obtain fingerprint spectra for comparison with known human decomposition products. Control soils were compared to potential grave soils using a 2 sample, 1 tailed t-test for each of the analytes tested. The tests concluded that Texas 1 soils unlikely contained evidence of human decomposition and the main driver behind this was the lack of DOC in the samples which is generally very high in the CDI. Furthermore the EC was significantly lower and the PO4-P not significantly different from the control soils although the NO3-N was significantly higher than the control soils. For the Texas 2 soils there was evidence in the wet chemistry results of human decomposition products (significantly higher DOC, NO3-N, PO4-P and EC) and the UV-Vis spectra showed a significant difference among the control and potential grave soils. To obtain human decomposition spectra the spectra from the control soils was deducted from the spectra of the potential grave soils. However, because the NIR database does not hold human decomposition signatures for samples over 3 years it was difficult to obtain a conclusive decision on the markers of human decomposition usually observed.

"Evaluation of Novel Massive Projectiles for Nano Scale Secondary Ion Mass Spectrometry"
Department of Chemistry, College of Science
By: Anita Vinjamuri

A distinct feature of secondary ion mass spectrometry, SMIS, with large projectiles, e.g. C60, Au400, Ar2000, is abundant secondary ion, SI, emission. Thus it is feasible to run experiments in the event-by-event bombardment-detection regime, where SIs from each individual projectile impact are recorded separately. A sequence of impacts amounts to probing a set of nanospots, as the ejecta originate each time from an area of 10-15 nm in diameter. To date we have developed nano analysis with Au4004+ viz. n/q=100, produced with a liquid metal ion source, LMIS. The purpose of this study, was to pursue this approach with still more massive projectiles. We found that the LMIS can produce projectiles measured to have n/q values of 200 to 350. A first task was to characterize the novel projectiles by identifying the number of constituent atoms and the charge of each projectile. This was accomplished by implanting the projectile into highly oriented pyrolytic graphite and performing Neutron Activation Analysis (NAA). By NAA, it was determined that the number of constituent atoms corresponding to n/q=100 and n/q=350 where 400 and 2800 respectively. A second objective was to determine if the more massive projectiles can produce more analyte specific secondary ions without increasing fragmentation. A library of mass spectra corresponding to different size gold clusters (n/q=100,200,350), was obtained for various samples (glycine, phenylalanine, Gramicidin S, etc.). When bombarding each sample with n/q=100 and n/q=350, the number of analyte specific secondary ions roughly doubled. For glycine we measured an increase from 1 to 2.6 molecular ions per impact when increasing the size of the projectile from n/q=100 to n/q=350. These massive projectiles show a promising enhancement in the performance of SIMS.

"Immunocytochemical illucidation of Lumbricus Variegatus Glutamate Receptors"
Department of Biology, College of Science
By: Douglas Allen Franklin

Lumbricus variegatus is a specied that posseses glutamate receptors within its ventral nerve cord. We used an immunocytochemical approach to tag these glutamate receptors and visualize them under a microscope.

“Synthesis of 2-Â-Vinyl Heterocycle as Potential Electrophilic Components as Inhibitors of Cruzain and NMR Spectroscopic Analysis of Their Thia-Â-Michael Reactions with Thiols”
Department of Chemistry, College of Science
By: Mireya Luna

Cruzain is an essential cysteine protease in Trypanosoma cruzi (T. cruzi), the causative agent of Chagas’s disease. Cruzain is an ideal target for development of potential trypanocidal drugs because of its critical role in the survival of T. cruzi in infected human hosts. Crystallographic analysis of cruzain treated with the covalent inactivator K11777, a peptidomimetic compound with an electrophilic vinyl sulfone substituent, undergoes the formation of a stable CÂ--S bond between cruzain and the vinyl group of the inactivator. We seek to develop new cruzain inactivators in which the vinylÂ--sulfone group is replaced by isoelectronic vinyl-Â-heterocycle groups which may provide reversible covalent inactivation of cruzain, which would be less subject to selectivity and toxicity problems that plague irreversible inactivators. This report examines the potential of 2Â--vinyl heterocycles as inhibitors for cruzain by NMR analysis of the thia-Â-Michael addition to the vinyl bond using 2-Â-mercaptoethanol (BME), cysteamine and L-Â-Glutathione as Michael donors.

“Genetic Pest Management of Invasive Rodents”
Department of Biology, College of Science
By: Jace Aloway & David Threadgill

Rodents are among the most common pests across the globe, particularly on islands where their presence alters the unique biosystems and threatens native species. Invasive mouse populations must be eradicated to allow recovery of these affected ecosystems. Because of the ineffectiveness and off-target effects of trapping and rodenticides, we are exploring a genetic approach to invasive mouse eradication. To achieve this goal, we are creating a strain of mice capable of producing only male prodigy, skewing the sex ratio, and ultimately leading to a crash in the target population. Sex reversal of female to male (e.g., an XX mouse that is phenotypically male and sterile) can be achieved by forcing the expression of key genes needed for male development or by deleting genes required for female development. The insertion of male sex-determining genes, our primary method, can be accomplished by linking Sry, a gene necessary and sufficient to initiate male development, to a gene drive system such as the t-complex using the CRISPR/Cas9 system. A gene drive is a region within the genome that is passed on to offspring greater than 50% of the time. The t-complex is a native mouse gene drive that can be pass on to up to 99% of offspring. We have determined that the tw2 haplotype is passed on at a rate of 95.29%, indicating that inserting the Sry gene into this region will be effective for skewing sex ratios. We are currently growing mouse embryonic fibroblast (MEF) cell lines with the tw2 haplotype to investigate the effectiveness of various Sry construct insertion sites. While insertion of Sry is the focus of this study, inserting a large section of DNA into the genome is often difficult and unstable. Deleting necessary female genes may offer an easier method in the case that the primary method is ineffective, however this method may not be as efficient at sex reversal. Foxl2 is a possible target in the female development pathway, which could be coupled with an artificial CRISPR/Cas9 gene drive.

“A Description of the Larval Stages of the Genus Thrauodes (Ephemeroptera: Leptophlebiidae)”
Department of Zoology, College of Science
By: Joseph Barnett

The genus Thraulodes (Ephemeroptera: Leptophlebiidae) is distributed across the Americas, and can be found in lotic systems from 25-28Â° S to 30-40Â° N. (Chacán et. al, 1999) With 45 described species, it is one of the most speciose genera of the Leptophlebiids. Despite the widespread abundance, this genus has been poorly documented with many species described as adults but lacking description of their larval counterpart. A morphological comparison between larval legs of five species will be presented and evaluated for systematic significance, along with the description of the nymph of Thraulodes lepidus and a previously undescribed species from Guatemala.

“Colorectal tumor growth analysis in (EGFR)-dependent and independent mouse models”
Department of Biomedical Sciences, College of Veterinary and Biomedical Science
By: Sydney Schuetze, Kathryn Anderson, & Carolina Mantilla Rojas

Colorectal Cancer (CRC) is the third most commonly diagnosed type of cancer in the US. Epidermal growth factor receptor (EGFR), a tyrosine kinase receptor, has been described as a key component in tumor growth. While it is a target for gene therapies, only 10% of the patients receive a benefit with this treatment. This suggests an EGFR-independent mechanism of CRC progression. The aim of this project is to investigate a new subset of colonic tumors that develop independent of EGFR activity, and compare their molecular signature with those tumors that grow dependent of EGFR. Previous studies showed that an EGFR-independent pathway influences the aggressiveness of CRC. In this study we used the metastatic-CRC mouse model (Apcf/f, KrasLSL-G12D/+) to evaluate the effect of EGFR (Egfrf/f, Apcf/f, KrasLSL-G12D/+) in colonic tumor progression. Mice at 3 months of age underwent AdCre exposure leading to the recombination of the alleles in a small portion of the distal colon. Tumor formation and growth was monitored with biweekly colonoscopy assessment. Following necropsies at nine months of age, the number, location, and diameter of colorectal tumors were analyzed. Methylene blue staining was used to assist identification of the tumors, with each sample scored twice. After measurement, tumors were excised and processed for histopathological analysis. As predicted, in the absence of EGFR we observed an increase in tumor penetrance, multiplicity, and size. The goal from this research is to determine how EGFR is involved in tumor initiation and progression, and ultimately lead to the discovery of novel biomarkers and alternate pathways involved in CRC progression.

"Microbial fermentation of polyphenolic compounds of Cocoa (Theobroma cacao) and Mango (Mangifera Indica)."

Department of Nutrition, College of Agriculture and Life Sciences
By: Maria Joselyn Castellon Chicas

Polyphenolic compounds have been widely investigated due to their antioxidant capacity and their potential use in the prevention of chronic diseases. In particular, fruit and vegetables have been found to include phenolic compounds in their composition. We have developed an incubation study to evaluate the influence of phenolic compounds (gallic acid and epicatechin) from mango (Mangifera Indica) and cocoa (Theobroma cacao) extracts on the growth of a mixture of probiotic bacteria (Lactobacillus casei, L. rhamnosus, L. acidophilus, L. plantarum and Bifidobacterium bifidum). Likewise, with the aim to assess metabolite production from mango and cocoa extracts by microbial fermentation (using the probiotic mixture), the production of gallic acid, pyrogallol and epicatechin were measured by rhodanine assay and High performance of liquid chromatography at 0, 1, 3, 6, 12, 24 and 48 hours. Moreover, we assessed how polyphenolic metabolites of both extracts (mango and cocoa) affect the population of bacteroidetes in lean and obese human microbiota using qPCR technique. Results show that both gallic acid and epicatechins have a concentration-dependent stimulatory effect on the growth of probiotic bacteria mix. Furthermore, the probiotic bacteria mix is able to metabolize phenolic compounds of both extracts into metabolites that are bioavailable for our body. In conclusion, phenolic compounds of mango and cocoa have a stimulating effect on the growth of probiotic bacteria. These results provide evidence of the important role that probiotic bacteria plays in the pharmacokinetics of phenolic compounds.

"Retrograde Tracing of the Direct- and Indirect-pathway Neurons in the Posterior Dorsomedial Striatum"

Department of Biology, College of Science
By: Britton Rae Barbee

The dorsomedial striatum (DMS) is crucial for goal-directed learning and heavily implicated in drug and alcohol addiction. The posterior DMS (pDMS) receives multiple inputs and contains medium spiny neurons (MSN) expressing dopamine D1 receptors (D1Rs) or D2Rs. These neurons exhibit abnormal synaptic plasticity after excessive alcohol consumption. However, the different sources of the afferent projections to the pDMS are unclear. To identify the source of presynaptic neurons projecting to specific pDMS D1- or D2-MSNs, we used a state-of-the-art monosynaptic retrograde tracing technology to label these presynaptic neurons in the whole brain. Then, we determined the extent to which those presynaptic cells projecting to pDMS D1-MSNs (or D2-MSNs) also contain D1Rs (or D2Rs). We found strong projecting neurons in the different subregions of the cortex, as well as the amygdala. Interestingly, pDMS D1-MSN-projecting cortical neurons did not contain D1Rs; pDMS D2-MSN-projecting cortical neurons did not express D2Rs. The results suggest that the connected cortical and striatal neurons do not express the same type of dopamine receptors, which is an important question in the addiction field that has not been addressed before. Understanding these connections will also improve our knowledge of the pDMS circuit in drug addiction.

"Visualization Suit for Physics Validation of the Quality of the Muon Alignment for the CMS Experiment at the Large Hardon Collider"

Department of Physics, College of Science
By: Malachi Brown

The muon system of the CMS experiment provides fast trigger decision, muon identification, and muon trajectory measurement. The CMS system consists of drift tubes chambers in the central parts and cathode strip chambers in the forward parts. The performance of the muon system depends on a precise knowledge of the positions and orientations of all its elements within the CMS detector. For this reason the muon tracks reconstructed in proton-proton collision data at the LHC are used to align the muon system with respect to the inner silicon tracker. Once the muon system has been aligned, it is crucial to verify the accuracy of the new geometry provided. The Physics Validation tool constructs muons coming from the Z-boson decay, and measures the reconstruction performance obtained from the new geometry. I will improve the physics validation tool by creating a visual interface that will allow the results to be easily browsed, facilitating the comparison among different geometries. This task is of particular interest since it is in general crucial to provide an updated muon system geometry as soon as the CMS experiment starts to collect data. The implementation of an automatic and intuitive visualization of the physics validation tool will help with monitoring the muon alignment with the short time available, and to spot eventual differences between data and simulation.

"Analysis of the individual roles of telomere-associated proteins in Arabidopsis"

Department of Biochemistry, College of Agriculture and Life Sciences
By: Gabrielle Lessen

Telomeres consist of simple repeating sequences and associated proteins, which together serve to protect chromosome ends from degradation or fusion. Misregulation of telomeres leads to replication stress, DNA double-strand breaks, and other biological consequences that affect normal DNA replication and organismal viability. Telomerase, "an essential enzyme for telomere function and maintenance," is responsible for telomere replication and maintains telomere length. In Arabidopsis, studies have led to the discovery of an essential telomere protein complex CTC1/STN1/TEN1 (CST), which caps and protects the end of the chromosomes and is highly conserved. CTC1 and STN1 interact with the telomere-associated proteins POT1a and TEN1, which positively and negatively regulate telomerase activity, respectively. This study will investigate how the individual telomere-associated proteins CTC1, STN1, TEN1, and POT1a interact with each other, with the telomere, and with telomerase in vivo. Candidates for amino acid residues important for mediating the interactions of CTC1 and STN1 were identified through the use of the multiple sequence alignment program ClustalW2, supplemented by modeling protein structure through the PHYRE2 Protein Fold Recognition Server and the molecular structure visualization and analysis program UCSF Chimera. Single, double, and triple mutations of these residues were introduced into CTC1 and STN1 using site-directed mutagenesis. Using a Rabbit Reticulocyte Lysate (RRL) system, the mutant proteins were expressed in vitro. Interaction between wild type STN1 and the CTC1 mutants, wild type POT1a and the CTC1 mutants, and wild type CTC1 and the STN1 mutants was tested through co-immunoprecipitation. Several residues of a triple mutant CTC1 protein were identified as candidates for mediating the protein interaction with STN1, and a single residue in STN1 was also determined as a candidate for CTC1 binding. The importance of these residues for protein interaction will be verified by yeast two-hybrid assay. Ultimately, transgenic Arabidopsis plants will be generated for separation-of-function analysis by specifically disrupting only one protein binding interface. By analyzing the biological consequences of disrupting these protein interactions, specifically their effect on telomere integrity, this study will give insight to the individual roles of telomere-associated proteins in vivo and advance understanding of how telomeres provide genome stability. Telomere dysfunction occurs in a myriad of stem cell-related diseases as a result of defects in DNA and cell replication. Thus, the study of telomeres, specifically the CST complex, and telomerase dysfunction may provide important new insight into stem cell disease etiology.

"Analysis of Polymers Using Secondary Ion Mass Spectrometry"

Department of Chemistry, College of Science
By: Jesse Manuel Sandoval

As new developments in the field of polymer chemistry are being achieved the need to characterize polymers is increasing. Some of the polymers have a characteristic head for diverse applications of lithographic templates. For this to be efficient the polymers need to be aligned vertically so the head is on the top. One way to characterize the identity of the molecule and the position is via Secondary Ion Mass Spectrometry in which hypervelocity Au-400 at 440 KeV ~3,300 Km/s clusters bombard the polymer that is spin cast onto a silicon wafer. The impact of Au-400 generates ions which can be detected with a time-of-flight mass spectrometer. The bombardment occurs in a sequence of individual Au400 each isolated in time and space. Each impact results in the emission of 20 ions from an area of 10-15 nm in diameter. The ejecta from each impact are recorded separately, thus enabling the identification of ions from co-located molecules. From this data we can determine the surface density of molecules and their extent of alignment.

"Sleep Deprivation Impact on Asexual Reproduction, and Neural Function and Behavior in L. variegatus"

Department of Kinesiology, College of Education and Human Development
By: David Villarreal III

Lumbriculus variegatus is an aquatic worm that exhibits a ventilatory posture, which facilitates gas exchange, where tails extended into the water column during daylight inactivity. In contrast, they are active at night. We have hypothesized that rest behavior represents a form of animal sleep. Deprivation of daily ventilation behavior disrupts aspects of neural regeneration, but not whole-animal metabolic rate. In our paradigm, worms are placed in a 12-hour light/dark cycle and chronically sleep deprived using an orbital rocker or caffeine treatment, beside untreated control worms. Chronic sleep deprivation causes a prolonged period of increased ventilatory behavior and minor, but significant, impacts on segmental and neural regeneration. We have also observed minor impacts on escapes behavior. Finally, we have investigated the impact of sleep deprivation on asexual reproduction in this annelid worm species. Our results suggest that L. variegatus possesses a sleep-like resting state that is not associated with changes in metabolism. Rather, chronic rest deprivation is linked to deficits in regeneration and asexual reproduction.

"Kinetic Study of Manganese Tetracarbonyl with a Dipiperidylmethane ligand as a CO Releasing Molecule"
Department of Chemistry, College of Science
By: Tucker Folsom

Research focused on the use of small molecules in biological systems has yielded new knowledge of the way carbon monoxide is utilized by the nervous system for signaling in physiological and pathophysiological situations. Small molecules, such as NO or H2S, have shown to be of interest, possessing significant therapeutic properties. Similar use of CO requires the development of a delivery mechanism for CO molecules to target areas. Research has centered on CO releasing molecules, or CORMs, where metal carbonyl complexes can serve as suitable CORMs.

Past literature has analyzed the reactivity of an Mn tetracarbonyl with a bulky diazabutadiene ligand as a CORM. The non-innocent nature of this ligand precluded a kinetic study of the molecules reaction as a CORM. Current research utilizes the innocent ligand dipiperidylmethane(Pip2) allowing for the kinetic study of the behavior of Mn(CO)4Pip2[BF4] as a CORM. Mn(CO)4Pip2[BF4] is synthesized from MnBr(CO)3Pip2, utilizing AgBF4 to remove Br permitting the addition of a fourth CO. When Mn(CO)4Pip2[BF4] is dissolved in acetonitrile, an axial CO is cleaved forming the tricarbonyl species, Mn(CO)3Pip2(CH3CN)[BF4], via a pseudo first-order dissociative mechanism. The complex Re(CO)4Pip2[BF4], an analog of Mn(CO)4Pip2[BF4], is expected to similar exhibit reactivity as a CORM, as both Mn and Re are Group 7 metals. Re(CO)4Pip2[BF4] was unable to be synthesized, as CO is not added to the species Re(CO)3Pip2[BF4], an unusually unreactive intermediate. A study of the reactivity of the Mn(CO)3Pip2[BF4] intermediate, part of the synthesis of Mn(CO)4Pip2[BF4], is being conducted to further understand the inability to synthesize Re(CO)4Pip2[BF4].

"Protein Antibiotic of Phage M"
Department of Biochemistry, College of Agriculture and Life Sciences
By: Lorna Min

The rise of antibiotic resistance presents a great challenge to physicians worldwide. The genetic elements responsible for resistance are often readily transmitted between bacterial populations, and issues such as patient noncompliance and over prescription only serve to accelerate their spread. Unfortunately, antibiotic discovery has decreased over the past decades. Furthermore, many current "novel" antibiotics are simply modified versions of already existing antibiotics. A need exists, then, to discover not only new antibiotics but also new antibiotic mechanisms.

Bacteriophages, the natural predators of bacteria, may comprise a hitherto disregarded reservoir of novel antibiotic mechanisms. The most abundant life form in the biosphere, phages produce lysis proteins that act as "protein antibiotics." The lysis proteins of two canonical small phages, FX174 and QÃŸ, cause host death by inhibiting biosynthesis of the bacterial cell wall in particular. To better understand the antibacterial activity of the small phage M lysis protein (LysM), we searched for spontaneous host mutants resistant to lysis. From the eleven isolated mutants, seven unique missense mutations were found in murJ, a proposed Lipid II flippase involved in bacterial cell wall biosynthesis. Interestingly, these mutations map to one of two transmembrane domains (TMDs) lining a central, solvent-exposed cavity: two to TMD2 and five to TMD7. These mutations suggest that LysM interacts with MurJ along TMDs 2 and 7 to prevent further flippase activity necessary for cell wall biosynthesis. This establishes a new class of antibiotics targeting Lipid II flippases of which LysM is a founding member.

"Investigating the impact of C+ formation on the rotational distributions obtained from 2+1 REMPI measurements of ground state CO"
Department of Chemistry, College of Science
By: Carolyn Gunthardt

"Neurogenetics of Learned Mating Preferences"
Department of Biomedical Science, College of Veterinary and Biomedical Science
By: Santiago Andres Forero

Mate choice plays an important role in reproductive isolation and hybridization between species. Mating preferences are often learned in early social development; therefore an individual's social environment has important evolutionary consequences. While decades of research on mate choice have studied social exposure, the neural network and specific genes active in developing a learned mating preference remain unidentified. The purpose of this experiment is to shed light on some of the neural mechanisms involved in learned mating preference of a swordtail fish (Xiphophorus birchmanni) for chemical cues of either conspecific adults or those of a closely related sister species (Xiphophorus malinche) based on social exposure (exposed to adult conspecifics vs. heterospecifics). Studying previously gathered RNAseq data, we identify possible target genes which are being differentially expressed between exposure treatments. Creating in situ hybridization probes for the candidate genes, we then identify activated brain regions and gain a better overall understanding of the neural framework of learned mating preference.

“Determining the Origin of a Ca2+ Wave Released in Arabidopsis thaliana upon Photostimulation of the ER-Chloroplast Nexus”
Department of Biology, College of Science
By: Sara Maynard

The endoplasmic reticulum (ER) in Arabidopsis thaliana is the source of the calcium signal produced by high-fluence blue light sensed by the junction between the ER and chloroplast, the ER-chloroplast nexus. Photostimulation of this nexus results in an observable and quantifiable cytosolic calcium wave in Arabidopsis seedlings: using FRET analysis, we were able to see both an increase in cytosolic calcium and a decrease in ER luminal calcium. Treatment with the plasma membrane calcium-pump inhibitor lanthanum had no effect on this wave. Treatment with the animal ER Ca2+-ATPase inhibitor thapsigargin had no effect, congruent with the literature. Treatment with the ER calcium-pump inhibitor cyclopiazonic acid (CPA) caused a delayed decrease in the calcium wave. CPA likely inhibits ER resequestration of calcium, allowing other organelles to sequester the calcium, or inhibits the delayed release of a smaller concentration of calcium due to photostimulation of just the ER, resulting in what appears to be inhibition of the original calcium wave.

“Study of Base Excision Repair (BER) in Designer Chromatin”
Department of Chemistry, College of Science
By: Julia Marie Santell

My current project focuses on the synthesis of 177bp DNA with specific damage sites near the linker region of a compact 12-mer nucleosome structure. These "designer" chromatins can later be used to analyze location-based repair characteristics of the dynamic chromatin structures within cells, helping to understand the origin and behavior of oncogene production within living systems at the organic "beads-on-a-string" chromatin level. The positioning of this Base Excision Repair (BER) site is crucial because the dyad region of the nucleosomal DNA is particularly sterically hindered to repair. With the research of this damage assessment in chromatin, further understanding of the behavior and repair characteristics of DNA damage sites can be deduced and eventually aid in the advancement of medical technology in fighting and repairing protooncogene mutations to reduce the risk of varying cancers.

“Predictive Analysis with the Million Song Dataset”
Department of Mathematics, College of Science
By: Kevin Chou

Nearly all students today regularly interact with music and are familiar with recommendation systems for suggesting new media based on previous viewing / listening history. In this article, we apply predictive modeling to a large and unique dataset containing digital characteristics of songs. Predictive modeling with large datasets is ubiquitous today, with applications ranging widely. Our analysis is illustrative of the process of building a evaluating models for both regression- and classification-based predictions.

"Allelic Exchange of the Flagellin Gene fliC of Clostridium difficile:
Generation of a Knockout Mutant"

Department of Biomedical Sciences, College of Veterinary Medicine and Biomedical Sciences
By: Diana Mai

Clostridium difficile is an antibiotic-resistant Gram-positive bacterium. It has become a major concern for hospitals and acute care medical wards where antibiotics are being used more readily. Therapies and preventative measures are being developed to control the disease, and therefore it is crucial to understand the basis of its colonization of susceptible hosts (e.g. antibiotic-treated patients). Genetic manipulation of the C. difficile genome can be achieved through allelic exchange technologies. Precise alterations are made in the PCR-ribotype 027 strain, R20291 to generate a deletion mutant of the flagellin gene fliC. By following mutagenesis protocols, this mutant can be obtained to serve as a tool and for studies on C. difficile motility and chemotaxis.

"Representations of the Hecke Group G(2) from Fermionic Modular Categories"

Department of Mathematics, College of Science
By: Kevin Michael Matthews Jr.

This project will be exploring a conjecture which states that groups from the Fermionic Modular Category are finite. Specifically representations of the Hecke group G(2) will be explored which are important in number theory. These representations are used for a mathematical model of Topological Quantum Computation (TQC) based on topological symmetries rather than geometric symmetries. The use of topological symmetries reduces the effects of outside interference on computations due to the nature of topological symmetries relying on the general shape but not distances or angles. TQC would aid in the development of quantum computing by helping to solve the problem of interference in quantum particles.

"Development of a Potential Molecular Catalyst for the Electrochemical Reduction of CO2"

Department of Chemistry, College of Science
By: Emily Brackhahn

Electrocatalysts involved in CO2 reduction can potentially reduce the levels of atmospheric CO2 while simultaneously producing a sustainable energy source. Electrochemical reduction occurs when a chemical species gains electrons and as a result undergoes a chemical change. The desired site of reduction is the carbon atom of the CO2 molecule as this process could produce reduced carbon compounds that can be used as combustible fuels. Molecular catalysts act to mediate this process by lowering the energy needed to induce the reaction to completion. This experiment details the synthesis of a d6 transition metal complex (Complex 1) that can potentially act as an electrocatalyst for proton-coupled reactions that convert CO2 to CO. Complex 1 was constructed using Lehn's catalyst as a model. Synthetic preparation began with the multi-step synthesis of a phenanthroline based ligand directly functionalized with electron withdrawing imidazolium moieties at the 2C and 9C positions. In the final step the ligand was coordinated to Rhenium(I) metal. The coordination complex was analyzed for electrocatalytic activity by studying its redox behavior using cyclic voltammetry. Data from these experiments can help lead to the development of an efficient process for CO2 reduction.

“Controlled Self- Assembly of Porphyrins by Different Counter Ions”
Department of Chemistry, College of Science
By: Abigail Josephine Starck

Due to its efficiency to convert light photons into energy, solar cells have become a more prominent form of sustainable and renewable energy. However due to the inconsistent fuel source of the sun, cost, and location, solar cells provide some limitations. Porphyrins demonstrate promising performance within solar cells due to the stabilized atomic structure present throughout the compound’s structure. This unique ability allows for porphyrins to aid solar cells control the absorption of sunlight radiation. Tetra(p-carboxyphenyl)porphyrin, TCPP, was directly acidified (with HCl, HBr, HNO3, or H2SO4) to analyze how the counter ions affected the synthesis of the nanowire structures. TCPP was formed into nanowires, nanospheres, or nanowire-based “sea-urchin” shapes, and the final products were characterized using atomic force microscopy (AFM) and UV-vis Spectroscopy. It was discovered that nanostructures had a red shift in absorbance, seen in the UV-Vis spectra. Overall, the self-assembly of porphyrins was regulated by the counter-ion, and future work will focus on fluorescence spectroscopy measurements and conductive probe measurements.

“Teratogenic Effects of Ethanol Alterations in Neural Stem Cell Exosomal miRNA Content”
Department of Biology, College of Science
By: Sarah Elizabeth Eaves

Exosomes are a subtype of extracellular vesicles, 40“ 100 nm in diameter, released by a variety of cells. Exosomes are known to contain protein, mRNA, and miRNA, and may participate in both paracrine and endocrine intercellular communication, whereby exosomes released from one cell fuse with, and release their content into, neighboring or distant cells. Though neural cells are known to be rich producers of exosomes, the role of exosomes in neural stem cell (NSC) development and differentiation, and in the NSC response to pathological stress, is unknown. For this reason, we optimized exosome isolation from NSCs using a polymer-mediated precipitation protocol (ExoQuick, SBI). Successful isolation of exosomes from NSCs was verified using SDS-PAGE and Western Blot, demonstrating significant enrichment of exosomal CD63 expression relative to parent neurospheres. We subsequently profiled the microRNA (miRNA) content of these exosomes in control and ethanol treated neurospheres and identified a subset of miRNAs whose expression levels were significantly influenced by ethanol treatment. Using a gain of function analysis, we show overexpression of these differentially expressed miRNAs significantly influences neurosphere growth. Therefore, the dysregulated miRNA content of neurosphere derived exosomes following ethanol exposure may underlie some of the aberrant neural maturation seen in Fetal Alcohol Spectrum disorders.

“Mutual suppression of echolocation in groups of tri-colored bats”
Department of Biomedical Sciences, College of Veterinary and Biomedical Sciences
By: Roja Manohar & Amber Patricio

Echolocation is a key feature of bats that allows them to maneuver through their environment and capture prey. However, echolocation can be interrupted due to acoustic interference from the calls of other bats flying in the same airspace. We hypothesized that mutual suppression is a common mechanism for mitigating interference in laryngeal-echolocating bats and predicted that tri-colored bats, Perimyotis subflavus, would decrease their pulse emission rates in the presence of echolocation from other bats in both open and cluttered environments. While mutual suppression has only been shown in Brazilian free-tailed bats, Tadarida brasiliensis, we tested to see whether or not this mechanism was common across multiple bat species. We recorded the echolocation of the tri-colored bats and measured their emission rates as they flew through a flight room with and without artificial playback of other bat’s calls. As the artificial acoustic stimuli emission rate increased, the pulse emission rate of the bats decreased. In addition, we recorded emission rates as the echolocation of the bats triggered an artificial stimulus and found that there was a decreased emission rate during the stimulus compared to the rate immediately before the stimulus was played. These findings indicate that a similar mechanism for mutual suppression of echolocation exists among different bat species.

“DAFT Steady Increase Training Versus Plyometric High Intensity Interval Training on Cardiovascular Levels in Collegiate Dancers”
Department of Kinesiology, College of Education and Human Development
By: Amanda Alvarez, Brooke Griffin, & Kali Taft

The purpose of this study is to analyze the effects of using the Dance Aerobic Fitness Test (DAFT) in collegiate dancers’ training in order to improve their overall cardiovascular stamina and endurance. While dancers attend daily technique classes and rehearsals, they often struggle with cardiovascular stamina and endurance due to the anaerobic nature of dance training. This proves to be consequential during a dancer’s performance season because they often are unable to maintain a healthy heart rate during fast-paced dance works. Additionally, they struggle to recover after many fast-paced movements, thus making it more difficult for them to complete an entire performance. This study will have a control group that will not train; a group that does the DAFT three times a week; and a group that does the High Intensity Interval Training (HIIT) three times a week. The participants will be evaluated on their maintenance of proper technique throughout the testing procedures and the maximum heart rate will be collected using heart rate monitors. The maintenance of the technique at high levels of activity will be an indicator of cardiovascular stamina. The recovery rate after one minute and after two minutes will be recorded to show any improvement in the dancer’s recovery rate. The expectation is that the participant’s overall cardiovascular stamina and endurance will increase correspondingly to either the DAFT or HIIT. Cross training has been proven to be very beneficial for dancer’s cardiovascular stamina and endurance. The results from this study should not only confirm this, but also introduce a new method in which dancers can cross train.

“Effects of Chromium Toxicity on the Trophoblast Cell Proliferation”

Department of Biomedical Science, College of Veterinary and Biomedical Science
By: John Zhouyang Wu

Several environmental chemicals have been identified to cause female reproductive disorders. Chromium VI (CrVI) is a heavy metal endocrine disruptor used in several industries. Increased production and use, and improper disposal of CrVI have led to the environmental contamination with CrVI in the U.S and developing countries. The United States of America, one of the world’s leading producers of Cr compounds, is facing numerous major health issues related to the adverse effects of CrVI. A recent study from our lab has shown an increased accumulation of CrVI and apoptosis of trophoblast cells in the placenta. Normal growth and differentiation of the trophoblast is critical for the initiation and maintenance of pregnancy. Therefore, any interference with trophoblast proliferation and differentiation could potentially lead to adverse outcomes of the pregnancy and fetal health. Therefore, the objective of the current study is to understand the role of CrVI toxicity on trophoblast cell proliferation.

“Iron Trafficking in the Vacuole of Saccharomyces cervisiae on the Basis of pH”

Department of Biomedical Sciences, College of Veterinary Medicine and Biomedical Sciences
By: Joel Ferrer

Vacuoles in yeast are vital organelles that take on many important biological roles. They are responsible for collecting and detoxifying iron such that reactive oxygen species are not formed. They are also important storage organelles for many nutrients including iron. In fact, if enough iron is stored within the yeast vacuole, the cell is able to survive in iron deficient conditions. A model for iron in the vacuole has been proposed previously by Cockrell et al that suggested that iron is imported as iron (II) where, once inside, it is oxidized to iron (III). Under standard conditions, it is known that yeast vacuoles tend to be more acidic, around pH 5, due to a proton pump encoded with many subunits one of them being VMA2. Because the molecule to which the iron is ligated with to is based largely on the vacuolar pH, it is suspected that when the subunit corresponding to VMA2 is knocked out en vivo, the iron will favor nanoparticles rather than its polyphosphate ligand. Previously, it has been shown en vitro that this interconversion is possible however en vivo studies have not been conducted. In addition to the interconversion, it was hypothesized that, if the pH is lowered below pH 5, the acidic conditions will favor an iron (II) oxidation state due to Le Chatelier's principle. These hypothesizes were tested by growing Saccharomyces cervisiae cells with a BY4741 background with and without the VMA2 subunit. The cells were then harvested and analyzed using a combination of biophysical techniques including Mössbauer spectroscopy, electron paramagnetic resonance (EPR), and inductively coupled plasma-mass spectroscopy (ICP-MS). As a result, it was seen that, indeed, this interconversion was possible en vivo. Moreover, when the subunit of the vacuolar ATP-ase was knocked out, there was a sizable increase in total cellular iron which could suggest that the iron regulon might be influenced by the mitochondria as well the vacuole.

“Protein Interaction Studies Between Individual Replication Protein A and CST Subunits”
Department of Genetics, College of Agriculture and Life Sciences
By: Catherine Smithson

Replication protein A (RPA) and CST, a telomere complex, are two highly similar heterotrimeric complexes involved in various aspects of DNA metabolism. RPA is involved in genome-wide DNA metabolism (including DNA replication, repair and recombination) while CST has been shown to play a specific role in telomere protection and maintenance. Recent studies have implicated RPA in telomere maintenance. Two CST subunits, STN1 and TEN1, have been found as a complex independent of the CST complex. Given the high level of structural conservation between RPA and CST it is possible that alternative complexes could form between individual CST and RPA subunits. The aim of this study is to determine if RPA and CST subunits associate with each other using a co-immunoprecipitation assay. We have constructed vectors with RPA2A, RPA2B, RPA3A, RPA3B, STN1, and TEN1 and have begun test expression of the proteins in rabbit reticulocyte lysate. If association between CST and RPA is found, further studies could investigate how and why CST and RPA work together to maintain telomeres and to promote aspects of genome stability.

“Synthesis and Characterization of Low-Coordinate Lanthanide Isocarbonyl Transition Metal Complexes for Single-Molecule Magnet Applications”
Department of Chemistry, College of Science
By: Adam Burkhard

Low-coordinate lanthanide complexes demonstrate strong potential for single-molecule magnet (SMM) applications. Due to the synthetic challenges of preparing low-coordinate lanthanide complexes, systematic studies of these compounds are lacking. In this study, three-coordinate lanthanide isocarbonyl transition metal complexes will be synthesized and the magnetic and electrochemical properties studied. These complexes will be prepared by an amine elimination reaction via a substituted cyclopentadienyl tungsten tricarbonyl hydride and Dy(N(SiMe3)2)3. The modified cyclopentadiene (HCpBIG) will be synthesized by a palladium catalyzed Heck-type reaction between zirconocene dichloride and 1-bromo-4-n-butylbenzene. The steric bulk and solubility of CpBIGW(CO)3H is expected to facilitate synthesis of the three-coordinate lanthanide complex. The magnetic properties of Ln(WH(CO)3(CpBIG))3 [Ln = Dy, Er] will be presented.

“Predictive Models using Discriminant Analysis on the MLB Baseball Hall of Fame”
Department of Mathematics, College of Science
By: Andrew Armstrong, Asaf Drizlikh, Steven Broll, & Xin Su

The MLB Baseball Hall of Fame is a continuously-developing, prestigious collection of highly-skilled baseball players from the 20th century and early 21st century. However, due to the fact that baseball players have many varying skill sets, being placed in this Hall of Fame is largely a subjective achievement, as there are no explicitly definitive qualifications. However, using linear discriminant analysis, a statistical analysis method concerned with retaining qualitative results using quantitative data, we create a predictive model for determining a baseball player's Hall of Fame-related status. In order to create this model, we took player statistics from multiple baseball players and ascertained the variables most highly correlated with Hall of Fame status from thirty potential choices. This model can be used by baseball enthusiasts, experts, and players alike for determining a player's potential Hall of Fame status or another player's qualifications for being in the Hall of Fame based on prior results. Additionally, this model provides a potential for advancements in sports statistics, laying a foundation for additional models for other sports and related activities.

"Analysis of Bacteriophage Î» Spanin Suppressors"

Department of Biology, College of Science
By: Russell Harold Moreland III

The final step of lysis in lambda infections of E. coli is mediated by the spanins Rz and Rz1, which form a complex that bridges the cell envelope and has been proposed to cause fusion of the inner and outer membrane. Mutations that block spanin function are found within coiled-coil domains and the proline-rich region. To gain insight into spanin function, we selected for spontaneous pseudorevertant alleles which returned spanin lytic function in lysis blocked mutants. Most second-site suppressors clustered within a coiled-coil domain of Rz near the outer leaflet of the cytoplasmic membrane and were not allele-specific. Many suppressors were polar insertions within the hydrophobic core of the coiled-coil interface. Unlike wild type, in which lysis occurs while the cells retain rod-shape, suppressor alleles supported lysis events that were preceded by spherical cell formation, suggesting that lytic capacity had been restored via a bypass pathway. We suggest destabilization of the membrane-proximal coiled-coil restores function for defective spanins by increasing the conformational freedom of the complex, at the cost of its normal all-or-nothing functionality.

"Identifying Galaxy Mergers in High Redshift Clusters Using the Hubble Space Telescope"

Department of Physics, College of Science
By: Courtney Watson

We propose a photometric and spectroscopic study of merging galaxies within two recently discovered high redshift clusters at $z = 1.6$ and $z = 2.0$. We use imaging taken with the Hubble Space Telescope's (HST) Wide Field Camera-3 (WFC3) in three filters: F105W, F125W, and F160W. Spectral data will be obtained from the 3D-HST survey taken with the WFC3 in two grisms: G102 in Field A and G141 in Field B. By combining our photometric measurements with the 3D-HST observations, we hope to determine relations among star-formation and mass growth due to these merger events."

Medicine; Surgery; Radiology; Pediatrics; Pathology; Obstetrics & Gynecology; Anesthesiology; Epidemology & Biostat; Env'tal & Occ Health; Health Policy & Mgmt; Health Promotion/Comm Health Sc; Public Health Studies; Pharm Sc; Pharm Practice; Nursing

"E-MAP Directed Analysis of Effector Protein Function in Salmonella enterica serovar Typhimurium"

Department of Biology, College of Science
By: Morgan Riba

Two effector proteins of Salmonella enterica serovar Typhimurium, sseC and sseG, were studied in order to determine their molecular contributions to virulence. Data generated from large-scale genetic interaction screens in yeast, called E-MAPs, were used to direct experiments. Immunoprecipitation, immunofluorescence microscopy, and drug sensitivity experiments were performed on the effectors, and it was found that sseC disrupts host cell anterograde transport by binding to the retromer of host endosomes. sseG was shown to colocalize with the Golgi, indicating that sseG functions by interfering with host cell trafficking processes.

"Impact of Renal Lymphatic Hyperplasia on Blood Pressure Regulation"

Department of Chemistry, College of Science
By: Gabriella Abouelkheir

Chronic high blood pressure, or hypertension, is identified as a risk factor for heart disease, stroke, and chronic kidney disease. The primary cause of most hypertension is increased peripheral vascular resistance that is controlled, in large part, by the kidney's water handling. In the kidney, specific immune cell subsets and overall renal inflammation have both been identified as drivers of hypertension in preclinical models. Lymphatic vessels serve as a route of both fluid and immune cell clearance and their expansion, lymphangiogenesis, is necessary for the resolution of tissue inflammation. We hypothesized that by increasing renal lymphangiogenesis, renal inflammation would be reduced, and blood pressure would be normalized during salt-sensitive hypertension. To investigate the role of renal immune cell trafficking in instances of blood pressure challenge, we employed a murine model of inducible renal lymphatic expansion. Mice expressing a lymphatic growth factor, vascular endothelial growth factor (VEGF)-D, under the control of a TRE-promoter were crossed with mice expressing a Kidney Specific Protein-regulated transactivator (rtTA). Upon administration of doxycycline, the rtTA-dox complex binds to the TRE promoter region, causing transcription of VEGF-D only in renal tubular epithelial cells. The resultant kidney-specific VEGF-D overexpression caused expansion of the existing renal lymphatic network in addition to generating de novo lymphangiogenesis in the cortex of "Kid-VD" mice. We then utilized the Kid-VD mouse model during an established rodent hypertension regimen of nitric oxide inhibition and high salt diet loading to identify the impact "through weekly blood pressure measures - and mechanism "by cellular, protein, and RNA analysis - of expanded renal lymphatics on blood pressure regulation. Lymphatic circulation may thus provide a new target for the treatment of chronic hypertension and its associated co-morbities.

“Does Motor Learning Affect the Neuromuscular Junction?”

Department of Biomedical Sciences, College of Veterinary and Biomedical Sciences
By: ChunChen Jason Lu, Yung-Jen Huang, Josh Reynolds, Misty M. Strain, James W. Grau

Prior work has shown that neurons within the spinal cord can learn about environmental relations without input from the brain (Grau et al., 2014, Neurobiol. Learn Mem, 108, 155-171). For example, rats that have undergone a spinal transection can learn to maintain a hindlimb in a flexed position to minimize exposure to a noxious shock. Interestingly, after this learning has occurred, cutting communication with the muscle (i.e. sciatic denervation) does not eliminate the flexion response. This implies that a peripheral modification within the muscle helps maintain the flexion response over time. My hypothesis was that this involved an alteration at the neuromuscular junction (NMJ). Neural communication at the NMJ is mediated by the acetylcholine receptor (AChR), which is composed of protein subunits a, ÃŸ, ?, and d. The degree to which the AChR is engaged depends upon both its subunit composition and whether it is positioned in the neural membrane. Past work has shown that inactivity leads to the movement (trafficking) of AChR out of the membrane, which would reduce the strength of the response elicited by the release of acetylcholine (ACh). My premise was that learning leads to a lasting increase in flexion duration because it has the opposite effect, and traffics AChR into the neural membrane. To explore this possibility, I sought to compare the ratio of AChR protein within the cellular membrane portion to that contained within its interior (cytosol). This requires a fractionation procedure to separate the membrane and cytosolic components. Once the tissue is separated, protein antibodies and Western blotting will be used to assess AChR protein levels in muscle tissue from rats that have, or have not, undergone training. While fractionation is routinely used to assess receptor trafficking in neural tissue (e.g., Huang et al., 2016, Exp Neurol, 285, 82-95), this procedure has not been widely applied to muscle tissue. Thus, the first portion of my thesis has focused upon developing an effective fractionation procedure. This was accomplished by performing subcellular fractionation and subsequently separating the cytosolic and membrane fractions. The success of the fractionation is verified using primary antibodies that serve as markers for respective fraction to confirm the abundance of the marker in one fraction and not in the other.

“A Descriptive Model of the Current PTSD Care System:
Identifying Opportunities for Improvement”

Department of Industrial Engineering, College of Engineering
By: Jukrin Moon & Alec Smith

Primary Objectives of this poster is to 1) present a descriptive model of the current Post Traumatic Stress Disorder (PTSD) care system for veterans, 2) identify areas of improvement within the current PTSD care system, and 3) present ideas for potential support systems for PTSD patients.

Post-traumatic stress disorder (PTSD), a mental health disorder that people develop after witnessing or living through distressing events or situations, is estimated to impact 23 percent of veterans from recent wars (Kessler et al. 1995). The U.S. Department of Veterans Affairs (2016) reported that “22 suicides per day” occur among veterans with PTSD. Despite these alarming rates, the Veterans Affairs (VA) do not have the necessary budgets or personnel to meet the needs of all the veterans. Due to these inadequate measures, there exists a critical need to improve the current PTSD care system.

To address such need, healthcare tools such as mobile apps (e.g., PE Coach and CPT Coach) have been developed and widely adopted; however, these tools have been designed in isolation without taking into account the overall care system. This could lead to a loss of potential opportunities for improvement. For instance, PTSD Coach is a widely adopted mobile app offering many advantages for veterans, but its remote capabilities that could have been addressed otherwise are largely absent.

The lack of systems perspective in currently available tools is partly due to the absence of clear understanding of the current PTSD care system to inform the design of such systems. In this poster we present a descriptive model of the PTSD care system built using the data gathered in interviews with healthcare providers and patients as well as a systematic investigation of literature. The model captures both the healthcare providers' and the patients' views of the system and helps in identifying the underlying limitations and problems of the current PTSD care system which would lead to the design of a tool that meets the needs of these stakeholders.

The semi-structured interviews with healthcare providers (e.g., clinicians, psychiatrist, and biofeedback specialists) and patients are in progress. The interviews are transcribed, coded, and analyzed by graduate and undergraduate researchers using an interview analysis tool called MAXQDA. During the coding process, each transcript is coded by at least two coders to avoid bias. Inter-coder reliability is then analyzed and reported. More specifically, each coder coded the transcripts by reading the transcripts and mapping the related portions to the codes. The coding outcomes of multiple coders was compared using MAXQDA. When encountered with non-negligible differences, we double-checked our coding system, whether or not it was well-defined and well-communicated to all coders. After coding, we compared the responses from different interviewees for the same code to integrate dispersed and sometimes conflicting answers and discussed the codes until a consensus was reached.

As a result of these iterative interview analysis processes, we have built an end-to-end descriptive model of the current PTSD care system. In this poster presentation, the resulting descriptive model will be presented using Unified Modeling Language (UML), visualizing the dynamic flow of activities. We used an iterative model building approach, where interviews were used to validate and improve the model. The visual model helped the research team to formulate additional probing questions to solicit information on specific activities, processes, or decision points that were inadequately addressed in previous interviews.

Our preliminary results identified two important research gaps. First, patients often forget their homework assignments, and therefore can benefit from technological mitigation in form of a memory-aid tool. Second, both patients and clinicians may benefit from having access to information pertinent to periods of "hyper-arousal" and other mental state changes. The remote collection of such data using sensor-enabled mobile devices can provide an objective assessment that could complement the subjective self-assessment data. We are currently designing a smartwatch technology to serve this purpose. This tool is briefly showcased in this poster.

"Effects of Blocking KATP Channels on Mesenteric Lymphatic Pump Function"

Department of Biomedical Sciences, College of Veterinary and Biomedical Science
By: Samantha Lowrey, Andrea Potter, Jana Gomez, Nahom Girmay, & Marne Chacon

Lymphatic system plays a critical role in homeostasis by removing excess interstitial fluid, proteins, waste products, etc. Recent studies reported that ATP-sensitive K+ (KATP) channels in lymphatic muscle cells of guinea pigs mediate endothelial NO-dependent lymphatic muscle relaxation. It is well-understood that lymphatic vessel responses to physiological and pathological stimuli are species specific as well as organ specific lymphatic vessels in an organ from animals of different species or lymphatic vessels in different organs from one animal behave differently. Isolated bovine mesenteric lymphatic model has been used most extensively over last several decades, and still continues to be the preferred model for in vitro lymphatic investigations. However, the role of KATP channels in bovine mesenteric lymphatic vessels has yet to be studied. Therefore, the purpose of the present study was to determine the effects of blocking KATP channels on bovine mesenteric lymphatic pump function. Postnodal bovine mesenteric lymphatic vessel segments (~3 cm long) were isolated and cannulated in a custom-built isolated vessel perfusion bath. Vessel segments were perfused and superfused with PSS warmed to 37oC at 6 cmH2O transmural pressure. Vessel diameter was determined using video caliper software and recorded continuously during the experiment. After initial equilibration, spontaneously contracting lymphatic vessels were exposed to cumulative concentration of Glibenclamide, a KATP channel blocker. Lymphatic contraction frequency and stroke volume were calculated from the recorded diameter. Blockage of KATP channels by Glibenclamide was confirmed by adding pinacidil (KATP channel opener) to the bath.

"Relationship Between Depression and Sedentary Activity in College-Aged Adults"

Department of Biomedical Engineering, College of Engineering
By: Taylor Dillard & Michelle Nzoiwu

The prevalence of sedentary lifestyle is expanding in American society, and all around the world, with the growth of the technology industry. Sedentary behavior is linked to an increase in the odds of ill health (Teychenne, Ball, & Salmon, 2010) and chronic illnesses (Harold W Kohl 3rd et al., 2012), and this study aims to examine the relationship between daily physical activity and mental health. Findings of this study could be used to implement targeted physical activity interventions to prevent the onset of these sedentary behavior-related diseases. The physical activity of 20 (10 male, 10 female) young adults from the local community was recorded for seven days using an accelerometer (activPAL, PAL technology, Ltd), and the physical activity from 7 am to 7 pm was analyzed. Half of the participants were medically diagnosed with Major Depressive Disorder (MDD), and the other half served as the control. Participants also completed the Center for Epidemiologic Studies Depression Scale (CES-D) survey to better quantify their depression levels. We found that the participants who suffered from depression were more sedentary than their nondepressed counterparts, and females, in both the MDD and the control group, were more sedentary than the males. These findings suggest that physical activity and depression are correlated and that gender could also be predictive of sedentary behavior. In the future, this study should be completed with more participants to further validate these findings.

"Solid Food Feeding Practices Among WIC Participants:
Examination of Rural-Urban Differences"

Department of Modern Languages, College of Liberal Arts
By: Lane Peery

Rural areas suffer from a distinct inequality of proper nutrition among children and infants when compared to urban areas. The WIC program has attempted to remedy this through its New Food Package Rule which was implemented in 2009 and finalized in 2014. The focus of this study is the effect of the rule change on the age at which solid foods are introduced. While the introduction of standard, recommended foodstuffs, such as cereals or vegetable, was negligibly impacted by the rule change, there was an appreciable decrease in potentially detrimental foods in infant diets. With foods such as desserts or meat, the instance of introduction at or before six months of age was reduced significantly and the rates of formula usage before this time also fell, signifying an increase in rates of breastfeeding. This study validates the WIC rule change, as it shows the impact the availability of healthy alternatives can have on infant diet and health.

"Role of SK and IK Channels in Mesenteric Lymphatic Pump Function"

Department of Biomedical Sciences, College of Veterinary and Biomedical Science
By: Cheyenne Rovello, Elizabeth Brown, Megyn Gordon, Shelby Corbitt, & Ranjeet M Dongaonkar

Lymphatic system plays a major role in regulation of interstitial fluid volume by spontaneously contracting and relaxing to actively pump excess interstitial fluid. Although lymphatic contraction is the intrinsic property of the lymphatic muscle, it is understood that lymphatic endothelial cells regulate lymphatic pump function by releasing vasoactive factors in response to altered lymph flow or composition. Calcium-activated small conductance (SKCa) and intermediate conductance (IKCa) potassium channels in vascular endothelial cells have been identified to primarily mediate endothelium-dependent vascular smooth muscle hyperpolarization and relaxation. Activity of SKCa and IKCa in lymphatic endothelial cells has yet to be investigated thoroughly. Therefore, the purpose of this study was to evaluate our hypothesis that blocking the activity of SKCa and IKCa channels in mesenteric lymphatic endothelial cells increases lymphatic active pumping. Segments of postnodal bovine mesenteric lymphatic vessels (~3 cm long) were isolated and cannulated in an isolated vessel bath, and were perfused and superfused with PSS warmed to 37oC. Vessel diameter and transmural pressure were continuously recorded during the experiment. After initial equilibration with transmural pressure set at 6 cmH2O, SKCa and IKCa channels in spontaneously contracting lymphatic segments were blocked by replacing PSS in the bath with PSS+ Apamin (SKCa blocker), PSS+Tram34 (IKCa) blocker) or PSS+Apamin+Tram34. Lymphatic contraction frequency, stroke volume and fractional lymph flow were calculated from the recorded diameter. These studies are the first to study the role of SKCa and IKCa channels in endothelial regulation of lymphatic pump function.

"In Vitro Mechanical Stress Stimulates Cholangiocyte Proliferation and Expression of Functional Markers"

Department of Biology, College of Science
By: Mary-Catherine Clark

Cholangiocytes are epithelial cells that line the biliary tree and are responsible for the regulation of bile composition. They predominantly do this by the addition of bicarbonate, the changing of water composition, and the secretion of some bile acids. Bile aides in the digestion of fats and allow for their absorption in the digestive tract. We have previously shown that in chronic cholestatic liver diseases, a link exists between bile duct injury, cholangiocyte proliferation and sub-epithelial fibrosis. Typically, chronic cholestasis is modeled through bile duct ligation (BDL) in both mice and rats. Mechanical stretch is an in vitro system that models general cholestasis in humans, similar to animal models of BDL. Thus the AIM of this study was to evaluate the effects of mechanical stress on cholangiocyte proliferative and functional responses. To do this, two adherent cholangiocyte cell lines, Mouse SV-40 Cholangiocytes and Normal Human Cholangiocytes, were lifted from T-75 flasks and plated on 6-well stretch membranes at 50,000 cells per well. Cells were stretched biaxially at various time points. Cells pellets and supernatants were then collected for various assays such as Western Blots, Immunofluorescence, PCR, and dead cell counts. The resultant data showed that when cells are exposed to biaxial mechanical stress there is an increase in proliferative gene expression, tight junction gene expression, and morphological changes. Therefore, our data suggest that mechanical stress provides an in vitro alternative for modeling general cholestatic liver diseases, thereby, saving researchers both time and money.

"Evaluating Foreign Aid Effectiveness in Nepal"

Department of Public Health, Rangel College of Pharmacy
By: Sandra Carolina Restrepo

The purpose of this research is to examine foreign aid and its effectiveness in reducing poverty. It will focus closely on Nepal's development by measuring their economic and social progress since the Millennium Developmental Goals set in 1990 by the UN. Despite having received millions in foreign aid throughout the last few decades, Nepal is still one of the world's poorest countries. Through examination of several indicators it will be possible to evaluate the effectiveness of certain programs and conclusively determine which are most and least efficient. Billions of dollars are invested in global aid programs, therefore such information may prove helpful for future implementation of efficient programs not only in Nepal, but in all countries struggling with poverty.

"Analysis of Causes and Nursing Implications of the Hispanic Paradox"
College of Nursing
By: Catherine Buskmiller

With skyrocketing healthcare costs, it comes as no surprise that the rich tend to have better health outcomes than poorer Americans. In line with this trend, poorer immigrants from South and Central America and Spain to the US would have worse life expectancies or disease rates than their wealthier, white neighbors. But surprisingly, these immigrants beat the odds. Even with lower incomes and less access to healthcare, Hispanic people in the US live longer and have a lower mortality rate overall. Because Hispanic immigrants' socioeconomic status fails to reliably predict health outcomes the way it does for other groups, these findings have aptly been named the Hispanic Paradox. Discovering the causes of the Hispanic paradox could provide the key to improving the health outcomes of other nationalities through nursing and medical interventions.

"Effects of EGFR Inhibition on Cardiac Function"
Department of Biomedical Sciences, College of Veterinary and Biomedical Sciences
By: Ashtyn Zapletal, Jared Eichner, Breanna Loberger, Elliot Flint, & Carolyn McCrossan

Studies from our laboratory have shown that use of an epidermal growth factor receptor inhibitor (AG1478) for the purposes of cancer prevention and treatment can have cardiotoxic effects in mice. We evaluated overall cardiac health from four mouse strains (BALB/cJ, FVB/NJ, C57BL/6J, and A/J) by clinical methods in order to increase the clinical applicability to human individuals. We utilized echocardiography to assess cardiac function by analyzing ultrasound images with M-mode and Speckle Tracking. We also evaluated blood pressure and cholesterol levels, two factors that can put individuals at risk for cardiovascular disease and are often elevated during chemotherapy treatment. Changes in cardiovascular profiles using these three in vivo clinical parameters indicate an influence of genetic background on drug response and the prevalence of a non-linear drug response curve. Currently, we are focusing on analyzing these heart samples by performing histopathology to visualize evidence of disease and qPCR of genetic markers that highlight onset of cardiotoxicity. With the results of this research, we hope to better understand the effect of EGFR inhibition on the heart and how this can be transferred from the murine model to the human model to aid in cancer prevention and treatment.

"Primary Mechanical Determinants of Ejection Fraction"
Department of Biomedical Sciences, College of Veterinary and Biomedical Science
By: Steven Shao, Dana Luu, Helen Chen, Christian Encarnacion, & Ana Hernandez

Ejection fraction is a clinical index used to track cardiac performance and progression of heart disease. Previous models used derivations of the time varying elastance model to assume no change between end systolic and diastolic dead volume (DVo). This does not accurately represent normal, heart failure, and heart failure with preserved ejection fraction conditions. Using the minimal closed-loop model with DVo, a full solution was derived with all determinants present; this was too complex to be clinically applicable and lacked physiological meaning. Further simplification reduced and coupled parameters into known ratios. Therefore, the present model utilizes fewer variables for patient generality in a clinical setting.

“A Nebulizer System for Positron Emission Tomography Imaging of Aerosols and Nanoparticles for Use in Preclinical Pulmonary Drug Delivery Studies”

Department of Nuclear Engineering, College of Engineering
By: Andrew Sterling Butters

This research project proposes to develop, integrate and characterize a nebulizer system for the nasal pulmonary delivery of radiopharmaceuticals in the form of aerosols containing nanoparticles for dynamic imaging studies using positron emission tomography (PET) in small animal models of disease. PET imaging of inhaled radiolabeled drugs in the form of aerosols containing nanoparticles can provide an in vivo measurement of drug distribution using the drug itself as the tracer. The system will be composed of 1) a nebulizer generator, 2) an anesthesia system, 3) a gas exhaust system, 4) a physiological monitoring system for respiratory synchronization and nebulizer triggering, and 5) a cylindrical bed to house in isolation the rodent. The proposed nebulizer system will be integrated into the Albira Si micro-PET/SPECT/CT imaging unit and it will help carry out translational imaging studies of novel PET radiolabeled drugs in small animal models of lung disease, such as lung cancer. The nebulizer system will be integrated and characterized for activity median aerodynamic diameter (AMAD) particle size distribution, aerosol mass distribution, nebulizer triggering using the respiratory cycle, drug and activity pulmonary distribution, and inhalation fraction and particle distribution in a normal and diseased rodent’s lung model.

Aerospace Eng; Biomedical Eng; Chemical Eng; Civil Eng; Computer Sc & Eng; Electrical & Computer Eng; Engineering Tech. & Industrial Distribution; Industrial & Systems Eng; Materials Sc & Eng; Mechanical Eng; Nuclear Eng; Ocean Eng; Petroleum Eng

"Extending Wave Particles to Model Wave Diffraction"
Department of Computer Science, College of Engineering
By: Brennen Taylor

One common research area in computer graphics involves the real-time simulation of water surfaces. Common uses of water simulation in movies or video games commonly includes simulating large bodies of water, such as oceans or lakes. The size of these environments tends to make realistic animation by hand a nearly impossible task, driving the need for both realistic and computationally light simulation methods. Approaches taken to solve this problem include parametric representations of water surfaces, Eulerian grid-based approaches, and Lagrangian particle-based approaches. More recently, a method based on wave particles was proposed, offering a real-time, computationally light and scalable technique to model wave simulation using modern graphics hardware. However, this method lacks the ability to model diffraction, the bending of surface waves when they approach an obstacle or slit. In this work, we propose an extension of the wave particle simulation to include surface wave diffraction. This extension aims to add a level of realism in environments where waves will interact with obstacles by simulating realistic diffraction in real-time. We discuss the theory and implantation behind the extension of wave particle behaviors to simulate diffraction. Experimentation shows that the method increases realism in environments with large levels of object interaction. In addition, studies show that the method maintains scalability of wave particles, allowing for large numbers of objects and wave particles to be simulated in real-time.

"Development of a Mechanical Testing System Enclosed in a Controlled Biological Environment for the Study of Tissue Mechanics"
Department of Biomedical Engineering, College of Engineering
By: Grady M. Burnett

Over $5 billion have been invested in tissue engineering since the 1980s, and the number of companies supporting research and development in the field has risen dramatically. However, according to the NIH NIBIB fact sheet on tissue engineering "Currently tissue engineering plays a relatively small role in patient treatment." We hypothesize that part of the reason of the failure to bring tissue engineered therapies into the clinic is a lack of understanding and tools to perform mechanical analysis on soft tissues and tissue engineered constructs. Biological tissues have unique and complex physical properties which set them apart from any other engineering materials, making them more difficult to mathematically model and engineer. Therefore, there is a need to investigate and quantify their mechanical properties. Because biological tissues exist in very controlled environments and are sensitive to changes in their surroundings, it is critical that the testing environment replicates in vivo parameters. We have constructed a system which will allow for bench-testing in a controlled saline environment. Mechanical testing takes place in a water-tight "bio-bath" which has an inlet and outlet to allow for controlled circulation of water with a temperature controlled reservoir; two float sensors to monitor water level during bath filling, emptying, and testing; and pH and osmolarity sensors. Temperature is the most critical parameter for monitoring, as it is at the greatest risk to changer rapidly and impact the tissue sample and testing. This biobath bench-testing system represents a solution to an industry-wide problem.

"A characterization method to quantify golden retriever muscular dystrophy"
Department of Biomedical Engineering, College of Engineering
By: Catherine McProuty

Muscular dystrophy is a genetic condition due to an absence of dystrophin protein. It is marked by progressive weakening of the muscles. One of its most severe human form is called Duchenne muscular dystrophy. As dogs affected by golden retriever muscular dystrophy (GRMD) show symptoms similar to Duchenne muscular dystrophy, it is expected that a therapy having good results on GRMD could be adapted for humans. Discovering new therapies requires accurate knowledges of the disease advancement and its variabilities. A physical therapy assessment tool has already been developed to measure GRMD joints range of motion with a goniometer. It quantifies the disease progression by measuring passively the angles: maximum bending-extension of dogs' back limbs is operated manually by a technician. As measuring active joint range of motion could be a more effective characterization method, we developed a procedure to collect angles when dogs are walking on their own with the 3-D motion capture system Vicon. We focused on the hock, stifle and hip-femur angles of GRMD dogs, and compared them with a control group. To analyze the joints' range of motion, we developed a code in Python language. We expect the comparison between active joint range of motion for GRMD and non-GRMD dogs would evidence better predictive markers of the disease progression than the assessment tool previously developed. It would allow us to set up a more accurate classification of the different GRMD phenotypes. Then this classification could be used as a framework for future, and especially as a basis for researches focusing on muscular dystrophy therapies.

"Analyzing Daily Behavioral Data for Personalized Health Management"
Department of Electrical Engineering, College of Engineering
By: Randy Ardywibowo

Emerging technologies in wearable and environmental sensors with smartphones have provided health professionals unprecedented monitoring and intervention capacity with their ability to continuously collect human behavior data. This enables new solutions to health management problems to promote healthier lifestyles outside of clinical settings. A typical example is for preventing and mitigating obesity. Obesity is currently considered a public health issue as over one-third of the US adult population is classified as obese. However, addressing obesity is believed to be beyond the capacity of the healthcare industry, calling for scalable smart and connected health solutions that can automate personalized activity planning from big volumes of daily life behavior data, continuously monitored by mobile sensors.

However, with such outburst of dynamic sensor data, several challenges arise in translating them effectively into personalized activity plans. These challenges come from the missing values and outliers often seen in the data. These data challenges result in modeling and computational difficulties that may lead to ineffective or undesirable activity planning. We first explore existing analytic methods to address these challenges, including a recently developed dynamic system learning method -- SSMO -- that learns personalized behavior model from real-world sensor data while simultaneously estimating missing values and detecting outliers. We compare these methods, including SSMO, Functional Data Analysis (FDA) methods, and other off-the-shelf missing value and outlier detection methods, showing that SSMO is superior to the other benchmark methods with better prediction accuracy for the future BMI trajectory.

We then develop a dynamic system learning method that learns personalized behavioral model from real-world sensor data based on a switching dynamic system model. This system is capable of handling the many defects inherent in noisy sensor data, while also learning from multiple user behaviors simultaneously. In addition, to enhance the feasibility and quality of health planning, we develop a method to constrain activity planning based on user preferences and needs, as well as the learned individual behavior models and the similar characteristics among the peers.

In addition to deriving personalized health management, the proposed system is generally useful for dynamic modeling with big and low-quality data and their translation into healthcare decision making outside of clinical settings. With appropriate infrastructure, it will have a profound impact on deriving effective smart and connected health solutions using emerging mobile sensors and applications.

“Manufacturing Bio-Inspired Surface Topologies Using Laser Texturing to Enhance Tribological Performance”

Department of Engineering Technology, College of Engineering
By: Michael Flores Carrillo

The objective of this research project is to fabricate snake scale-inspired surface topology features on selected materials in order to improve their tribological performance, including lowering friction and increasing wear resistance. An Ytterbium fiber laser integrated with a CNC mill will be used to fabricate the desired topological features on aluminum, steel, titanium, and tungsten carbide as candidate materials. Snake scales have unique topology and material properties that increase their wear resistance and decrease their coefficient of friction (COF). Manufacturing a synthetic metal surface that has some of the core bioinspired principles will allow us to take advantage of millions of years of evolution. For this, surface topology features of scaled reptilian skin that enable its tribological performance will be investigated, the core principles recreated on synthetic metal surfaces, and its friction and wear performance tested. At the end of this research project, materials with superior abrasive wear resistance and a low COF are expected to emerge.

“Peo Amphiphile as an Agent to Prevent Protein Adsorption on Medical Devices”
Department of Biomedical Engineering, College of Engineering
By: Andrea Brunal, Mikayla Barry, and Melissa A. Grunlan

Protein adsorption occurs immediately upon implantation and triggers the body’s hemostatic response, leading to thrombus formation, infection, and inflammation. Current treatment options are limited to anticoagulants, which reduce the body’s ability to form blood clots, but increase risks of blood loss. Therefore, a coating to prevent this adsorption would increase the safety and efficacy of implanted medical devices. Poly(ethylene oxide) (PEO) is a flexible, hydrophilic molecule known to decrease protein adsorption, but, when combined only with a polymer, migrates to the center of the polymer and loses its function. To increase solubility in silicone and improve PEO’s ability to return to the surface, PEO was bound to a flexible, hydrophobic siloxane tether, creating an amphiphile (a-(EtO)3Si(CH2)2-oligo-dimethylsiloxane13-block-[PEO8-OCH3]). These PEO-silane amphiphiles have demonstrated efficiency in preventing protein adsorption at fairly low concentrations of 10 µmol/g silicone. To identify the minimum concentration needed for effective protein resistance, surface hydrophilicity (an indicator of PEO-silane amphiphile presence on the surface) and a bovine whole blood study were conducted. The results of these studies suggest that PEO-silane amphiphiles may be effective for short-term use with concentrations as low as 7.5 µmol/g silicone.

" Geolocation Inferencing Using Twitter Data”
Department of Computer Engineering, College of Engineering
By: Nazif Ali

Modeling human behavior over social media can provide amazing insights into crowd behavior. It can be used to understand how crowds react to a certain local or international event and how they influence us. However, this analysis requires data that are geo-tagged, and most of the social media data has no location associated with it. This has led many data scientists to develop models and algorithms to find the location of a user based on the user’s social media profile. Most common ways to infer location include social network analysis and content mining on user’s data. Unfortunately, most methods are not scalable and robust enough to work perfectly in real world applications. My research focuses on using current state of the art models to make them scalable and robust enough to be applied on different geographical regions and different languages of the world.

“AFM study of conductive sites and dielectric breakdown structures in HfO2 resistive switching devices”

Department of Chemical Engineering, College of Engineering
By: Sarah Hammock

One of the main obstacles preventing the implementation of HfO2 resistive switching devices is the high variability in switching parameters. This variability is thought to be caused by differences in the morphology and number of conductive filaments that are formed; therefore, characterization of the HfO2 layer after formation is important. Oxide microstructure is also important as it may affect how and where filaments form. In addition to filaments, other structures may form in the oxide layer due to destructive dielectric breakdown that ultimately damages the device. This study uses cAFM to investigate both types of structures in Cu|HfO2|pSi devices of varying oxide crystallinity after formation at constant voltage bias. The top contact of each device is removed via wet etch, and the surface topography of the HfO2 layer is mapped using tapping mode AFM. Any surface features noted on this layer are mapped more closely, and potential filament sites are measured using cAFM. The results are interpreted to gain insight into how oxide microstructure affects the morphology and size of both oxide damage and conductive filaments. As an ongoing development, the internal structures of potential filament sites are being investigated via scalpel cAFM.

“Developing an Apparatus to Study Blast-Induced Traumatic Brain Injury (bTBI) Via MR Elastography”

Department of Mechanical Engineering, College of Engineering
By: David Tighe

It has been estimated that up to 20% of soldiers returning from recent military conflicts have suffered from blast-induced traumatic brain injury (bTBI), which is caused when the shock wave from an explosion impacts the brain. Despite the high amount of these injuries, bTBI is still not fully understood. One proposed method for studying the effects of blast exposure is through imaging with MR elastography, which allows mapping of different stiffnesses of tissues within the brain by measuring displacement due to a mechanical shear wave actuated through the tissue. In order to investigate the capabilities of MR elastography in the study of bTBI, an apparatus has been developed which will interface with both the imaging system and the shear wave generator, as well as allow for quick and easy transition of animal models between imaging and blast exposure in a conventional shock tube. This apparatus utilizes the magnetic field within an MRI scanner to create a torque on a perpendicular magnetic field generated within an inductor. This torque is then transmitted to the specimen to create the mechanical shear wave by placing the inductor and specimen at opposite ends of a lever arm. By comparing the elastographic images taken from a healthy specimen to one which has undergone blast exposure in a shock tube, new information regarding the diagnosis and treatment of bTBI may be obtained.

"Accurate Human Motion Estimation Using Inertia Measurement Units for Use in Biomechanical Analysis"

Department of Mechanical Engineering, College of Engineering
By: Wyatt Hahn & Tyler Marr

Vision-based motion capture systems (MCSs) are often used as a way to create full-body virtual models of human beings, for applications ranging from movie Computer-Aided Imagery (CGI) to biomechanical analysis of human movements to medical purposes. However, vision-based MCS are often very expensive and require long and complicated preparation procedures. In this application, the proposed research aims to use inertia measurement units (IMUs) which are significantly more cost-effective and easier to use than visual-based MCSs. IMUs can be placed at each segment of the human body in order to create a computer model of human movement. We intend to utilize the data collected using the IMU's three-axis accelerometer, three-axis gyroscope, and three-axis magnetometer to precisely estimate the orientation and rotation of the body segments to which the IMUs are attached. The ultimate goal of this application is to develop a graphical user interface (GUI) that can facilitate the accurate biomechanical analyses of the human and/or animal movement using kinematic data (e.g., 3D orientation) from low-cost and easy-to-use IMUs. Successful accomplishment of this application will enable a more affordable, accessible, and portable biomechanics lab of human movement analysis for researchers and provide simple ways for clinicians to diagnose pathological movements of their patients.

"Assessment of Infrastructure Resilience to Natural Disasters: Case Study of the 2015 Gorkha Earthquake"

Department of Civil Engineering, College of Engineering
By: Jenny Truong

Nowadays, infrastructure systems, including water, sanitation, transportation, power, and communication infrastructures, are exposed to an increasing number of natural disasters (e.g., hurricane, flood, earthquake). As a community greatly relies on those critical infrastructure systems, the damages of infrastructures due to disasters could significantly affect the quality of life. Thus, it is important to build and maintain resilient infrastructures which are capable of absorbing, adapting to, and recovering from disasters. To this end, this study aims at gaining a better understanding of infrastructure resilience and identify effective strategies for improving infrastructure resilience. To achieve the research objectives, a case study on the performance of infrastructures during 2015 Gorkha Earthquake in Nepal was conducted. Data was collected and analyzed from more than 45 in-depth interviews with subject-matter experts (e.g., government officers, researchers, and international organizations representatives) in Nepal after the 2015 Gorkha Earthquake. From the collected data, different contributing factors and indicators of infrastructure resilience will be identified. The results of this research can provide a better understanding of different aspects of infrastructure resilience and ultimately help policymakers improve infrastructure resilience through adoption of effective adaptation strategies.

“Joint Motion Simulation Device for Veterinary Orthopedic Research Studies”

Department of Biomedical Engineering, College of Engineering
By: Amanda Marie Bass

In vitro testing is a vital, but typically expensive, step in the evaluation of orthopedic devices and surgical techniques. This is a particular issue in the veterinarian field where funding is limited for such research and an affordable device for in vitro testing is needed. The Joint Motion Simulator (JMS), developed by the Biomechanical Environments Laboratory at Texas A&M, is a testing system that allows the user to recreate physiologically accurate motion profiles with an applied static load for a fraction of the cost of similar commercially-available systems. The system was designed to adapt to a wide array of specimen sizes and accommodate different environmental chambers. Motion validation consisted of three performance tests: straight-line movement, sinusoidal motion, and canine coxofemoral joint motion. Statistical analysis of the empirical motion data from the straight-line and sinusoidal sequences quantified the accuracy and repeatability of motion studies in the JMS. The simulator’s capability to replicate physiologically relevant motion profiles was tested by comparing the system’s generated movements to documented canine joint movement profiles. The results demonstrated that the JMS can act as a precise motion simulation device for many different motion profiles. The combination of the JMS’ testing flexibility and design offers a cheaper testing alternative without sacrificing precision or relevancy. Introducing the JMS into the market will ease the validation process for joint devices and procedures, promoting innovation and culturing scientific knowledge within veterinary orthopedics.

“Investigating Lymphatic Flow Regulation via In Vitro Shear-stretch Methods”

Department of Biomedical Engineering, College of Engineering
By: Tawfik Hussein

The lymphatic system plays several important roles, including immune response, fluid and nutrient transport, and cancer metastasis. All of these functions rely on the generation and regulation of lymph flow. Any malfunction in the flow, such as impaired fluid reabsorption, could lead to anomalies, such as edema, a global health problem. Therefore, it is of great importance to understand how mechanical forces regulate lymphatic flow.

Research currently done in this field includes the quantification of stretch and flow forces in vivo (Dixon et al 2006). It is known that these are altered by edemagenic conditions (Rahbar et al 2014). However, only a few in vitro studies apply shear stress to lymphatic endothelial cells (LECs), and those did not consider physiologically relevant flow patterns (Jafarnejad 2015). In contrast, the effects of shear, stretch, and the interactions thereof on blood endothelial cells have been studied extensively for decades (Davis et al 2015). There has not been a study that considers the combined effect of stretch and shear forces on the lymphatic endothelium. Therefore, the deficiency of literature regarding the study of the mechanical forces on the LECs motivated this research.

Our approach is to conduct more realistic studies of shear and stretch forces on LECs. We will study the effect of shear stress on cultured LECs through investigating LEC calcium release in response to pulsatile shear stress in a parallel plate flow chamber. Additionally, we will study the effect of stretch forces on those cells via cyclic stretching of cells on a membrane. Finally, we will conduct conjoined studies combining the shear and stretch forces to better understand their impact on the LECs via a shear-stretch bioreactor developed in our lab. We expect the data collected from these experiments to help reinforce our understanding of lymphatic flow mechanoregulation.

"Effects of target stoichiometry on microstructure and magnetic properties of nanocomposites"

Department of Electrical Engineering, College of Engineering
By: Matias Kalaswad

Recent studies have shown that vertically aligned nanocomposite materials possess unique properties, including ferromagnetism. These properties can be used for spintronic applications, including new types of high density data storage. Vertically aligned iron pillars have been studied previously, but work remains to optimize their growth for practical applications. This study attempted to improve iron pillar growth and magnetic response by increasing the concentration of Fe_2O_3 (iron oxide). Three $(La_{0.5}Sr_{0.5}FeO_3)_{1-x}$:$(Fe_2O_3)_x$ targets were created, where x equals 0, 6, and 12 percent. The samples were grown on $SrTiO_3$ substrates using pulsed laser deposition. The resulting samples were analyzed using X-ray diffraction, transmission electron microscopy, and a physical property measurement system. Higher iron oxide concentrations yielded fewer iron pillars and a lower magnetic response. The results suggest that iron oxide doping is an unfavorable approach. This introduces the potential for further studies, such as varying deposition frequency.

"Locard's exchange principle in Cyber Crime"

Department of Technology Management, College of Education and Human Development
By: Juan Segura Rocha

Cyber-crime has grown exponentially and society is having trouble preventing it from occurring. The goal for this research is to commit a cyber-crime and to get away with it. We know that we might leave digital dust at the crime scene so we want to see what laws we can violate, or go around so that the evidence found is not admissible in court. Dr. Locard believed that no matter how good a criminal was the perpetrator would always leave evidence behind whether that be DNA, pieces of clothing, fingerprints, fibers, skin cells, hair, bodily fluids, or many others traces of their presence. The problem we face now is that a cybercriminal never comes into physical contact with the crime scene. I believe Locard's exchange principle could be violated through the use of remote cloud computing resources to leave no useable evidence. The objective of this research is to hack into a pre-designed box and have a team of cyber security experts determine whether or not they could trace the attack back to me. I will use remote cloud computing, shells, torrents, VPNs, as well as other resources to leave no usable evidence at the crime scene. A great portion of this project relies on social engineering, as the number one weaknesses in most organizations are its people in regards to cyber security. I plan on obtaining full control of the predesigned box and its network by leaving a USB storage device infected with malware/spyware somewhere inside the organizations physical compound. We will be hoping an employee picks it up and plugs it into their computer to see whom it belongs too, giving us full control of their computer and network. To prevent us from leaving physical evidence or a paper trail we will use bitcoins and online trading markets to make it impossible to follow the money. In conclusion, we would like to prove that by taking the correct countermeasures one could potentially violate Locard's Exchange principle by relying on human error and their inability to find relevant evidence.

"Modelling and Simulation of UAVs Hovering in Extreme Temperature Environments"

Department of Aerospace Engineering, College of Engineering
By: Daniel Ghan

A model for an unmanned aerial vehicle (UAV) hovering in high-temperature environments was developed and programmed into a MATLAB simulation. Motors, propellers, batteries, insulation, and phase-change material were modelled and the simulation determines when the battery can no longer supply the potential needed by the motors. It can be used to design the optimal UAV for a given mission. The simulation was programmed with realistic physical and electrical properties based on DJI's Matrice 100 quadcopter and used to predict the UAV's survival time under various mission parameters (e.g. payload masses and environmental temperatures) and UAV configurations (amounts of insulation and phase-change material, different propellers, motors, and batteries, etc.)

"Mailbox Detector"

Department of Computer Engineering, College of Engineering
By: Sumit Mishra & Yun Guo

Many people who live in rural areas or in communities where there is only one central mailbox location have difficulties checking their mailboxes regularly, or might sometimes check their mail unnecessarily since there is no mail. We reviewed the different patents and products that currently exist and found many problems with them such as being large in size, expensive and lack long distance communication. Our proposed solution to this problem is to design a compact device that can detect the presence of mail, communicate over long distances with the user and alert the user when the mailbox is tampered with by text or email. In addition, we give the option of using an app to receive the information faster and more conveniently. The app would give the option of live information, and other miscellaneous information such as how full the mailbox is and whether or not you have packages. The device will make use of a photo resistive or weight sensor, a MCU to process the information from the sensor and wirelessly communicate to a central server that will then alert the user through either email or text. This device will demand compaction and long-distance wireless communication in order to be a viable contender.

“Novel Breast Cancer Screening Modality: A Simulation Study”
Department of Mathematics, College of Science
By: Sicheng Wang

We demonstrate a novel method which has potential to accurately detect tumors surrounded by healthy tissue from their stiffness contrast. We aim to estimate the elastic material properties using the given boundary data and the surface displacement data. The problem is derived from the applications of quantitative elasticity imaging and posed as a constrained optimization problem. Through the inducement of indentations on the exterior of the simulated “breast,” the “measured” surface displacement fields are created to test the inverse strategy on a problem domain consisting of a stiff inclusion embedded in a homogeneous background. We observe that the reconstructed shear modulus distribution and the reconstructed inclusion appearance improves with an increasing number of surface displacement fields, but the reconstruction result deteriorates with increasing noise level. A series of examples are presented to reveal the effectiveness of the proposed method.

“Developing a low density, high throughput SNP genotyping assay in mice”
Department of Biomedical Engineering, College of Engineering
By: Kevin Tracy

Inbred mouse models have been widely used in biomedical research for the past century and provide a low variability model for the study of genetic differences. The use of genetic crosses between inbred mouse strains are frequently used to identify quantitative trait loci (QTL) in genome wide association studies (GWAS). Currently, most GWAS in mice use either high density arrays or whole genome sequencing to identify QTLs. Both options are costly and do not provide much benefit for low complexity crosses such as an F2. We propose a low cost option using the Fluidigm BioMarkHD 96.96 microfluidic genotyping array to assay a low-density mouse SNP array generated. The goal of this study is to validate informative SNP assays amongst crosses between the 10 most commonly used inbred mouse strains on this platform to generate a low-cost mapping panel useful across a variety of mouse strain crosses.

“A Semi-supervised Approach to Event-Based Ontology Creation”
Department of Computer Engineering, College of Engineering
By: Allison Ruth Badgett

One of the major challenges for modern data scientists is providing structure to data. Textual data is especially difficult to interpret and categorize. Much of the meaning found in this natural language data, like news articles or tweets, is contextual and potentially non-standard. Attempts have been made to manually create organizational ontologies, but this is usually limited to specialized sub-domains, as the task of providing a complete structure “by hand" across larger domains is unmanageable. We propose a semi-supervised learning approach to event ontology creation, building upon a subevent classifier already developed in the initial stage of our research. This classifier can distinguish between main events and subevents to create a coarse event hierarchy. Using this initial work, we further tune the classification process to produce an event ontology showing cross-domain event relationships, like event ownership and temporal ordering, within news articles. This event ontology facilitates faster and more accurate automated data interpretation by providing a structure to textual data. The next stage in the ``big data" phenomenon is not accumulating more data, but fully utilizing the vast amount of data already available. Event ontologies are a necessary step in this direction.

“Predicting Academic Performance via Machine Learning Methods”
College of Electrical Engineering, College of Engineering
By: Qingyu Wu

Machine learning is a heavily researched area in recent years, and many machine-learning methods for data analysis have been proposed in the literature. The goal of this research was to explore various machine-learning methods for the purpose of predicting the future performance of Electrical Engineering majors based on their academic records from the common year in the College of Engineering. Machine-learning methods make predictions solely based on historical data, and no emotions are involved in the decision-making process. Therefore, such predictions can be much more objective than those offered through in-person meeting and “eyeball” tests. In our work, we used the final grades from ECEN 214 Electrical Circuit Theory as the primary indicator of future performance, and our research showed that both the Nave Bayesian and Random Forest methods could lead to accurate predictions of the ECEN 214 final grade based on the student’s academic records from the common year. Our research also uncovered the courses that have the most predictive power to the future performance of Electrical Engineering majors.

“CMOS Integration of Structural Health Monitoring Sensor”
Department of Electrical Engineering, College of Engineering
By: Daniel Oviedo

The structural health monitoring device proposed by Jason Lee Wardlaw in his work, Energy Harvesting for Self-Powered Wireless Sensors, has been shown to have individual circuit blocks that operate at the technology used, which is an ON Semiconductor 0.5Âµm Complementary Metal Oxide Semiconductor (CMOS) process. To advance this research, an IBM 0.13Âµm CMOS process will be used to replicate the operability of the circuitry and obtain an overall system integration onto a single semiconductor chip.

“Kinematic differences during throwing between middle school
and high school football players”
Department of Biomedical Engineering, College of Engineering
By: Cynthia Rojas

The purpose of this study was to utilize motion capture technology to collect data on quarterback throwing biomechanics. Few biomechanical studies have been done on football and even fewer focus on younger football players and their development and differences in throwing mechanics compared to older players. We set out to establish a way to analyze motion capture data and visually present the results in a manner that is useful for coaches and players, not just an audience of scientific peers. Then to utilize this data 1) as a method for training quarterbacks, and 2) to track quarterback development over multiple years and analyze the progression of their throwing mechanics.

Fifteen quarterbacks (ages 12-18, mean 15.1 years) were brought in for data capture using a custom market-set designed for the study. Subjects performed three throws (hitch, corner, comeback), each using a different foot pattern (quick game, 3-step drop, rollout), to the both sides of the field. Throwing data was obtained using a twelve-camera Vicon Motion Capture System (Vantage V16), and four AMTI force plates (OR6-6-1000). The parameters that were calculated using programmed custom analyses include elbow flexion, balance throughout the throwing motion, release time, release orientation, analysis of the stride, accuracy of the throw, and the hip leading angle. The results from the study were used to compare the biomechanics of one middle school quarterback and one high school quarterback throwing a corner route off of a 3-step drop back.

“Sketchtivity: An Online Tool for Teaching Design Sketching”
Department of Mechanical Engineering, College of Engineering
By: Matthew Runyon

Perspective drawing is an important part of engineering design. Practice is required to master design sketching. Through machine learning, Sketchtivity automatically recognizes several shapes and allows students to increase their competence in design sketching through online, pen-based input lessons.

“Investigation into the Ballistic Properties of Three-Dimensional Braided Fabrics”
Department of Mechanical Engineering, College of Engineering
By: Michael New

High strength fabrics are an integral part of modern personal ballistic armor. Up until now, the most common practice has been to use conventional woven fabrics in these applications. This work explores the feasibility of replacing these conventional fabrics with three-dimensional (3D) braided fabrics for ballistic and other applications. Low-velocity tests were conducted on conventional woven and 3D braided fabrics to quantify properties of the different fabric structures. In particular, this work examines the thickness direction strength and stress-strain properties of both fabric structures as the layer count increases.

“Feasibility Study of Noninvasive Membrane Potential Measurements using Model System of Giant Unilamellar Vesicles”

Department of Biomedical Engineering, College of Engineering
By: John Paul Hernandez Alcala

Current methods such as surveys and physician evaluation for diagnosing mental illnesses are biased and unquantifiable; however, neuro activity can be measured and exploited for diagnosis and treatment of these illnesses. Despite advances provided to the neuro-spectroscopy field from current techniques such as the combined utilization of molecular probes (such as fluorescent dyes) and Second Harmonic Generation imaging, there is one major problem with most common noninvasive methods of measuring the membrane potential: the addition of probes or dyes for spectral signal amplification. The concerns of such an approach are cellular toxicity, pharmacological effects, and alteration of endogenous membrane potential. It is commonly reasoned that the origin of these problems is due to exogenous perturbation of the plasma membrane. To circumvent these problems, an optically driven intrinsic technique for measuring membrane potential will be revisited in this study using a cell model system of Giant Unilamellar Vesicles (GUV) and different optical modalities such as Coherent Anti-stokes Raman, spontaneous Raman and Brillouin spectroscopies to pave the way for non-invasive, probe-free membrane potential measuring methods.

“Characterizing Early Time Fracture Interference Effects and Late Time Reservoir Shape Factor Effects Using Analytical Methods”

Department of Petroleum Engineering, College of Engineering
By: Nutchapol Dendumrongsup & Nian Wei Tan

This project aims to extend the concept of drainage volume defined by the MCERI research group at Texas A&M University to (i) characterize the effects of fracture interference analytically using well-testing methods to individual fractures, and (ii) characterize the reservoir shape factor analytically after the infinite-acting flow period.

Recent practices in horizontal well hydraulic fracturing brought the issue of fracture interference to our attention. This project addresses our interest in characterizing fracture interference analytically by extending the pre-existing transient flow drainage volume methodology to model fracture interference. The interference effect is proposed to be incorporated using the concept of material balance time and rate-normalized pressure. The results of this project can be applied to further our understanding of fracture interference and lead to formulating a deterministic approach to finding optimal fracture spacing

The reservoir shape factor is the industry standard in calculating average reservoir pressure for different reservoir shapes. However, these shape factors are empirically calculated and are limited to a few simple geometries. This project addresses our interest in characterizing the reservoir shape factor analytically from the evolution of the drainage volume. Specifically, the transition zone of the drainage volume from the infinite acting radial flow to the pseudo steady state depends on the settings of the well and the reservoir shape. The results of this project will lead us to an enhanced comprehension of the effects of reservoir boundaries on average reservoir pressure and potentially lead to an analytical methodology to calculate shape factor for a generalized reservoir geometry.

To conclude, the results of this project shows that the application of material balance time and rate- normalized pressure concepts are able to quantitatively characterize the effects of fracture interference in unconventional reservoirs. In addition, we successfully used a hyperbolic approximation to determine the shape factor for multiple reservoir boundary shape and well locations.

"Investigation of Pedestrian-Cyclist Interactions through Machine Vision"

Department of Civil Engineering, College of Engineering
By: George Francis Gillette II

For pedestrian-cyclist facilities where collisions result in damaged property rather than police reports, there is a need for improved safety indicators. This proposal suggests a machine vision algorithm that evaluates the number of near-misses between pedestrian and cyclist entities on these facilities. Previous measures have been developed, such as pedestrian level of service, but they rely on facility geometry to assess safety rather than the traffic. The algorithm function in three primary steps: identification, classification, and prediction. Identification focuses on determining the location of moving entities, and classification determines whether the entity was a pedestrian or a cyclist. The prediction step then combines this information with a Kalman filtering process to generate a predicted future state. If the algorithm can successfully identify near-misses, an objective safety measure of pedestrian-cyclist facilities can be generated. This causes two important consequences: firstly, that pedestrian-cyclist facilities will be designed with geometric features that can demonstrate a reduced number of near-misses, and secondly, that currently dangerous facilities can be immediately addressed before becoming public hazards.

"Evaluating Initial Fixation Capabilities of Total Knee Arthroplasty Devices"

Department of Mechanical Engineering, College of Engineering
By: Lauren Brabson

Total Knee Arthroplasty (TKA) is a common procedure in which the contact surfaces of the knee joint are replaced in order to restore normal function. Revision rates for TKA procedures are significant and are often more complicated than the initial TKA due to increased bone damage and bone loss. Current devices usually include "pegged" or "keeled" tibial trays which are thought to contribute to uplift, loosening, and related complications due to insufficient bone through-growth, leading to the high revision rate. The novel 4WEB TKA device incorporates unique geometrical and mechanical properties expected to decrease micromotion, by increasing long-term fixation through facilitating bone through-growth in the device. The goal of the project is to secure FDA approval for the device; to that end, the 4WEB device will be submitted to a suite of required and recommended tests that evaluate mechanical properties of the device. One such test analyzes the initial fixation capabilities of the TKA device relative to competitors; this test applies a load that resembles walking and measures the resultant micromotion. If this device is approved, the need for revision procedures would potentially be reduced.

“Simulation of In-vivo Environment for Mechanical Testing of Tissues”

Department of Biomedical Engineering, College of Engineering
By: Shannon Hair

Mechanical mismatch between implanted bio-materials and tissues has become a common mode of failure among biomedical implants designed to augment tissues such as hernia repair meshes, vascular grafts, connective tissue prosthesis, etc. Consequently, a thorough understanding of the mechanical properties of tissues is necessary to prevent future device failure. However, mechanical testing of tissues can be difficult, largely because tissue mechanical properties vary dramatically in response to changes in environmental conditions such as temperature, osmolality, pH, and moisture level. Therefore, a system designed to precisely monitor and control environmental conditions for mechanical testing of tissues is paramount to obtaining reliable tissue mechanical data.

To address this current issue in biomedical research, we developed an environmental measurement and control system for use in mechanical testing studies. The system measures temperature, moisture, pH, and osmolality. A digital control algorithm to precisely regulate the temperature and moisture of a tissue sample was developed using a state machine design pattern and implemented on an Arduino microcontroller. The moisture control system includes an environmental chamber (biobath), a fluid reservoir, a pump with digitally controlled valves, and multiple digital float sensors which allow the controller to detect and control the water levels in the biobath and reservoir quickly and efficiently. The temperature control system utilizes multiple temperature sensors in tandem with resistive heating elements to maintain a desired temperature with a narrow range of error. This system will be utilized for research projects which require reliable tissue mechanical data for the development of improved implantable bio-materials with enhanced mechanical matching.

“Analysis of Time-Delay Artificial Neural Networks in Ball-Catching Task”

Department of Computer Science, College of Engineering
By: Cassandra Bub

We look at the success of a time-delay neural network in a scenario requiring memory as well as reactivity. Utilizing a ball catching scenario where the agent will have to move to catch a falling ball, and then remembering where the second one was relative to its position in order to catch the second, we can determine how the time-delay neural networks perform in these tasks. For comparison to previous work with this scenario, we will compare the performance to a feed-forward network, and a recurrent neural network.

“Phased Array, Integrated Optical Beam Steering Device with Thermo-Optical Heaters”
Department of Electrical Engineering, College of Engineering
By: Francisco Espinal

In this paper we demonstrate a phased array integrated optical beam steering device for sensing and analyze the efficiency of using thermo optic heaters to manipulate the phase of the signal in each waveguide to produce a steering effect in the far field. The designed silicon nitride waveguide array has eight arms that must be controlled individually. Manufacturing variations cause the fabricated device performance to deviate from the nominal design behavior. An algorithm was formulated to attain the optimal phases for each arm to steer the beam, the algorithm performed as expected but significant amount of drift appears in the output, potentially due to the temperature gradient presented on each channel. A temperature stabilization system will be attached to the chip to minimize the drift.

“Patient-Centered Monitoring and Image Processing on Smartphone”
Department of Electrical Engineering, College of Engineering
By: Chenjie Luo

Surgery Site Infection (SSI) is an infection that occurs after surgery in the part of the body where the surgery took place. It typically occurs within 30 days after the surgery (and discharge from the hospital). With rapid advance of sensing and mobile technologies, today more methods may be used to control the risk of SSI. In particular, mobile phones can be one of the most convenient and effective tools for monitoring SSI prognosis. The purpose of this research was to develop an algorithm for deforming the surgery site image to help monitor SSI risk and implement the algorithm on IOS devices. With proper deformation, the surgery site image can be readily analyzed using mobile phones with limited computational power. Our work focused on the so-called thin-plate spline interpolation, which is a two-dimensional extension of the cubic spline in one dimension. Compared with other spatial interpolation functions, the thin-plate spline is smooth and numerically stable. We implemented a thin-plate spline based deformation algorithm using both Matlab (for PCs) and Object-Oriented C (for IOS devices) programming languages, and showed promising deformation results for surgery site images.

“ORB-SLAM Examination in the Textureless Indoor Environment”
Department of Computer Engineering, College of Engineering
By: Yuan-Peng Yu

The purpose of the research is to evaluate the performance when ORB-SLAM algorithm works in a textureless indoor environment. ORB-SLAM is believed to be one of the best among state-of-the-art visual SLAM algorithms, where it adopts a heuristic model selection to tackle with different scene scenario in their experiments. However, the researcher is interested in whether repetitive patterns, textureless walls, and planar structures in the indoors affect the robustness of a visual SLAM algorithm. The research conduct experiments in the HRBB 4th floor to examine the performance of ORB-SLAM in a textureless indoor environment.

“Characterizing Early Time Fracture Interference Effects and Late Time Reservoir Shape Factor Effects Using Analytical Methods”

Department of Petroleum Engineering, College of Engineering
By: Nian Wei Tan, Nutchapol Dendumrongsup

This project aims to extend the concept of drainage volume defined by the MCERI research group at Texas A&M University to: (i) characterize the effects of fracture interference analytically using well-testing methods to individual fractures, and (ii) characterize the reservoir shape factor analytically after the infinite-acting flow period.

Recent practices in horizontal well hydraulic fracturing brought the issue of fracture interference to our attention. This project addresses our interest in characterizing fracture interference analytically by extending pre-existing transient flow drainage volume methodology to model fracture interference. The interference effect is proposed to be incorporated using the concept of material balance time and rate-normalized pressure. The results of this project can be applied to further our understanding of fracture interference and lead to formulating a deterministic approach to finding optimal fracture spacing.

The reservoir shape factor is the industry standard in calculating average reservoir pressure for different reservoir shapes. However, these shape factors are empirically calculated and are limited to a few simple geometries. This project addresses our interest in characterizing the reservoir shape factor analytically from the evolution of the drainage volume. Specifically, the transition zone of the drainage volume from the infinite acting radial flow to the pseudo steady state depends on the settings of the well and the reservoir shape. The results of this project will lead us to an enhanced comprehension of the effects of reservoir boundaries on average reservoir pressure, and potentially lead to an analytical methodology to calculate shape factor for a generalized reservoir geometry.

To conclude, the results of this project shows that the application of material balance time and rate-normalized pressure concepts are able to quantitatively characterize the effects of fracture interference in unconventional reservoirs. In addition, we successfully used a hyperbolic approximation to determine the shape factor for multiple reservoir boundary shape and well locations.

“Hierarchical Embedding Graph for Motion Planning”

Department of Computer Engineering, College of Engineering
By: Qingqing Li

Rapidly-exploring random tree, also known as RRT, is a state-of-art method in robotics motion planning. RRT is widely adopted to solve kinodynamic system, such as self-driving car or drone. However, it suffers from poor performance when the environment is heavily dependent on its topological characteristics, for example, a real-world multiple-floor garage. Previous work, dynamic region-based RRT(DRRRT), has dedicated to capture such topological characteristics and thus guide the growth of RRT with it. Although embedded graph significantly expedites the planning time of robotics, it can yield multiple paths and some of them are not feasible considering the size of the robot, for instance, the robot may find it struggling to pass through a narrow passage. So it is important for embedded graph to obtain additional information about the environment and prune out unfeasible paths generated by original method.

This project is presented to refine embedded graph to prune unfeasible paths in the environment that robot is struggling to go through and guide robot to more feasible paths with an algorithm called hierarchical aggregation.

“Position-Patch Based Face Hallucination Using Super-Pixel Segmentation and Group Lasso”
Department of Electrical Engineering, College of Engineering
By: Pengcheng Pi

Traditionally, researchers in face hallucination have focused more on the reconstruction part by using square-shaped segments. However, image segmentation has a huge impact on face hallucination. In this research, we apply a new position-patch based image segmentation method for improved face hallucination. With super-pixel segmentation, we exploit feature information of human faces by segmenting face images into spatial patches according to their appearances. Our experiment’s results show that super-pixel segmentation has a positive impact on the final result.

“Page Replacement Policy Evaluation in the Linux Kernel”
Department of Computer Engineering, College of Engineering
By: Andrew Singer

Modern computing systems are placing ever greater pressure on their memory management systems. The current means of managing the page cache in the Linux kernel is a binary ranking standard through which cached pages are stored either in an active list or an inactive list and managed by a least recently used (LRU) algorithm. Recent endeavors in processor caching have revealed the opportunity for increased performance resulting from refining LRU memory management algorithms. I propose to determine the feasibility of replacing the current LRU page cache system with one based on re-reference interval prediction (RRIP). I will achieve this by exploring the current Linux kernel to understand how exactly the page cache is managed, programming and implementing the custom RRIP page level replacement policy, and performing benchmark tests to determine the change in performance of the new system. Conducting this research will determine the efficiency of the Linux kernel’s current page cache system and establish its ideal configuration for minimizing the amount of page cache misses.

“Prediction of Ti-6Al-4V Chip Morphology & Surface Characteristics due to Adiabatic Shear Banding”
Department of Engineering Technology, College of Engineering
By: Evan Loehr

The research objective of this project is to investigate the ultra-high frequency aspects of adiabatic shear banding (ASB) during the Ti-6Al-4V chip generation process through the use of a piezoelectric dynamometer and accelerometer-based multidirectional force sensing systems. Such a coupled force sensing system was first assembled and calibrated. A design on experiments of machining tests were conducted to understand the relationships between these ASB-related machining force components and the resulting chip morphology, workpiece surface characteristics, and tool deterioration. This understanding helped generate strategies to control tool and workpiece responses by suitably altering process parameters such as machining speed, feed, and cutting depth, and were validated through further tests to exhibit the improvements in productivity, surface roughness, and tool wear.

“Mechanical Testing of Biodegradable Bone Cuffs for Comminuted Fractures in Sheep Models”
Department of Biomedical Engineering, College of Engineering
By: Ashley Bennett

Comminuted fractures occur when a bone breaks or splinters into two or more fragments. In the worst case scenario some of these fragments must be removed leaving a gap in the bone that will not heal on its own. To combat this, a cylindrical cuff has been created out of a novel biodegradable polymer to fix the alignment of the fractured bone segments, bear loads associated with normal activity, and deliver an osteogenic compound. In initial animal testing using sheep, it was observed that the construct could not endure the force of the test subject transitioning from a supine to standing position. Therefore, the polymer was reinforced with spherical and rod-like nanoparticles to improve the cuffâ€™s strength. To verify that the improved cuff is capable of withstanding the forces that will be applied during rehabilitation, torsional and four-point bend testing will occur. Inside the cylinder are fins that span the length of the cuff and are used to interface with the bone to prevent the cuff from turning once placed. Torsional testing will ensure that these fins are capable of withstanding the forces that will be applied by the bone without failing. The four-point bending test will mimic the forces that occur when the sheep transitions from a supine to standing position ensuring that the improved cuff can endure the physiological loading. Finally, to verify that the cuff is manufactured with a consistent quality, conical compression testing will act as a batch-by-batch quality control.

“Tunable Release of BMP-2 From Thiol-ene Click Hydrogels”
Department of Biomedical Engineering, College of Engineering
By: Ashley Tucker

With over 6.3 million fractures that occur in the United States each year, autogenic and allogenic bone sources are becoming a dwindling resource. With both sources having their own drawbacks, many have considered using growth factors, such as bone morphogenetic protein-2

(BMP-2), to promote healing in non-union long bone fractures. While research has shown that uncontrolled release of these growth factors can cause potentially life threatening conditions to occur, the fabrication of hydrogels as drug delivery vehicles to control release through tunability of the mesh size, rate of degradation, and chemical conjugation has been shown to mitigate these side effects. In particular, affinity ligands, such as bisphosphonate, has been shown to electrostatically interact with BMP-2 and can be tethered into hydrogel matrices in order to non-covalently control release and maintain the bioactivity of the growth factor. In this study, we compare controlled release of osteogenic growth factor BMP-2 from tunable poly(ethylene glycol) hydrogels that are tethered with varying amounts of bisphosphonates. By monitoring growth factor release rate and testing the ability of released growth factor to induce osteogenesis in vitro, we aim to design a hydrogel platform with superior and sustained growth factor delivery compared to previous works.

“Development of a Software Tool to Analyze Quarterback Motion Capture Data”

Department of Mechanical Engineering, College of Engineering
By: Zubin Shah

The throwing mechanics of a quarterback is a massively understudied aspect of football. To address this problem, we have begun a longitudinal study to provide more insight and understanding of the biomechanical development of a quarterback's throwing mechanics. There are two goals of this research, to provide data to identify what is currently being done to develop quarterback mechanics and analyze the development of each quarterback’s throwing mechanics based on common “coaching points” identified through interviews of local football coaches. This research is being conducted using the VICON motion capture system of 8 V16 resolution cameras to create Motion Capture (MOCAP) data through the Nexus software program. We have analyzed middle school and high school quarterbacks performing the most common throws based on their level of experience. Tests will be conducted during multiple offseason periods and the throwing biomechanics of each testing period will be statistically analyzed by comparing the quarterbacks to themselves, other quarterbacks at a similar level, and quarterbacks going through a different coaching system to determine if there is a significant difference in coaching. A python program is being developed to graphically analyze the MOCAP data, as well as accurately propagate any errors due to the calculations made and the uncertainty the VICON cameras themselves present. The diagrams and charts created through the python program will aid in the analysis of the differences in angles of flexion/extension, abduction/adduction, rotations and angular velocities of rotations during different points of the throwing motion. The purpose of this study is to produce an overall trend of how young quarterbacks change their throwing mechanics overtime as well as provide the biomechanical analysis of throwing to assist coaches in instructing younger quarterbacks to improve their biomechanical development.

"Synthesis and Characterization of Bioactive Pan-Paampsa Nanoparticles Dispersed in Polyhema Hydrogels"

Department of Biomedical Engineering, College of Engineering
By: Blake Smith

Electroconductive hydrogels, biologically responsive nanocomposites with conductive polymers, such as polyaniline doped with water-soluble poly(2-acrylamido-2-methylpropanesulfonic acid) (PAn-PAAMPSA), are promising candidates for sustained interface with cardiac, neuronal cells and hMSC. In the past, 2-(dimethylamino)ethyl methacrylate (DMAEMA) and 2-aminoethyl methacrylate hydrochloride (AEMA) have been used as pH modulators within hydrogels, a characteristic that is useful in addressing cardiac and neuronal applications. However, an evaluation of the impact of such modulators on electrical characteristics of hydrogels has not been done. Furthermore, incorporating water-soluble PAn-PAAMPSA in the formulation of hydrogels is a potential solution for the problem of electroconductive hydrogels typically being brittle, not readily processable, and insoluble in biocompatible material. For this reason, this study aims to assess the impact of varying molar concentrations of DMAEMA and AEMA as well as increasing amounts (wt%) of PAn-PAAMPSA on the electrical characteristics of polyHEMA-based electroconductive hydrogels.

"Autonomous Underwater Vehicle for Underwater Exploration and Recovery"

Department of Biological and Agricultural Engineering, College of Engineering
By: Kathryn Bickley, Sarah Beardsley, Pranati Chinthapenta, Zarah Navarro, Kaitlin Frierson, Yvonne Chukwu, Maricarmen del Toro, Adaora Atuegbu, Millie Kriel, Shawn Hinkle, Anjali Patel, Grace Westerman, Laura Austin, Doan Le, Leah Murff, Kathy Pai, Savannah Cooper, Kelsey Banasik, Jessica Jaksik, Alyssa Schaeffer, Brenda Lopez, Abigail Meza, & Judy Amanor Boadu

An Autonomous Underwater Vehicle (AUV) is being designed and fabricated to compete in the AUVSI Foundation International Robosub Competition. This research project is divided into three subdivisions: Electrical, Mechanical, and Programming. The electrical subdivision entails the power efficient design of the overall electrical system of the AUV while the programming subdivision requires the smart interfacing of sensors with the electrical system. The mechanical components include the small form factor design of the frame and hull, smart waterproofing of various sensors and cables, and ensuring the entire structure is water-tight.

"Phase-Dependent Finite Difference Heat Transfer Analysis with Heat Exchanger Applications"

By: Anthony Hresko, Blake Leiker, & Augustus Ellis

The finite difference method, a form of nodal analysis, is a powerful tool for developing accurate models of the changing thermal states of an object. With this method, a body that is too large or too complex for analytical heat transfer equations to handle can be separated into many smaller bodies for which the analytical equations are reasonable to solve. For this proposed project, the goal is to develop a program that uses the finite difference method to accurately model the heat transfer within a body subject to external effects, temperature dependent thermophysical properties, and material phase changes. The specific application of the program would be for modeling a phase change heat exchanger system. An important distinction for this project is that it will be completed from the ground up using readily available coding software. In order to verify and validate the results of the finite difference model, the project will also involve the building of an experimental apparatus. The apparatus will consist of a heat exchanger which disperses heat into a phase change material. The process for completing this project will require preliminary research, initial development of the necessary algorithms, and the application of the algorithms in our program, before ultimately the experimental apparatus is built and tested.

"An Ex Vivo Evaluation of the CBLO Using a Novel Canine Stifle Model: Considering the Physiologic Biomechanical Environment"

Department of Mechanical Engineering, College of Engineering
By: Pablo Leon

Cranial Crucial Ligament (CCL) injuries are common injuries causing clinical dysfunction in dogs through increased anterior tibial translation. Center of Rotation of Angulation (CORA) Based Leveling Osteotomy (CBLO) is a procedure developed by veterinary surgeon Dr. Don Hulse for the treatment of CCL injuries that improves on existing tibial plateau leveling osteotomy procedures. In vitro testing allows for more repeatable and controllable analysis of the kinematics of the stifle (i.e. knee) pre- and post-surgery. Current in vitro canine cadaver studies show 16-18mm anterior translation after CCL transection, while in vivo studies show approximately 10mm. To better compare CBLO with other surgical repairs, the Biomechanical Environments Laboratories and the Small Animal Clinical Sciences Department at Texas A&M are collaborating to create a more accurate in vitro limb-press model using mechanical elements to recreate muscular forces on cadaveric limbs. Our group believes the difference between the in vitro and in vivo translations is due to the current in vitro model accounting for only 2 of 29 major muscular groups on the limb. The improved model will add select muscular groups that prevent anterior translation of the tibia by approximating the attachment point and relative force generated by each muscle. The final product will allow surgeons to better compare CBLO with other orthopedic procedures so that more informed treatment decisions can be made.

"Development and Analysis of Haptic Feedback Navigation Aid"

Department of Aerospace Engineering, College of Engineering
By: Katherine Schneider, Elisha Gerhard, & Jordan Roiko

GPS navigation systems and applications have transformed the way drivers get to their destination. With the guidance of a computer-generated voice, users can receive turn-by-turn directions without the dangerous distraction of a map but what about deaf drivers who cannot hear this voice? Despite the millions of deaf and hard-of-hearing drivers in the United States, this group has limited solutions for safe, convenient, and simple navigation. By performing the development and analysis for a navigation system that uses haptic feedback, our team of has gathered the information necessary to create a cheap, reliable navigation solution for drivers who are hard of hearing.

“Force Analysis of a Moored Tanker Ship Due to Wave Induced by Vessel Passing Parallel”
Department of Ocean Engineering, College of Engineering
By: Da Yeon Kang

While a tanker is loading and offloading oil and gas onshore, it is effected by waves generated by the parallel passing vessel. The mooring system and motion of the tanker experiences excitations in surge, sway, and yaw. First numerical method is applied to approach the problem and various computer programs including advanced ones such as SIMDYN are used to analyze the force and moment.

“Characterization of DNS Servers for Latency Estimation Metrics”
Department of Computer Science, College of Engineering
By: Joseph Johnson

It is easy to “ping” a remote computer from one’s own to determine the time delay between them, but estimating the latency between two remote hosts is much less trivial. This problem has various applications: social networking and online gaming are a few significant examples. Clever algorithms have been developed to approach the problem, though recent changes in the Internet are rendering them increasingly inaccurate. One such algorithm, Turbo King, makes use of DNS servers geographically near two remote hosts to estimate the latency between them. Unfortunately, with the emergence of IPv6, certain DNS server implementations have added additional queries and steps to their name resolution process. Because these extra delays are unpredictable, they add error to Turbo King’s latency estimation, rendering the algorithm imprecise. We have reevaluated Turbo King by classifying DNS servers by behavior and analyzing delays for potential patterns. Combining the patched algorithm with a new, updated scan of all DNS servers worldwide allows us to use Turbo King reliably and correctly. Though there still exist cases which Turbo King cannot handle, we are now several steps closer to having knowledge of latency between any two endpoints on the Internet.

“Wireless Device Orientation Estimation”
Department of Electrical Engineering, College of Engineering
By: Derek Winter Heidtke

Estimation of wireless device location (localization) has been studied for its usefulness in network infrastructure. However, the related issue of determining device orientation, has received less attention. Many contemporary electronic devices are equipped with inertial measurement units (IMUs) and, hence, they are aware of their own orientation. In some situations, it may be valuable to estimate device orientation without relying on its IMU. This research uses the idea that a distributed array of sensing antennas can measure the differences in signal strength of a transmitting device from multiple directions. Combining the device's antenna characterization with a simulation allows us to experiment with and predict the orientation estimation performance of different arrangements of sensing antennas. First, an anechoic chamber is used to ensure that the device characterization contains as little external noise as possible. Then, simulation software allows more freedom in the placement and testing of sensing antenna arrangements. Finally, an estimation system takes the previous data and returns an estimate that minimizes the mean squared error of the device orientation in question. Upon completion, we plan to answer whether or not this method is accurate or feasible, and what advantages it may have over other methods of obtaining orientation information. As a side objective, we expect to learn if there is a general choice or method of choosing the sensing array used for orientation estimation. Though this project is concerned with orientation of antennas using the 2.4 GHz ISM band, the concepts could have application for a wide variety of devices that operate in various spectral bands.

"An Efficient Wearable Platform for Handwriting Reconstruction Using IMU/Kinect Data Fusion"

Department of Electrical Engineering, College of Engineering
By: Trung Le

Gestural interaction between human and electronic devices is becoming increasingly demanding as conventional user interfaces (UI) lag behind the fast growing amount of interaction human now experience with smart devices in daily life. While much research has been done to interpret human hand gesture as inputs to such interface, few have truly come up with a robust system that exploits a non-invasive multi-modality based approach to reliably reconstruct human handwriting, a basic yet important activity of human in daily life. In this paper we propose a wearable multi-sensor system of an index finger-worn ring with a support of a Kinect camera, together with a fusion algorithm to track and reconstruct human handwriting. The fusion of inertial measurement unit (IMU) and the Kinect camera can overcome each sensor's own disadvantages and was found to help improve the overall tracking result. This system has a potential to be utilized in classroom settings as an alternative to ordinary teaching input methods such as touchscreen.

"Simulation of Water Consumption Time Series"

Department of Civil Engineering, College of Engineering
By: Gabriella Christine Morales, Mohsen Aghashahi, & M. Katherine Banks

The development of water distribution systems, to a great extent, owe the research communities that have been working on the characteristics of water networks. In this field, due to the reluctance of water utilities to share real data for their confidentiality, most of the academic research groups deal with an acute problem: the lack of time series of water consumption data. This data helps water researchers extract the dynamic characteristics of water consumption data and improves water supply methods. The purpose of this research is to create and analyze the artificial time series of water consumption data. In order to collect data, we prepared a survey in which water activities were recorded in details, such as time of use, type of water consumption activity and the volume of water usage. Then, twenty participants were asked to complete the survey during a week. The research led to approximate time series which can be applied in water consumption forecasts and analysis.

“Efficient Design and Communication for High Bandwidth Memory”
Department of Computer Engineering, College of Engineering
By: Andrew Douglass

As computer memory increases in size and processors continue to get faster, memory becomes an increasing bottleneck to performance. Clocking the I/O bus between the memory module and the memory controller at faster speeds has helped create a scalable architecture to continue increasing transfer rates. However, the DRAM memory chips continue to operate at slower speeds compared to the devices they communicate with. For the next generation of memory modules, a new architectural approach using 3D stacked DRAM chips will allow lower power consumption and higher bandwidth. To communicate between these chips, this paper proposes the use of ring based standing wave oscillators for fast data transfer. Simulations with the new clocking scheme and data transfers are performed to show the improvements that can be made in memory communication. Experimental results show that a ring based clocking scheme can obtain higher performance while decreasing power consumption. This is a result of the more efficient clock distribution scheme and the higher channel count. Using this new architecture will allow systems to achieve higher memory speeds without compromising the complexity of the hardware.

“Towards Understanding Scene Transition Techniques in Immersive 360 Movies and Cinematic Experiences”
Department of Computer Science, College of Engineering
By: Seyed Kasra Rahimi Moghadam

Many researchers have studied methods of effective travel in virtual environments, but little work has considered scene transitions, which may be important for virtual reality experiences like immersive 360 degree movies. In this research, we designed and evaluated three different scene transition techniques in two environments, conducted a pilot study, and collected metrics related to sickness, spatial orientation, and preference. Our preliminary results indicate that faster techniques are generally preferred by gamers and more gradual transitions are preferred by participants with less experience with 3D gaming and virtual reality.

“Prediction of Material Removal Rate in Die-Sinking Electrical Discharge Machining”
Department of Engineering Technology and Industrial Distribution, College of Engineering
By: Alicia Guthrie & Stephanie Lee

This project proposes a more exact model of material removal rate (MRR) of conductive materials using die-sinking electrical discharge machining (EDM). Five workpiece plates with different properties “ Aluminum 6061-T6, HSLA steel, Brass CA 360, Alloy R92 Pewter, and ZA8 Zinc-Aluminum Alloy”had rows of <1 mm holes EDM-machined through, in order to find the time required to remove a certain volume of material under various parameters. Variables include magnitude of current, current on time, current off time, thermal conductivity, and diffusivity. The removed volume is calculated by a derived equation based on entrance and exit diameter. The goal is to improve an MRR equation in order to predict, through calculation, values that are closer to experimental data, compared to those found via previously published models taking into account only discharge current and melting temperature.

“Improving BSFC through Multiple Injections and Varying
Cetane Number for a Light Duty Diesel Engine”
Department of Mechanical Engineering, College of Engineering

Due to their relatively low carbon dioxide emissions and superior fuel efficiency performance, interest in further utilization of diesel engines for commercial and industrial use continues to grow. The concept of multiple injections provides ever further optimization of the diesel engine in terms of improving emissions, combustion noise, and combustion efficiencies. With the development of highly efficient diesel after treatment systems, the need for in-cylinder control of harmful emissions has been significantly reduced. This adaptation lifts the emissions barrier to maximizing combustion efficiency through multiple injections. This study serves to reexamine multiple injection capabilities in improving combustion characteristics, specifically targeting brake specific fuel consumption, without the constraint of reducing emissions through in cylinder means. Tests will be conducted on a General Motors 1.9l 4 cylinder light-duty diesel engine. A single injection case optimized for maximum fuel efficiency will act as the base condition, and a test matrix sweeping injection duration & timing will act as the main data points. Pilot injection, a secondary injection occurring a few degrees prior to the main event, will serve as the additional injection component. As another layer to the study, two fuels with varying cetane numbers will each be utilized in the study to better understand the effect of cetane number on multiple injection event. From these tests, data should yield a strong base from which to analyze peak injection schedules to improve the operating conditions of diesel engines.

Architecture; Construction Science; Landscape Architecture & Urban Planning; Visualization

"Enhancing Biodiversity Through Green Infrastructure"

Department of Urban & Regional Planning, College of Architecture
By: Justin Patton

I. The Problem: Every metropolitan region in the U.S. has expanded significantly in land area since the 1950s. In 2014, the United Nations reported in its World Urbanization Prospects report that this percentage would increase to 66% by the year 2050. The growth in urban settlements along the Gulf of Mexico region is having an increasingly negative impact on its associated ecosystems. The built environment and the natural environment are correlated to the point that air quality, water quality, human health, climate change, and economic value can be impacted based on infrastructure designs; therefore, there is a real need for sustainable urban infrastructure design. Environmental concerns are rarely considered during the stages of land development (conceptualization, design, construction, activation, and management). Man-made problems are making the function of natural systems difficult. Are there ways to use urban planning as a solution to unsustainable land use?

II. Hypothesis: If the built and natural environments correlate in such a way that the built environment has a significant impact on the natural environment, then green infrastructure in the form of open space corridors can foster ecosystem enhancement, leading to an increase in biodiversity and an uplift in economic value along the Gulf Coast (Gulf of Mexico).

III. Analysis: The goal of this research is to inform and show how the data collected can be applicable in the Gulf of Mexico region. I want to provide data and validity to the concept of green infrastructure. A Quadruple Net Value analysis will allow me to communicate an evaluation of my position on the topic and expose opportunities for the future.

Quadruple Net Value analysis: a basis for measuring a four-category matrix that evaluates factors such as social/cultural value, economic value, environmental value, and sensory/visual value.

"Passive Solar Design"

Department of Environmental Design, College of Architecture
By: Victoria Rosado

This research explores architecture of the past, such as that of ancient Greek society. The purpose is to display how building practices and techniques of this time period provide passive solar designs that can still be implemented today. Through these techniques, heating and cooling of buildings can be accomplished efficiently and at lesser energy and monetary costs than modern methods.

“Developing Tactical Urban Agriculture Pop-Up Installation Methodologies”

Department of University Studies, College of Architecture
By: Melissa Lemuz, Alaina Parker, Mackenzie Anderson, Victor Duron, Kourtney Gonzalez, Kayla McCabe, Leticia Meza, Molly Morkovsky, Vanessa Ngo, Victor Ramirez, Lindsey Reed, Laura Ruiz, Maritza Sanchez, Sharon Schafer, Bailey Sullivan, & Mary Catherine Tucker

Urban Agriculture has reemerged as a potential tool for many of the modern city’s ailments (Deelstra & Girardet, 2000). It carries with it its own set of opportunities and constraints that can be explored rapidly and in parallel through utilizing strategies of tactical urbanism. However, tactical urbanism is still an emerging field without much research. There are many questions about how city decision-makers can best learn from and incorporate projects into the existing urban fabric and understand this form of civic participation (Courage, 2013). There is a need for an approach for gathering data on urban agriculture through the use of tactical urbanism. Our project overlays urban agriculture onto tactical urbanism by designing, installing, and measuring the effects of an urban agriculture pop-up plaza project. The plaza under design is located in the Langford Architectural Complex on the Texas A&M University’s north campus.

This presentation covers the methodology for data gathering and analysis of human use and spatial patterns students used to understand how the space is being used prior to installation through direct observation. Research variables include: people counts, pedestrian circulation patterns, time spent in the space, social activities within the space, and qualitative observation of how people use the space.

Our initial findings suggest that people spend on average 19.98 seconds in the space. The average rate of people using the space is 11.3 people per minute. We have also identified the established pedestrian movement patterns and primary spatial use patterns. This data is being used currently to help the student designers better understand the opportunities and constraints for the site. With the information that we have gathered, we will begin to design and construct an urban agricultural space to observe the effects that the installation will have on the population."

Agric Econ; Agric Leadshp, Edu & Comm; Animal Sc; Biochem & Biophy; Bio & Agric Engr; Ecosys Sc & Mgmt; Entomology; Horticulture Sc; Nutrition & Food Sc; Plant Pathology & Microbio; Poultry Sc; Recreatn, Park & Tour Sc; Soil & Crop Sc; Wildlife & Fishrs

“Engineering the hydrocarbon biosynthetic pathway from the green microalga Botryococcus braunii into a faster growing heterologous host Chlamydomonas reinhardtii”

Department of Biochemistry, College of Agriculture and Life Sciences
By: Victoria Yell

Botryococcus braunii is a green microalga that is capable of producing large amounts of liquid hydrocarbons that can be processed into liquid fuels such as gasoline, kerosene and diesel. Lycopaoctaene is a C40 hydrocarbon produced by race L of B. braunii using the enzyme lycopaoctaene synthase (LOS). LOS catalyzes the head to head linkage between two geranylgeranyl diphosphate (GGPP) molecules to yield lycopaoctaene, which is then further reduced to lycopadiene. Lycopadiene is the hydrocarbon that accumulates within the colony extracellular matrix and usually constitutes 8-12% of the algae’s dry weight. The slow growing nature of B. braunii is one of the main factors limiting the use of this alga as a viable host for biofuel production. Because B. braunii has not been able to be transformed, it would be advantageous to transform a faster growing model alga with hydrocarbon biosynthetic genes. Chlamydomonas reinhardtii is a faster growing model green microalga with many genetic tools developed for it, and is being used in our study to express the LOS gene for lycopaoctaene production. In order to increase lycopaoctaene production in C. reinhardtii, GGPP synthase (GGPPS) will be expressed constitutively along with LOS. In order to do this, transformant lines of C. reinhardtii will be generated and compared. The four C. reinhardtii transformant lines being compared include one overexpressing GGPPS, one overexpressing LOS, the LOS transformant further transformed with C. reinhardtii derived GGPPS, and the LOS line further transformed with A. thaliana derived GGPPS. Using two differently sourced GGPPS genes will allow us to compare levels of expression and lycopaoctaene production.

“Design of an Experimental System for Torsional Testing and Evaluation of hMSC Regenerated Mouse Femurs”

Department of Biomedical Engineering, College of Engineering
By: Kathryn Gray

Yearly, millions of bone fractures fail to heal for reasons ranging from fracture type, to poor bone quality. Non-union fractures are currently treated with bone grafts but can require multiple surgeries to treat, and the different types of bone grafts each have limitations. Human mesenchymal stem cells (hMSCs) are being investigated for their osteoregenerative capabilities and potential as an alternative to bone grafts. The regenerative properties are being tested in mouse femur models by implanting hMSCs into surgically-created defects. The Biomechanical Environments Laboratory is responsible for the mechanical testing of these regenerated femurs. The femurs will be tested under torsional loading to evaluate the strength of the new bone in comparison to the unaltered contralateral controls. Performing torsional testing allows for stress to be uniformly distributed across the length of the bone and the data collected can potentially be used to calculate the strength and stiffness. From our work with pilot specimens, we have found that mouse femurs are on average two-thirds of an inch long and a sixteenth of an inch in diameter at the midshaft. This specimen size has introduced unique challenges into the design of the torsional system and clamping fixtures.

"Influence of Reflection and Immersion on Students' Views of Cultural Diversity"
Department of Biomedical Sciences, College of Veterinary and Biomedical Sciences
By: Emily Evans

International high-impact experiences in agriculture are increasing in number. Myriad research investigates the benefits of such programs, least of which includes enhanced cultural awareness. Recognition of cultural diversity is related to self-efficacy, intercultural communication, and other soft skills. This study describes how international high-impact experiences and purposeful reflection on those experiences influences students' views about cultural diversity. Short-term study abroad participants completed pre- and post-experience reflections (two programs and countries) about cultural identity. Qualitative analyses were used to find shifts in self-reported recognition of cultural diversity. Analyses centered on participants' descriptions of their cultural heritage in relation to the cultural immersion experiences abroad. In pre-departure reflections, few students described the uniqueness of their cultural heritage (an initial step in recognizing cultural diversity), indicating deficient thought about culture. Students wrote about culture objectively, such as race, nationality, and socioeconomic status. They described hometown neighborhoods as homogenous settings, devoid of cultural diversity. However, in the same post-program questions, a majority wrote about increased awareness about familial customs, heritage, and diverse belief systems. In post-reflections, students described culture subjectively, more attuned to interpersonal variations within cultural groups, indicating enhanced awareness of cultural diversity. Therefore, high-impact experiences strengthened students' understanding of cultural diversity through reflection and recognition of their cultural heritage in concert with exposure to new cultures. Practitioners of international agricultural and/or high-impact experiences should engage learners in purposeful reflection exercises and immersive activities to enhance awareness of cultural diversity. Future research should seek causal connections between cultural identity and soft-skill development.

"Levels of gene expression increase when microRNA is added next to a gene of interest"
Department of Biology, College of Science
By: Jamie Gutierrez

MicroRNAs (miRNA) are known to affect gene expression by its encoded sequence that targets an mRNA. This sequence is loaded into catalytic enzymes that either read the target mRNA and cut it, or inhibit its translation by other means. Besides the repression function of miRNA, it was recently found that the primary miRNA transcript (pri-miRNA) has encoded peptides that enhance its miRNA transcription1. The mechanism of the enhancer function is not fully understood. Previous experimental data show that adding primary miRNA (pri-miRNA) to 3â€™UTR of luciferase genes, a reporter gene, would increase its expression. Transgenic Arabidopsis plants containing luciferase fused with pri-miR159a, pri-miR164a and no pri-miRNA were screened for their luciferase signal. The results showed that there was an increased level of gene expression once the primary miRNA was added next to the luciferase gene, as compared to those that only had luciferase. We wanted to know if the secondary structure of pri-miRNA increases mRNA stability or if the miPEP encoded by pri-miRNAs was responsible for enhancing expression of transgenes. We copied distinct fragments of the primary microRNA

159a transcript (pri-miR159a) and pri-miR164a and fused it to the 3" UTR (untranslated region) of the luciferase gene in order to see which part of the pri-miRNA was responsible for the increased expression of luciferase. The constructs were then treated with Dpn1 to make point mutations. These results have not been obtained.

"Combining Reflection and Peer Review to Enhance Soft-Skills"

Department of Ag Leadership & Development, College of Agriculture and Life Science
By: Anne-Marie Joi Prochaska

Written reflection and peer review are staples of soft-skill development. Reflection is a well-documented approach to high-impact learning. Peer review and critique are similarly vetted and established practices to improve communication skills. What happens when reflection and peer critique collide? This innovative teaching strategy combined reflection and peer review of visual images to enhance self-efficacy, critical thinking, communication, and metacognitive awareness in agricultural students. Prior to a study abroad experience, students captured digital photos symbolizing each one's personal cultural heritage. They also wrote reflections to articulate the metaphorical meanings of their photos. Each photo was critiqued through a double-blind peer review process. Peer reviewers examined unidentified photos (without author's reflections), and then wrote separate reflections to interpret the cultural symbolism of each photo. Students compared their original reflections with peers' interpretations. Participants had tangible evidence showing the same image could elicit similar/dissimilar reflections. Through the peer review process, students shared aspects of cultural heritage, gained mutual respect and appreciation for others' photos/reflections, and enhanced their communication skills. Students' mutual respect manifested itself through shared vision and interpretation, contributing to building community and understanding about cultural heritage. By comparing their reflections with peers' reviews/interpretations, students enhanced their communication effectiveness and message clarity when using photography to symbolize ones' cultural heritage. Future research should combine peer review (visual, textual, and other forms) and reflective writing in other settings and disciplines. Instructors should seek further innovation to maximize personal identity and communication in learning environments.

"Glycine regulates protein synthesis and degradation on C2C12 muscle cells"

Department of Animal Science, College of Agriculture and Life Science
By: David William Long Jr.

Glycine is used for the synthesis of muscle proteins and is one of the most abundant amino acids in animals. In the present study, we conducted an experiment to determine a role of glycine regulating rates of protein synthesis and degradation in C2C12 muscle cells. The cells were cultured at 37Â°C for 3 h in medium containing 5mM glucose, physiological concentrations of amino acids (found in plasma), 1mM phenylalanine, radioactive 3H-phenylalanine (*Phe) and one of 5 concentrations of glycine (10, 100, 250, or 500 ÂµM). The radioactivity of *Phe in protein was determined to calculate the rate of protein synthesis. In addition, the release of *Phe from pre-labeled proteins in C2C12 cells was measured to calculate the rate of protein degradation. The experiments were preformed 8 times. Our results indicate that 100 to 250 ÂµM

of glycine dose-dependently stimulated protein synthesis and inhibited protein degradation ($P<0.05$). Glycine also enhanced the phosphorylation of the mechanistic target of rapamycin (MTOR), thereby regulating intracellular protein turnover in muscle cells. Thus, glycine is not only a building block of protein, but a regulator of a cell signaling pathway to promote muscle growth. Our findings further support the notion that glycine is a functional amino acid in animal nutrition. Supported by USDA-NIFA grants and Texas A&M University.

"Analysis of automation's effects on 16s metagenomic sequencing"

Department of Biomedical Sciences, College of Veterinary and Biomedical Science
By: David Christian Thornberg

The continuous reductions in sequencing costs have incited massive growth for the sequencing industry. New and superior sequencing models are constantly being developed. This upsurge of innovation, however, has not come to the entirety of the sequencing process. Preparations of DNA libraries for sequencing are still often done by-hand. This is both a costly and time-consuming procedure. The goal of this study was to assess two different sequencing library preparations, automated and by hand, to understand how those methods affect sequencing data. Our study evaluated the statistical differences between 6 fecal samples relative to their preparation process. The 6 fecal samples were simultaneously quantified and diluted to the specified concentration. Using the 16S Metagenomic Sequencing Library Preparation guide, the 6 samples were prepped by-hand, while the Eppendorf EpMotion 5075 prepared the same 6 samples. After library preparation, all 12 libraries were pooled and sequenced on the Illumina MiSeq using the MiSeq v2 Nano Reagent 2 x 250 cycle kit. The results were then processed and analyzed using Illumina's BaseSpace sequencing hub, Microsoft Excel, and JMP. The percentages of bacterial species identified were in agreement between the hand and automated preparation. However, automated library preparation showed a significant increase in genus diversity, as compared to the preparations done by-hand. Ultimately, understanding how automation affects sequencing data will improve our ability to more accurately study the genome as well as reduce financial waste.

"Simulated effects of poaching on the endangered Hawksbill Sea Turtle (Eretmochelys imbricata) population dynamics"

Department of Bioenvironmental Sciences, College of Agriculture and Life Sciences
By: Cinnamon Brandi Laxton

The worldwide poaching, or illegal hunting and capturing, of the Hawksbill Sea Turtle (Eretmochelys imbricata) has been a longstanding tradition, from using their shells as pottery to eating the Hawksbill Sea Turtle's eggs, in many parts of the world that continues today. The continuous decline of the Hawksbill Sea Turtle population has landed the species on the IUCN list for being critically endangered. This decline of population has also affected the ecosystem where the Hawksbill Sea Turtles typically has been found. We conducted thorough scholarly literature review to obtain the best information available to develop a population dynamic model for Hawksbill Sea Turtle. We then used the model to estimate the potential effects of different poaching levels on the population dynamics of the Hawksbill Sea Turtle. We found that poaching had significant negative effects on Hawksbill Sea Turtle population size.

“The Regulation of IRF7 Through the CRISPR System”
Department of Genetics, College of Agricultural and Life Sciences
By: Mayra Guadalupe Guzman & Matthew Lewis

"Disease decreases productive efficiency and kills millions of animals across all types of livestock operations every year. This is severely detrimental to both animal producers and consumers from an economic and overall food supply standpoint. Unfortunately, many current options for disease control prove to be impractical in various situations. Vaccines are very costly to administer, can require many consecutive rounds and overly extensive periods of time to become effective, and certain diseases cannot be controlled by vaccines at all. Therefore, alternative methods of disease control must be implemented in order to better protect the lives of productive livestock. Type I Interferons (Type I IFN) are the first line of defense against viral pathogen invasions in animals and humans. Type I IFN is activated by the master regulator, IRF-7, which can itself be inhibited by OASL-1 and 4E-BP1 and 4E-BP2. (Honda, Yanai et al. 2005) OASL-1, 4E-BP1 and 4E-BP2 negatively regulate IRF-7 translation and therefore type I IFN stimulation (Lee, Kim et al. 2013). Reducing the number of IRF-7 stem loop structures may alter binding of the negative regulators and decrease IRF7 inhibition. Genomic editing using the CRISPR/Cas9 system will be used to alter the IRF-7 structure via the stem loop sequence. We hypothesize that these DNA sequence modifications will lead to increased IRF-7 expression and ultimately an increased interferon response, leading to increased resistance to viruses and potentially other pathogens. This can potentially give rise to genetically engineered animals with improved immune systems that are more efficient at preventing disease.

“Spatial Distribution of Ticks in Texas”
College of Biomedical Science, College of Veterinary and Biomedical Science
By: Brian Thomas Doss, Ryan Garland, & Jaisel Patel

Ticks are known vectors of both human and animal pathogens (e.g. Borrelia spp., Rickettsia spp., Babesia spp.). Many tick species are endemic to Texas, most of which are capable vectors of pathogens. Risk of pathogen transmission is dependent upon the presence of a tick vector. To this end, the Boy Scouts of America? have been recruited to conduct active surveillance (via tick dragging) for ticks in every Texas county. Thus far, Southeast Texas has shown the greatest abundance and diversity in tick species, with nearly all Texas ticks being represented. The purpose of this study is to analyze the spatial distribution of ticks in Texas. From this data, maps showing the distribution of tick species in Texas can be generated. These maps will allow for the identification of counties and regions wherein the risk of pathogen transmission by a tick vector is present.

"Nitrification Inhibition Effectiveness of Dicyandiamide vs. Nitrapyrin in Three Texas Soils"
Department of Plant and Environmental Soil Science, College of Agriculture and Life Science
By: Vanessa Limon

Agricultural application of nitrogen, a plant macronutrient, is commonly found as urea fertilizer. Ureases break down urea to ammonia which exists in pH-dependent equilibrium with ammonium in the presence of water. Certain microorganisms use ammonium as an energy source (specifically beta-proteobacteria and gamma-proteobacteria) and produce nitrate via nitrification. Leaching of nitrogen as soluble and anionic nitrate can lead to groundwater and surface water contamination. Nitrification inhibitors developed to combat this issue include Nitrapyrin (N/A) and Dicyandiamide (DCD).

This study was conducted using 3 Texas soil types including clay loam, sand, and loam which comprised of 5 treatments, 4 replications, and 6 sampling times. 100 mg of urea was added to all treatments except for the control. Two rates of Univar N-Bound® DCD with urea, one rate with CHS incorporated N-Edge® (a urease inhibitor), were compared for nitrification inhibition against Dow® Agrosciences Instinct® II N/A with urea only. Nitrate and ammonium analysis was taken using 40mL 2M KCl on sub-samples of the soil and shaking for 30 minutes. Concentrations of mg NO3-N kg-1 and mg NH4-N kg-1 were compared with the control (no treatment).

In the first 21 days of incubation typical NO3-N accumulation occurred across all treatments. The loam had significant N loss at day 10 potentially due to volatilization and initial high pH, as the average C:N of ~7:1 discredits causation from bacterial immobilization. Higher sand content equates to increase potential for nitrate runoff, in the soils of this experiment minimum nitrate increased from 0.13% to 0.16% with increasing clay content as per textural class. A priming effect for nitrogen mineralization and immobilization was noted at incubation intervals past 21 days. Overall, neither rate of DCD improved inhibition or protected NH4-N despite one having CHS N-Edge® accompanying it, while the N/A treatment with urea only showed the greatest inhibitory effects.

"Understanding Cultural Heritage Prior to High-Impact Educational Experience"
Department of Animal Science, College of Agriculture and Life Sciences
By: Sherice Nicole Perkins

Culture is an integrated pattern of human knowledge, customary beliefs, and social forms. It is a set of shared values, goals, and practices that aid character development. As more individuals identify as a mixed race, it becomes increasingly difficult to keep track of our history and cultural heritage.

The "My Cultural Heritage" process was used to induce TAMU students into better understanding their cultural heritage prior to an international educational experience. These papers were written by students who participated in the Costa Rica and Namibia study abroad programs held by Texas A&M.

This assignment prompted students to investigate their family origin, history, and cultural heritage to explore self-identity. This improves upon the learners' life skills by better preparing them to interact with other ethnicities and cultural customs in a high-impact learning setting.

After in depth research, many students reported a stronger connection with their heritage. Some students were astonished to discover relatives and the customs of their ancestors, finding that their current beliefs and practices contradicted their family cultural heritage. Even though they have not fully experienced their family culture, many have come to "appreciate the rights [they've] been given, thus, having more empathy when entering a culturally diverse setting.

This educational high-impact process gives a sense of culture and divulges a common aspect that we're all interconnected. Whether we identify with our ancestors' race or are for diversity initiatives, with each new generation, comes a more innovative way of thinking and ultimately leads us on a pathway of acceptance.

"Estradiol, Mediated Through P53, Provides Protective Effects
Within the Colon Through a Reduction in Proliferation"
Department of Nutritional Sciences, College of Agriculture and Life Sciences
By: Jenna Jeffrey

Previous studies have shown a correlation between estradiol (E2) levels in women and the decreased risk in colon cancer. E2 serves a protective role in the colon by increasing apoptosis in non-malignant colonocytes that have become damaged due to different stressors within the body [1]. The p53 protein plays an important role at the cellular level, where damaged cells will either experience DNA repair, and/ or apoptosis. A proposed mechanism suggested by in vitro studies, indicates that the protective effects of E2 on tumor formation within the colon is mediated by p53 [2]. The roles that both E2 and p53 have on tumor growth in the colon will be analyzed through the identification of proliferative cells in the distal colon of mouse tissues. The incidence of proliferation will depend on the treatment received by each group (E2) and the presence or absence of the tumor suppressor p53.

"An Investigation of Substrate Scraping Behavior in Three Species of Sicydiine Gobies
Inhabiting Freshwater Streams on Dominica, West Indies"
Department of Wildlife & Fisheries Sciences, College of Agriculture and Life Sciences
By: Wendy Diaz

Gobies of the genus Sicydium are freshwater fishes present throughout the western Central Atlantic and eastern Central Pacific. They feed by scraping algae from hard surfaces in fast flowing rivers and streams and have highly modified teeth used for scraping. An investigation and analyses was conducted specifically on the frequency of substrate scraping during feeding in three different species of Sicydium found on Dominica (S. buscki, S. plumieri and S. punctatum). A total of 20 video recordings of scraping events were obtained using a waterproof digital camera and analyzed using appropriate software. Forty individual sicydiine gobies were documented: S. punctatum (n=14), S. plumieri (n=5), S. buscki (n=18). The total length range for

S. punctatum was 22.0”71.2 mm, 32.3“ 117.0 mm for S. plumieri, and 34.0“82.0 mm for S. buscki. The head length range for S. punctatum was 3.9“13.5 mm, 8.0“25.3 mm for S. plumieri, and 6.8“18.1 mm for S. buscki. The range of scrapes per second for S. punctatum was 8“11, 2“6 for S. plumieri, and 3.5“6.5 for S. buscki. Sicydium punctatum had an average of 9.6 scrapes per second. Sicydium plumieri had an average of 3.9 scrapes per second. Sicydium buscki had an average of 4.8 scrapes per second. Results show that there are significant differences in the frequency of scraping in the different species of Sicydium. Thus, individuals can be identified as one of the three species documented based on their scraping frequencies.

“Simulated effects of Indo-Pacific lionfish (Pterois volitans and P. miles) invasions on parrotfish (Scaridae family) populations on coral reefs in the Caribbean”

Department of Wildlife and Fisheries Sciences, College of Agriculture and Life Sciences
Marissa Ortega, Paola Camposeco, Jasmin Diaz-Lopez

The introduction of invasive species in marine environments is rare but detrimental to the existence of native species. The Indo-Pacific lionfish species (Pterois volitans and P. miles) recently has invaded coral reefs across the Atlantic and Caribbean at an alarming rate. One keystone species currently being affected by the lionfish invasion is the parrotfish (Family Scaridae). The parrotfish plays a vital role in the stabilization of coral reef ecosystems by preventing a phase shift from coral to macro-algal dominated reefs. We proposed to study the dynamics of parrotfish populations in response to the lionfish invasion in the Caribbean. We reviewed the literature to obtain recent demographic parameters for both the lionfish and parrotfish, developed an age-/stage- structured population dynamics model for each species, and then integrate the two models in order to quantify the potential effects of lionfish on parrotfish population dynamics on coral reefs in the Caribbean. Our results suggested that an increase of Indo-Pacific lionfish population would cause a decrease in parrotfish populations.

“Use of UV-Vis-NIR Spectroscopy for Hair Analysis in Forensics”

Department of Forensic Investigative Science, College of Agriculture and Life Sciences
By: Journey Nicole Ewell

Hair is important as trace evidence. Most evidence boxes contain vacuuming’s collected from a home or vehicle potentially contain multiple hairs that don’t always have the root follicle attached. Although, advances have been made towards improving current technology used for examining and analyzing hair as trace evidence, limitations can still be identified pertaining to these types of analysis techniques. The purpose of this study was to test whether UV-Vis-NIR spectroscopy could be used in forensics to develop a database that could be used to distinguish between different individuals based on the results from the scan of their hair sample. Data was acquired on hair as trace evidence by collecting samples of hair from approximately 100 individuals’ heads. Study participants filled a small coin envelope with hair collected from a hair cut or trim. Participants who did not wish to cut their hair were able to collect hair samples directly from their hair brush. The responses to the 10 indicator questions specified below pertaining to an individual’s life style choices, physiological, and phenotypic characteristics were recorded from each sample donor: 1) Age, 2) Height (in.), 3) Weight (lbs), 4) Male/Female

/Trans, 5) Diet: Meat Eater/Vegetarian 6) Ethnicity, 7) Smoker (Y/N), 8) Drinker (Alcohol) (Y/N), 9) Long Term Prescription Drug Use (Y/N), 10) Processed/Permed/Dyed/Colored /Highlighted Hair (Y/N). Each hair sample was scanned 5 times using UV-Vis-NIR spectroscopy and the spectrums that were generated for each sample used in partial least squares regression analysis to test for individual lifestyle choices. Comparison of spectra of study participants who made similar life style choices and had similar physiological and phenotypic characteristics was also completed. Correlations between specific indicator variables and absorbance peaks at explicit wavelengths on the spectrums would indicate that this method is effective allowing it to serve as a quick, easy, and efficient alternative to DNA testing and hair microscopy which accounts for the substantial amount of backlog of unanalyzed forensic evidence.

“Effect of Larval Secretions and Excretion on Selection of Food Source
by Dermestes Maculatus (DEGEER, 1774)”
Department of Biomedical Sciences, College of Veterinary and Biomedical Sciences

Necrophagous insects utilize cues such as volatiles and compounds in the environment, collectively known as public information, while locating ephemeral resources such as a decaying corpse. Volatiles, including those emitted from competing individuals, inform an organism’s decision to colonize or avoid certain food sources and are thus critical triggers for insect colonization and succession. This study seeks to determine if and to what effect larval secretions and excretion affect the resource selection process of Dermestes maculatus, a local necrophagous species. Adult beetles were allowed to make a choice between dog food treated with larval secretions and excretion collected from D. maculatus larvae, and untreated dog food. Preference for untreated food would indicate that compounds present in larval excretions and secretions may serve as compelling indices of the presence of a competing colony. Determining the impact of larval secretions and excretion on the decision-making process of D. maculatus will provide insight into the mechanisms behind necrophagous insect succession.

“Motivation to Lead and Intent to Lead of Undergraduate Agriculture Leadership Majors”
Department of Agricultural Systems Management, College of Agriculture and Life Science
By: Brad Borges

Leadership education has quickly become a topic of importance for students in post-secondary schools. Identifying students’ motivation and intent to lead can allow Leadership Educators to assess whether students are gaining the knowledge and skills for leadership. The purpose of this descriptive, slice-in-time study was to describe the motivation and intent to lead of undergraduate students enrolled in an academic leadership course in a college of agriculture during the fall 2016 semester (n=142). Five core courses and one elective course, representing various stages of the agricultural leadership degree program, were selected to participate in this study. The instrument used was an electronic version of the EPL Career Aspiration Survey (Chan et al., 2012), with twelve additional demographic questions. For ease in data interpretation, only the motivation and intent to lead scales were included in this study. The motivation to lead scale consisted of 9 items, and the intent to lead section consisted of 3 items, all of which were measured on a five-point summated scale: 1(Strongly Disagree), 2(Disagree), 3(Neither Disagree nor Agree), 4(Agree), and 5(Strongly Agree). Scores were summated for each construct and categorized by the norms (seven categories ranging from Very Low to Very High) developed by Chan et al. (2012). Institutional Review Board approval was received to conduct the study. A majority of students in this study indicated both a high motivation and intent to lead. No significant differences in motivation or intent to lead were found based on gender. Increased time within the major did not appear to impact students' motivation to lead scores; however, lower intent to lead scores were reported for students further along in their agricultural leadership degree program. Additional research on this topic is needed.

"Colonic Health Impairment Due to Space Flight"

Department of Biomedical Sciences, College of Veterinary Medicine and Biomedical Sciences
By: Ryan Jospeh Bindel

Recent progress has been made in understanding the physiological responses to conditions prevalent in the space flight environment, including radiation source, duration of radiation exposure, weightlessness, and diet. The aim of this project was to use an experimental model simulating the space environment to investigate the immune response with exposure to oxidative stress, weightlessness, and continuous low dose ionizing radiation. Mice were randomly assigned to groups according to a 2 x 2 x 2 factorial design of continuous cobalt (60Co) radiation (C-RAD) or no radiation (SHAM), weight bearing or hind limb unloaded, and a diet with high or normal iron levels. The mice were given a 45 or 650 mg iron/kg diet, and maintained a fully body head down tilt for 42 days during the radiation treatment phase. Continuous radiation (C-RAD) mice were exposed to a whole body dose of 60Co gamma (?) radiation on a continuous basis (0.5 mGy/hour) over the 6-week HU period, resulting in a total dose of 0.5 Gy. Scraped colon mucosa has been collected, RNA isolated and tested for sample integrity in preparation for synthesis of cDNA and RT-PCR reactions. Gene targets of interest on the 50 mice (TNF-, IL-6, IL-10) will be analyzed to explore how these space-relevant environmental exposures influence the immunological state of the colon.

"The Study of microRNAs in Plasma to Discover Biomarkers that Indicate Muscle Growth in Beef Cattle"

Department of Animal Science, College of Agriculture and Life Sciences
By: Teresa Salas Martin

Producers are constantly looking for ways to improve muscle growth in cattle such that both the quantity and quality of beef can be increased. One approach is to examine expression of microRNAs as a potential selection tool. MicroRNAs are small RNA molecules that have regulatory functions in all metazoans. Current research in humans investigates microRNAs as biomarkers in diagnostic purposes. In the current experiment, we will attempt to quantify the concentration of two microRNAs present in the plasma of beef cattle and that are known to effect muscle development (miR-27a and miR-133b) in order to evaluate their potential association with muscle growth traits. Expression in plasma samples will be measured by RT-PCR on a Fluidigm instrument in order to determine the relative concentrations of microRNAs. The Fluidigm software will also be used for analysis of the data obtained from the real-time PCRs.

The relative concentrations of miR-27a and miR-133b in high-growth rate cattle and low growth rate cattle will be compared to each other, to determine whether differential expression is associated with this phenotypic trait.

"How Abiotic and Biotic Factors Shape the Coexistence of Invasive Species"

Department of Wildlife and Fisheries Sciences, College of Agriculture and Life Sciences
By: Katherine Carbajal

Invasive species have had enormous, sometimes irreversible, impacts on biodiversity, human property, and economic activities throughout the world. Invasive plants can compete with native species for resources, disrupt evolutionary processes and hybridize with natives, reduce system productivity, alter disturbance regimes, and threaten native biodiversity. Theoretically, plant communities with high species diversity should be most resistant to invasion. While many empirical studies support this hypothesis, numerous other empirical studies suggest that communities with higher biodiversity tend to be invaded more easily. Hence, we aimed to understand the relationship between abiotic/biotic factors and the coexistence of invasive species. We analyzed an extensive dataset collected as part of the Forest Inventory and Analysis Program of the United States Department of Agriculture (USDA) Forest Service. We associated the data on coexistence of Chinese tallow, Chinese/European privet, and Japanese honeysuckle (SNIPET) with the data on landscape conditions, forest features, disturbance factors, and forest management activities (FIA Data and Tools) using the FIA plot identification numbers. We then checked the relationships. Our results indicated that some abiotic/biotic factors showed significant effects on the coexistence of invasive species.

"LOX10 mediated signaling suppresses SA biosynthesis and defense against Colletotrichum graminicola"

Department of Genetics, College of Agriculture and Life Sciences
By: Denisse Lizeth Flores

Colletotrichum graminicola is one of the most damaging fungal pathogens of maize, causing more than $1 billion dollars in the Americas alone. It causes two types of diseases: anthracnose leaf blight and more economically important, anthracnose stalk rot (ASR). Surprisingly, the maize lipoxygenase (LOX) mutant, lox10, displays increased resistance to C. graminicola compared to wild type (WT). lox10 mutants are devoid of an important class of stress inducible volatiles known as green leaf volatiles (GLVs). We hypothesize a lack of GLV signaling in lox10 mutants alters normal responses of two defense hormones, jasmonic acid (JA) and salicylic acid (SA), resulting in increased resistance. To investigate which hormones underlie lox10 resistance, we infected stalks of W438, a WT inbred maize line, and near-isogenic lox10 mutants with C. graminicola. Results showed that compared to WT, lox10 mutants have increased levels of SA shortly after infection and high amounts of JA several days after infection.

“Neotropical Backbone: Conservation Assessment of Latin America's Spiny Rats”
Department of Wildlife & Fisheries Sciences, College of Agriculture and Life Sciences
By: Alondrita Barron

The International Union for Conservation of Nature (IUCN) Red List is a global organization that assesses species extinction risk of the worldâ€™s vertebrates. Every eight years species are re-evaluated to examine changes in their conservation status. Our research reflects the most recent evaluation of species conservation status for the New World small mammal family: Echimyidae. We focused on the family Echimyidae (spiny rats), with 97 species from 23 genera in Central and South America. We used the geographic information system ArcGIS 10.4 and newly published literature to update home ranges from 2008 to 2016 for each species of Echimyidae. We then calculated home ranges using the IUCN Red List standardized approach - minimum convex polygon. In order to assess current conservation measures for each species, we overlayed current home range maps with world protected areas to analyze how many species have part of their range protected. If their range was protected, we analyzed the percentage of protection for each Echimyid species. We found that 62% of the species had increased in their area home ranges, 23% of the total Echimyid area is currently being protected and 97% of the species had stayed with the same conservation status. However, lack of change in their conservation status may also be due to lack of new (past 10 years) information about Echimyids. The updated home range maps have been used to inform species extinction risk and conservation status for the upcoming re-assessments of New World small mammal species for the Small Mammal Specialist Group and IUCN Red List.

“Impact of Photo Narratives on Reflection and Learning Retention”
Department of University Studies, College of Liberal Arts
By: Emily Kate Bost

Cultural heritage describes our “way of life.” It comes from previous generation’s traditions and incorporates our current constructed and natural environments, and tangible artifacts. Photovoice is a social action research process by which people identify, represent and enhance their community through specific photographic techniques. The photo narrative process, derived from Photovoice, combines photography and narrative expression about artifacts important to one’s way of life. One desired outcome of photo narratives is to help learners reflect on their personal cultural heritage through personal photographs and narratives of artifacts central to one’s way of life. This study explored the impact of photo narratives on students’ reflections about their cultural heritage in agriculture. Researchers analyzed graphic and textual content of photo narrative reflections created by students participating in two agricultural study abroad programs. Content analysis revealed prominent cultural heritage themes were agricultural lifestyle, familial appreciation and outdoor living. Participants’ reflections centered on agricultural production (familial or commercial) in [State] as most symbolic of their cultural heritage. Their reflections helped them better understand the importance of host country national cultural heritage involving agriculture, family and outdoor activities in two distinctly different study abroad programs. Photo narrative assignments have evaluative and instructional value across agricultural disciplines, enabling learners’ ownership of subject matter. The combination of image and text empowers learners and deepens information retention through expressive communication and reflection. Educators should incorporate discussions about agriculture, family and outdoor lifestyles into other topics to promote understanding of cultural heritage across agricultural disciplines.

“Simulated Effects of Indo-Pacific Lionfish (Pterois volitans and P. miles) Invasions on Parrotfish (Scaridae Family) Populations on Coral Reefs in the Caribbean”

Department of Wildlife and Fisheries Sciences, College of Agriculture and Life Sciences
By: Maria Paola Camposeco, Jasmin Diaz-Lopez, & Marissa Ortega

The introduction of invasive species in marine environments is rare but detrimental to the existence of native species. The Indo-Pacific lionfish species (Pterois volitans and P. miles) recently has invaded coral reefs across the Atlantic and Caribbean at an alarming rate. One keystone species currently being affected by the lionfish invasion is the parrotfish (Family Scaridae). The parrotfish plays a vital role in the stabilization of coral reef ecosystems by preventing a phase shift from coral to macro-algal dominated reefs. We propose to study the dynamics of parrotfish populations in response to the lionfish invasion in the Caribbean. We reviewed the literature to obtain recent demographic parameters for both the lionfish and parrotfish. We developed an age-/stage-structured population dynamics model for each species, and finally integrated the two models in order to quantify the potential effects of lionfish on parrotfish population dynamics on coral reefs in the Caribbean.

“Using PVC pipes as a conservation tool for green tree frogs (Hyla cinerea) after wildfire in central Texas”

Department of Wildlife and Fisheries Sciences, College of Agriculture and life Sciences
By: Kaitlyn Forks

Wildfires are natural phenomena that can impact native fauna by altering their habitats. In 2011, a large wildfire occurred in the “Lost Pines” region of central Texas, drastically altering habitat conditions for many wildlife species, including green tree frogs. We investigated the possibility of using of PVC pipes as artificial refuges for green tree frogs in post-fire pine forests. We placed 80 PVC pipes, positioned vertically, in the Griffith League Scout Ranch in Bastrop, Texas and monitored green tree frogs use of the pipes over a 5-month period from June to October 2015 when is their active season. Individuals found in the pipes were marked and released. Seventy-five different adults and 141 different juveniles used the pipes. Our results suggest that PVC pipes could be used as artificial refuges to proactively restore green tree frog habitat in post-fire pine forests. Moreover, such artificial refuges may be particularly important for juveniles.

“Evaluating potential effects of Antarctic ice-shelf retreat on blue whale populations: a simulation model of interactions among sea ice, Antarctic krill, and blue whales”
Department of Wildlife and Fisheries Sciences, College of Agriculture and Life Sciences
By: Jennifer Morgan Borski

In the Antarctic, blue whales (Balaenoptera musculus) feed primarily on Antarctic krill (Euphausia superba), which feed primarily on under-ice algae. The retreat of the Antarctic ice shelf may pose potentially serious problems for blue whale populations by causing shifts in the abundance and distribution of sea ice and, hence, under-ice algae and Antarctic krill. Hence, the objective of this study is to evaluate the potential effects of Antarctic ice-shelf retreat on blue whale populations. We collected a comprehensive literature review to obtain data on the Antarctic ice-shelf retreat, abundance and distribution of Antarctic krill, and vital rates and population dynamics of blue whales. We then developed a simulation model representing the interactions among sea ice, Antarctic krill, under-ice algae, and blue whales, and used the model to explore the potential effects of Antarctic ice-shelf retreat on blue whale populations under various assumptions regarding the rate of retreat of the Antarctic ice shelf. Our results suggested that a decrease in ice-shelf extent would cause a decrease in blue whale populations due to a decrease in abundance of Antarctic krill.

“Tree Growth-Climate Relationship of Three Sub-Alpine Tree Species from the Nepal Himalayas and Alaska, USA”
Department of Environmental Studies, College of Agriculture and Life Sciences
By: Rachael Elizabeth McBride

The purpose of this research is to analyze cores from three sub-alpine tree species and use the collected data to determine how climate has changed, and will continue changing, over time in these areas. Dendrochronology is used to measure and date environmental variations in former periods in order to study climate change. In order to collect this data, the distance between tree rings in numerous core samples from three different sub-alpine tree species were analyzed using specialized laboratory equipment and, in turn, used to draw conclusions about climatic change that occurred in previous time periods. This research will provide information valuable to scientists in regards to past environmental events and how climate is changing in northern sub-alpine regions.

“Biochemical Mechanisms of Chlamydomonas reinhardtii”
Department of Environmental Sciences, College of Agriculture and Life Sciences
By: Kriti Gaur

All species of algae contain a carbon concentrating mechanism (CCM) for photosynthetic efficiency. Chlamydomonas reinhardtii is a model organism for algae biofuel research. The primary objective of the experiment was to determine the effects of different concentrations of inorganic carbon (Ci) on the CCM, in strains of C. reinhardtii, CC-503 & CC-4425 (D66). By analyzing the effects of different concentrations of Ci, in the form of NaHCO3 on C. reinhardtii, data can be gained on how C. reinhardtii produce triacylglycerides under environmental stress. C. reinhardtii can produce isoprenoids by only using a MEP pathway, meaning that it is at a metabolic advantage to produce complex hydrocarbons. The secondary objective of the experiment was to extract squalene from a transgenic squalene-synthase mutant of C. reinhardtii, (SQS) in order to potentially analyze the use of squalene as a biofuel compound.

Exposure of both strains of C. reinhardtii to increasing concentrations of NaHCO3 resulted in a decrease in optical density and an increase in overall lipid content, as the molarity increased. The increased molarity of the NaHCO3 caused a condition of environmental stress, which resulted in the C. reinhardtii storing additional triacylglycerides inside the cell body as a food reserve. Different strains of C. reinhardtii have different reactions to environmental stress depending on the evolutionary adaptations that a strain has. Squalene extraction was attempted for the 6 samples of dried algae biomass, using a GC-MS machine. The data for the squalene extraction was inconclusive, as squalene is a volatile compound that is difficult to extract. Thus, the squalene extraction was unsuccessful. Future applications of this research may include exposing other strains of C. reinhardtii to other forms of environmental stress, to enhance lipid production in the cell.

"Effect of Physiological Stress and Experience on Riders with High-Reactive and Low-Reactive Horses While Riding Bareback"

Department of Health, College and Health and Human Development
By: Mattea Much

To quantify the relationship between experience level and physiological stress of horse and rider during a bareback riding session, 28 horses (geldings, ages 6-20 years) and 28 riders (16 male, 12 female, ages 19-22) were organized into a 2X2 factorial experimental design. Horses were categorized as either high-reactive or low-reactive based on their response to a reactivity test. Average daily distance travelled was monitored for the horses. Riders were be split into two groups: novice (never have ridden a horse) and experienced (2-3 years of riding instruction). Riders were also be given a personality classification survey. Two riding sessions were be measured and recorded on video, with the second session occurring at least three weeks after the initial session. Heart rate for both horses and riders was be monitored before, during, and after the riding session.

"Effects of commonly abused over the counter substances on development of blow fly species Calliphora vicina"

Department of Forensic and Investigative Sciences, College of Agriculture and Life Sciences
By: Tammy Lee Starr

Forensic entomologists commonly use blow flies, such as Calliphora vicina, in investigations to determine the post mortem interval (PMI), based on the calculated time at which the blow flies colonized the body. When performing this calculation, the assumption made is that a certain species of fly will grow at a specific rate based primarily upon temperature, however, there are many different variables in the environment that could potentially affect the rate at which blow flies develop within set temperature ranges. This project aims to determine the effects of chemicals present in food resources, specifically, commonly abused substances present in the blood at the time of death. The substances tested were cough syrup, caffeine and alcohol. These substances are all easily accessible to the public and commonly abused. In order to assess the effects of these substances on C. vicina, the larvae were separated into equal groups and placed in separate treatment boxes with a food resource, liver, which was blended with either water, cough syrup, alcohol or caffeine. Doses of the treatments were calculated to simulate abuse levels in the body. Observations were made on development times, eclosion success rates and larval length at the pre-pupal stage. With this information it will be possible to assess the difference in the development of flies which ingested certain substances, which could, in theory, lead to inaccurate PMI calculations in forensic practice. With further study and a better understanding of the relationship between these substances and the potential changes they cause in development of blow flies, a more accurate system for calculating PMI could be determined.

“Conservation of Mexican Long-nosed Bats Along the Migration Route and Surrounding Maternity Caves”

Department of Wildlife and Fisheries Sciences, College of Agriculture and Life Sciences
By: Brittany Stamps

The nectar-feeding Mexican long-nosed bat (Leptonycteris nivalis) population has been experiencing a steep decline over the past ten years. Conservation of this species is vital for the mutualistic relationship between the plant genus Agave and the bat species Leptonycteris nivalis. Bat pollination promotes genetic diversity of the agave plant and ensures maintenance of the plant community structure. To gain an understanding of critical habitat locations for conservation, high-resolution species distribution models will be developed with data on current and historic sites and observations.

Education, Admin., & Human Resource Dev.; Educational Psychology; Health & Kinesiology; Teaching, Learning & Culture

“Clumsiness: A Preliminary Study of Developmental Coordination Disorder in College Students”

Department of Kinesiology, College of Education and Human Development
By: Megan Rund, Paige Vajdos, & Ryan Roessler

The purpose of the study was to survey the probable incidence of Developmental Coordination Disorder (DCD), a condition marked by poor motor coordination and clumsiness, in college-aged students. To conduct this study, a total of 178 individuals at Texas A&M University, aged 18-23 (40% males and 60% females), were systematically selected to complete a validated questionnaire. Participants completed the questionnaire either in hard copy or online (the latter was created by us). The study found that 15% of individuals fell into the category of “probable” or “likely” to have DCD. Whereas there was no statistically significant difference between age groups (age 18-19 and over the age of 20), 10 (out of 40 items) were significantly different between genders. That is, males had more difficulty with fine motor tasks, while females had more problems with gross motor and social tasks. While future research is needed, especially using a larger sample, these findings suggest that a significant number of college-aged individuals may have difficulty with clumsiness and require attention to address their needs.

“Hot-Button Issues: Personality Predictors in a College Student Sample”

Department of Psychology, College of Liberal Arts
By: Holley Whorley

Young voters are notorious for not taking part in the political processes. The aim of the present study is to investigate the role that mood and selected personality variables play in attitude about “hot-button societal issues,” amongst college students. Once the latter are determined, analyses were conducted to ascertain how the mood and personality variables interact with these violate issues. In order to measure mood and personality variables for our subjects, we used the following scales: NEO Personality Inventory (NEO-PI; Costa & McCrae, 1985), and a Right Wing Authoritarianism Scale (RWA; Rattazzi, Bobbio, & Canova, 2007). Subjects also responded presented to 5-point Likert scales that measured their attitudes towards popular controversial issues such as abortion, the death penalty, marijuana legalization, gun control, and attitudes towards water conservation. Responses to the controversial issues were analyzed in terms of the previously mentioned mood and personality variables. The objective of this research project was to investigate how students’ mood and personality predict their attitude about controversial societal issues.

“Isolation, immortalization, and differentiation of primary culture murine myoblasts cells into functionally contractile myotubes”

Department of Kinesiology, College of Education and Human Development
By: Branden Nguyen

Skeletal muscle tissue exhibits many plastic properties, changing its size or function in response to a variety of stressors. This adaptability is due, in part, to satellite cells, a type of multipotent adult stem cell that are found between the sarcolemma and basement membrane of muscle fibers. These cells, while normally quiescent, are activated by mechanical strain or injury. When activated, they are responsible for creating new muscle fibers and/or combining with existing myofibers to facilitate growth and repair. After an injury, satellite cells begin to proliferate and differentiate into myoblasts to facilitate the repair and regeneration of muscle tissue. Further understanding the contributions of satellite cells to the plasticity of skeletal muscle may lead to important medical contributions for a number of diseases associated with the loss of skeletal muscle mass or function, such as muscular dystrophy. This study sought to accomplish two specific aims, the first of which was to harvest and isolate satellite cells from intact murine muscle, and subsequently grow these cells into viable myotubes in culture. The second aim of these studies was to characterize the cultured myotubes and compare aspects of their anabolic profiles to tissue from the same animal at the time of tissue harvest. Outcomes for these studies include analyzing signaling outcomes between cultured and intact muscle in an effort to understand morphological/metabolic differences between these conditions. The central hypothesis for this study is that phenotypic expression of skeletal muscle (fiber type, metabolic profiles, anabolic profiles) will persist in cell culture. If the harvested cells maintain similar characteristics to the intact tissue, these methodologies can be used to better understand mechanisms of muscle disease states in cell culture, and potentially, translate our findings to intact living organisms. Ultimately, if successful, these methodologies could be adapted to isolating satellite cells from biopsied human skeletal muscle tissue, and subsequently invested differentiated myotubes that retain specific muscle abnormalities of the donor. This would allow for the ability to harvest and maintain human cells expressing a desired trait, without the constant need to obtain muscle biopsies from new subjects.

“Elementary curriculum development for addressing misconceptions of adaptation using bats”

Department of Biomedical Sciences, College of Veterinary and Biomedical Sciences
By: Elizabeth Sigala, Suryanarayan Balaji, Dominic Lira

Adaptation by natural selection is a core scientific principle, but it is also one of the most widely misunderstood scientific processes. A deficit in educators’ understanding of adaptation, as well as students’ flawed prior knowledge, have been found to affect students’ ability to learn and comprehend the concept of adaptation. To counter this misconception, we created three activities for 1st grade teachers to use in their classrooms for introducing and strengthening their students’ understanding of adaptation. We used bats as a model for teaching adaptation because of their diversity and unique adaptations. The activities we developed build on each other, introducing students to bat physical characteristics, their diets, and finally how bats are physically adapted for their specialized diets. The goal of the activities is to combine active learning and physical movement in order to increase understanding of the concept of adaptation, and to promote appreciation and conservation of bats. We will test the effectiveness of this curriculum for achieving these goals in classrooms with pre- and post-activity test questions to test students' knowledge on adaptation, as well as the ability to learn and overcome any misconceptions they may have regarding the topic.

"Functional Impairment in Body-Focused Repetitive Behaviors"

Department of Psychology, College of Liberal Arts
By: Shoaleh Motamedi

Body-focused repetitive behaviors (BFRBs) such as compulsive hair pulling, skin picking, and nail biting are often associated with negative consequences such as physical damage, psychosocial distress, and functional impairment in daily life. Occasional engagement in BFRBs is common and benign, while clinical rates are considerably rarer and thought to be associated with greater psychosocial impairment. Studies have shown that adults with pathological hair pulling and skin picking experience distress and impairment in multiple areas of life (e.g., social, occupational, academic, and psychological). However, there are several open questions that have not been answered by previous studies looking at how BFRBs affect life functioning. For example, prior studies did not compare clinical BFRBs with a healthy control group, making it impossible to estimate the magnitude of distress and impairment in BFRBs. It is also important to compare clinical and subclinical BFRBs to determine whether occasional engagement in BFRBs causes significant functional impairment. Additionally, no studies have focused on comparing different types of BFRBs to examine for significant differences. Although studies have indicated that BFRBs such as hair pulling and skin picking share significant similarities, it is possible that separate BFRBs may have more of an impact in specific life areas. The current study aimed to test for differences in impairment in areas of life functioning for adults with clinical BFRBs ($n = 759$) and compared the results to a healthy control sample ($n = 576$) as well as a subclinical BFRB sample ($n = 321$). We also compared areas of life functioning between different types of BFRBs, specifically persons with Trichotillomania ($n = 223$), Excoriation Disorder ($n = 206$), and other unspecified BFRBs ($n = 69$; nail biting, cheek biting, teeth grinding, etc.). The survey participants completed the Behavior and Symptom Identification Scale-32 scale (BASIS-32), which is a brief screening measure that examines various aspects of life functioning and psychopathology (e.g., managing day-to-day life, relationships, depression, suicidal ideation, quality of life). We found that the clinical BFRB sample reported greater distress and impairment than both the subclinical BFRB sample and healthy control sample on the vast majority of items on the BASIS-32 scale. This suggests that many areas of life functioning are significantly affected by clinical BFRBs. Furthermore, few differences were found between the different types of BFRBs which show that they are more similar than previously thought. The implication of these findings for the conceptualization and treatment of BFRBs will be discussed.

“Inspirational Irish Women”
Department of Interdisciplinary Studies, College of Education and Human Development
By: Kaitlin Howard

Women in history and social studies are often portrayed as supporting roles due to traditional roles and limited rights inflicted them across the globe. It is important for primary and secondary students to learn about the necessity for women in social studies and to learn about them more than just Women’s History Month. I am doing research on four Irish women who impacted children through protests, medicine, humanitarian work, and charity. These four women include Mary Harris Jones, Kathleen Lynn, Mary Elmes, and Christina Noble. These names are unfamiliar to most, myself include before I discovered their altruistic stories. These four women are influential to Irish and women’s culture and I look forward to continuing my research during my trip to Ireland with my EDCI 485 class.

“Encouragement or distraction: The effect of verbal encouragement on mood, attitude, and motivation with a cold pressor task”
Department of Psychology, College of Liberal Arts
By: Amanda Brown

Studies have been done that show social support is very helpful in lowering cortisol, increasing pain tolerance and thresholds, and in lowering heart rate. One commonly used form of social support is encouragement. Previous research has included encouragement as a form of social support and demonstrates itâ€™s physiological benefits. However, encouragement has not been widely studied in the realm of psychological impact. Similarly, distraction has been shown to be beneficial for pain tolerance. This research explores the differences between distraction and encouragement and whether encouragement causes a more positive psychological impact after a painful task. A cold pressor, ice water task, is used to simulate a painful task. Participants are split up into three conditions: Control, Encouragement, and Distraction. Each condition dictates the content of speech the participants hear while their hands are in ice water. Surveys before and after the task evaluate mood, attitude, motivation, and personality. While results do not show statistical significance comparing mood, attitude, and motivation, we will discuss potential trends in the data, reasons for a lack of significance, and future directions for research.

“Engaging reluctant readers through the use of augmented reality book-talks: an undergraduate research project”
Department of Interdisciplinary Studies, College of Education and Human Development
By: Amara Ghorbani, Ghada Zakaria, & Ruben Delgado

This case study will explore the experience of a group of undergraduate students engaged in a community-based research project. Utilizing the constant comparative method of data analysis (Glaser & Strauss, 1967) and classical content analysis (Berelson, 1952) research team members will examine the processes and problem solving strategies among these students as they are exposed to the field of research. The research team members will examine the benefits of this experience for these students as they develop, conduct and reflect on their own research agenda through a community based research experience. Community-based research is an opportunity for undergraduates that can have beneficial outcomes both within and beyond institutional walls (Paul, 2003, 2008). Community partners such as public and private schools, libraries, and museums benefit from such partnerships. The goal of the collaboration between community, faculty members, and students is community betterment and service (Paul, 2003). The collaborative nature of community-based research ensures that all participants “each with different perspectives and complementary skills” contribute to and benefit from the experience (Nyden, 2003; Paul, 2003; Karukstis, 2005). Community-based research connects the professional and “life based” expertise and experience to the undergraduate research study. (Paul, 2003). In light of the above, this project links pre-service teachers (undergraduate students) with fifth grade students in one middle school in College Station, Texas who have been identified as reluctant readers by their teachers. This poster will examine the benefits and impact of this experience on all stake holders.

“An Analysis of Women's Access to Education and Workplace Restrictions in Developed Versus Developing Countries”

Department of Technology Management, College of Education and Human Development
By: Jill McLain & Destiny Soliz

Gender disparity has become a topic of major discussion in developing countries in recent years, particularly in relation to the access to education and workforce restrictions. The purpose of the study is to gain an understanding of the factors of women’s limited access to education and workforce restrictions placed on women in the three countries, the United States, Mexico, and Guatemala. Using The Womenstats Project, an Internal Review Board approved open access database, our team will compare and contrast the differences between the three selected countries. We hope to highlight the effects the gender disparity of access to education and workforce restrictions can have on a country and have detailed solutions to counteract these disparities.

Using The Womanstats Project, investigated the complexity of the factors that contribute to the limitations placed on women in each of the selected countries. This information is significant to study, because it will help create a guide to make improvements for women in the United States, Mexico, and Guatemala.

“Disuse-induced Bone Loss Is Impacted by Age”

Department of Kinesiology, College of Education and Human Development
By: Anne Michal Anderson, Corrine E. Metzger, Susan A. Bloomfield

Bone is a dynamic tissue that responds and adapts to stresses and strains. When bones are more frequently subjected to mechanical loads (i.e. weight-bearing exercise), bones adapt by increasing in bone mass. The opposite occurs when the bones are not regularly exposed to mechanical loads leading to a loss of bone mass and increased risk of fracture. Patients on extended bed rest or astronauts in long duration spaceflight space experience disuse-induced bone loss. PURPOSE: The purpose of this experiment was to see if young (growing) and old (skeletally mature) rats respond differently to short term disuse. We hypothesized young rats would experience greater decrements in bone due to disuse than old rats. METHODS: Male Sprague Dawley rats either 3 months old (Y) or 9 months old (O) were divided into hindlimb unloaded (HU) or ambulatory control (CON) for 14 days. Peripheral quantitative computed tomography and static histomorphometry was completed on the excised bones to measure volumetric bone mineral density (vBMD) and cancellous microarchitecture of the proximal tibia metaphysis. T-tests between CON and HU were completed in Y and separately in O. RESULTS: Total vBMD (cortical shell+cancellous core) and cancellous vBMD were lower in Y-HU compared to Y-CON. Trabecular number was lower in Y-HU compared to Y-CON and trabecular separation trended to be higher ($p=0.08$). In O-HU vs. O-CON, there were no difference in vBMD or any measures of trabeculae between the groups. CONCLUSION: In this study we demonstrated that the older rats were less impacted by short-term disuse than the younger rats. Therefore, younger individuals who experience bone loss due to disuse may potentially be affected more than skeletally mature adults.

"The Impact of Visual Acuity and Dietary Retinol, Vitamin A and its Precursors on Visual Cognitive Tracking Performance in the IONSport Study"

Department of Kinesiology, College of Education and Human Development
By: Kaeleigh Nicole Elmendorf, Caroline L. Sullivan, Tori L. Stanzeski, Curtis J. Zachry, Zain S. Jessa, Kadyn A. Grayson, William L. Porter, Rachel R. Beakley, Nicos C. Georghiades, Jenna M. Rutan, Yesenia Nieto, Melanie Mascorro, Santiago U. Capetillo, Karina L. Wilson, Steven E. Riechman

BACKGROUND: Retinol, Vitamin A and its precursors may help to sustain ocular health and affect visual acuity. These nutrients are believed to act as antioxidants, which has been linked with the conservation of eyesight and the protection of the rods and cones in the retina against sun damage and other oxidative damage. PURPOSE: The purpose of the Nutrition, Vision and Cognition in Sport Study (IONsport) is to determine the factors that explain the large difference in visual cognitive performance and training responses between individuals. In this sub-study, we examined specific eye-related nutrients and a standard measure of static visual acuity and their association to visual-cognitive tracking performance and training responses. METHODS: College age men and women performed 15 visual cognitive training sessions (Neurotracker) in 10 visits to the laboratory (all 10 visits within 15 days). On the days of training, all food intake was documented (Nutribase) along with measures of body composition, sleep patterns, fluid intake and recent exercise. Mean nutritional intakes were calculated for the 10 days of food records. Neurotracker tests one's ability to successfully track 3D images on a virtual screen with increasing amounts of difficulty. RESULTS: Dietary Retinol, Vitamin A and its precursors as well as static visual acuity were not strongly associated to visual-cognitive performance or training responses. CONCLUSION: These results suggest that these eye-related nutrients and static visual acuity do not affect visual cognitive performance and the visual cognitive testing isolates affects within the brain.

"Can Bone Formation Recover Post Spinal Cord Injury?"
Department of Kinesiology, College of Education and Human Development
By: Haile Bradley

Spinal cord injuries (SCI) cause severe bone loss due to immobility and mechanical unloading. The period immediately following injury, referred to as the acute phase, is associated with rapid, dramatic bone loss due to increased bone resorption and decreased bone formation. Following this acute phase, bone loss is less drastic; however, the impact on bone formation rate (BFR), a kinetic measure of osteoblast function, is not well understood. The purpose of this study is to examine the effects of incomplete spinal cord injury (SCI) in rats on bone mineral density (BMD) and bone formation rate 28 days post injury. Methods: Twelve male Sprague Dawley rats were split into two equal groups (n=6/group): SHAM surgery and SCI. The SCI group received moderate contusion surgery to mimic effects of a spinal cord injury. Fluorochrome labels to measure bone formation rate were injected 7 and 2 days prior to termination. Tissues were collected 28 days post injury. Peripheral quantitative computed tomography scans were taken of the right proximal tibia and BFR was analyzed in the cancellous bone of the metaphysis and the cortical shaft. Data were analyzed using an independent t test. Significance was determined at $p<0.05$. Results: In the proximal tibia metaphysis, total bone mineral content (cancellous bone + cortical shell) was 19% lower in SCI compared to SHAM and cancellous volumetric BMD was 25% lower in SCI. There was a trend for lower cortical thickness in the midshaft tibia of SCI rats. Cancellous BFR in the proximal tibia was 37% lower in SCI versus SHAM due to 45% lower mineralized surface. There were no differences in cancellous mineral apposition rate between the two groups. Conclusions: Twenty-eight days post-injury, BMD and BFR in SCI rats were significantly lower than that of SHAM rats. The decrease in BFR was primarily attributed to lower number of osteoblasts (i.e., 45% mineralized surface) present on cancellous bone surfaces. The maintained decrements in bone formation following the acute phase may contribute to the lifelong elevated risk of fractures seen in SCI patients.

"Detection of Disparities in Vision Difficulty Care through Regression Analysis"
Department of Biomedical Science, College of Veterinary and Biomedical Science
By: Katelyn Elaine Goodroe

Due to the progressive nature of preventable vision loss, annual examinations are necessary to address early stages of diseases. While studies have focused on risk factors leading to preventable vision loss, little work has been done to understand prevalence of vision difficulty in regard to availability of services and factors such as age, health insurance, and poverty. This study demonstrates geographic trends in vision difficulty to broaden the understanding of disparities in vision care accessibility in the United States. American Community Survey 2014 5-Year Estimate disability data were analyzed alongside Urban Influence Codes and National Provider Identifier registry data for optometrists and ophthalmologists to investigate correlations between accessibility to eye care and prevalence of vision difficulties. Through ArcMap software, ordinary least squares analysis of county-level data of eye care providers and other factors produced the standard residuals for the model used to identify vision care disparities. Vision care disparities were detected in 107 total counties between all twelve Urban Influence Codes classifications using county-level data. This study focuses only on the first of three phases of addressing the disparities but lays out the groundwork for the next two phases by geographically identifying the locations of vision care disparities.

"A Literature Review on the Effects of Global Food Insecurity on Developing Countries"

Department of Health, College of Education and Human Development
By: Caroline Marie Crixell

Global food security is a rising dilemma in this day and age, and it particularly effects underdeveloped countries. Malnutrition is a major consequence from global food security, and impacts much of the world population. According to the World Health Organization (2017), child and maternal malnutrition can account for ten percent of the world population. Because children are of the most vulnerable populations, they can have the most detrimental impact of nutritional deficiencies, including but not limited to reduced educational attainment, stunted growth, and death. Conditions that are life threatening and difficult to treat in places with limited access overburdens already fragile health systems. At the root of the cause, global food security is a major player in the nutritional deficiencies of underdeveloped nations. Global food security has many contributable factors including growing populations, climate change, and growing food prices. To combat this, vulnerable nations need to increase agricultural production to meet with growing populations with efficient use of water and land. With these strategic interventions, the consistency of staple crops and stable prices in markets are more assured. This literature review aims to study the impact malnutrition causes on child populations in underdeveloped nations, specifically focusing on India, and how this can be prevented by further analysis in policies and interventions implemented to eradicate or resolve the harm global food insecurity poses on these communities.

"Integration of Irish Dance in Elementary Social Studies Curriculum"

Department of Interdisciplinary Studies, College of Education and Human Development
By: Sarah Crawford

The social studies curriculum would be the perfect place to demonstrate to elementary students how dance, specifically Irish dance, is seen as a social gathering that allows all classes to interact and share their heritage. Documentation of Irish dance, which came from English visitors, first originated around the seventeenth century. There are many types of Irish dance such as the jig, hornpipe, and reel. One type of jig, step dance, is more popular than all the rest. From its roots, step dance is competitive. One must learn the techniques at a dance academy or through a skilled teacher. Over the years, Irish step dance has become more popular. Through "Riverdance," a theatrical show featuring Irish folk dance and music, and "Lord of the Dance," an Irish musical and dance production, Irish step dance is more popular than ever. This research discusses the historical origins of Irish folk dance, the different types of dance, Irish step dance, how Irish step dance became popular, and how to integrate the research into social studies curriculum for elementary students.

“Effects of Dietary Lutein and Zeaxanthin and Eye Color on Visual-Cognitive Performance and Training Responses in the IONSport Study”

Department of Health & Kinesiology, College of Education and Human Development
By: Zain Jessa

BACKGROUND: Lutein (LU) and zeaxanthin (ZE) have been identified as key nutrients associated with eyesight and the prevention of macular degeneration. Moreover, eye color has also been associated with risk of macular degeneration. PURPOSE: The purpose of the IONSport Study is to identify key factors associated with variability in visual-cognitive performance and training responses. The specific purpose of this sub-study is to determine the association of dietary LU and ZE and eye color on these parameters. METHODS: College age men and women performed 15 visual cognitive training sessions (Neurotracker) in 10 visits to the laboratory (all 10 visits within 15 days). On the days of training, all food intake was documented along with measures of body composition, sleep patterns, fluid intake and recent exercise. Mean nutritional intakes of LU and ZE were calculated for the 10 days of food records (Nutribase). RESULTS: In preliminary analyses, LU and ZE was significantly associated to Neurotracker performance, however eye color and family history of macular degeneration were not. More sophisticated analyses are pending. CONCLUSION: These results suggest that intake of LU or ZE may benefit visual cognitive training performance, supporting the contention that visual cognitive performance is more than an innate ability

“The Effects of Americanization on St. Patrick's Day”

Department of Interdisciplinary Studies, College of Education and Human Development
By: Melanie Hartt & Lindsey Uresti

Since the mid-19th century, St. Patrick’s Day has become an international celebration of Irish culture by Irish and non-Irish people, alike. Despite popular belief, veneration of the day did not always appear the way it presently does, and instead has been shaped and transformed throughout history. This research reveals the specific ways St. Patrick’s Day has altered over time, as well as provides reasons for why this phenomenon has occurred. Irish perspective regarding celebration of their cultural holiday by Irish and non-Irish individuals is also recovered through an in-depth investigation of history-based forms of mass media such as: The History Channel, National Geographic, various works of literature, and Texas A&M Library Databases. An analysis of these publications point to Americanization as the leading cause for the remolding of St. Patrick’s Day, as well identify varying opinions regarding its celebration by non-Irishmen. These findings serve to guide educators interested in cultivating a multicultural classroom by highlighting the elements of cultural appropriation centered on St. Patrick’s Day in order to ensure true Irish heritage not be misrepresented. This analysis is part of a growing body of research related to culturally aware teaching, and will contribute to authentic cultural curriculum planning.

"Education in Ireland V.S. Education in the United States"

Department of Interdisciplinary Studies, College of Education and Human Development
By: Jaqueline Hurtado

In this research, I will be comparing United States and Ireland's education system. In 1831, Ireland's National School System was established. The main objective was to unite in one system children of different creeds. Various schools were jointly managed, however, the main Christian Churches put pressure on the government to allow aid to be given to school under the management of individual churches. Throughout the years, curriculum changed as well as school's management. Ireland's Education System was fundamentally different to the systems in other parts of the world. Variations between the United States and Ireland's Education are vastly diverse. To begin with, the schools are divided up differently in each country, and all the levels have different names. In America, Kindergarten and grades one to six are in Elementary School. Usually, Middle School holds grades seven and eight. Then there is High School, which has grades nine through twelve. However, in Ireland, Junior and Senior Infants as well as classes one through six are in Primary School and years one through six are in Secondary School. This is one of the main differences I observed between the schools in America and Ireland. A similarity both countries contain is the length of the school days. As I study abroad in Ireland, I will expand my knowledge about Irish Education to compare it to the United States. Making connections and finding differences, I expect to share the diversity of both education systems thoroughly.

"The Impact of Dietary Protein and Amino Acids on Visual Cognitive Performance and Training in the IONSport Study"

Department of Kinesiology, College of Education and Human Development
By: Nicos Costas Georghiades, Caroline L. Sullivan, Kaeleigh N. Elmendorf, Curtis J. Zachry, Zain S. Jessa, Kadyn A. Grayson, William L. Porter, Rachel R. Beakley, Tori L. Stanzeski, Jenna M. Rutan, Yesenia Nieto, Melanie Mascorro, Santiago U. Capetillo, Karina L. Wilson, Steven E. Riechman.

Visual cognitive ability is an important characteristic of athletic performance, however, testing, training and determination of nutritional factors that influence this ability is largely unexplored. PURPOSE: The purpose of this study is to determine whether chronic dietary protein and amino acid intake, specifically neurotransmitter precursors, explain the large difference in visual cognitive performance and training responses between individuals. METHODS: Men and women age 18-35 completed 15 visual cognitive training sessions (Neurotracker) in 10 visits to the laboratory. On the days of training, all food intake was documented (Nutribase) along with measures of body composition, blood pressure, hydration status, sleep patterns, and recent exercise. Mean nutritional intakes were calculated for the 10 days of food records. Total daily intakes of protein, amino acids and neurotransmitter precursors were also calculated for each of the 10 days of food records. RESULTS: We have identified significant associations of the amino acids arginine, histidine, and tryptophan, as well as mean total daily protein intake to visual-cognitive performance. More sophisticated analyses are pending. CONCLUSIONS: Protein intake, possibly through the availability of neurotransmitter precursors, influences visual cognitive performance and training responses.

“Hydration Factors Affecting Visual Cognitive Tracking Training and Performance in the IONSport Study”

Department of Kinesiology, College of Education and Human Development
By: Tori Stanzeski

Hydration levels are an important characteristic of athletic performance and may impact cognitive function. In turn, cognitive function, specifically visual-cognitive function, is a critical ability in many dynamic sports. PURPOSE: The purpose of the Nutrition, Vision and Cognition in Sport Study (IONSport) is to determine the factors that explain the large difference in visual cognitive performance and training responses between elite and non-elite athletes. The purpose of this sub-study is to determine the effect of acute and chronic fluid intake, urine color, electrolyte intake and bioelectric impedance measures of hydration status on visual-cognitive performance and training responses. METHODS: College age men and women performed 15 visual cognitive training sessions in 10 visits to the laboratory (all 10 visits within 15 days). On the days of training, all food intake was documented along with measures of body composition (including percent water), fluid intake, urine color and recent exercise. Means were calculated for the 10 days of each variable and used to determine association to visual cognitive performance. RESULTS: Significant associations of sodium intake and body water to visual-cognitive performance were identified. More sophisticated analyses are pending. CONCLUSIONS: The preliminary results suggest that hydration status can impair visual cognitive performance.

“The Irish Potato Famine”

Department of Interdisciplinary Studies, College of Education and Human Development
By: Amber Hutchinson, Morgan Smith

The researchers will be investigating the effects of the Potato Famine, or the Great Famine of the mid 19th century, on different socioeconomic classes in Ireland. This was a period of time in history where potatoes, which were then a major crop in Ireland, turned black and died off. The result of the failed potato crops caused mass starvation, diseases, and mass exodus from the country of Ireland. The researchers will investigate the diseases that resulted from this famine and how these diseases impacted the country of Ireland. Specifically the researchers will investigate how the famine impacted children and the educational system of Ireland.

The research will focus on the impact of the Potato Famine on the various social classes in Ireland. Specifically, our research will focus on the differing impact on the socioeconomic classes. The researchers want to examine various aspects of the famine on all socioeconomic classes, how and if each class survived during the famine, and how they reintegrated into Irish society. The research will explore the differences in education for children both prior to and following the famine across socioeconomic classes.

“Understanding the underlying pathways associations with place and type-2 diabetes”

Department of Health, College of Education and Human Development
By: Miryan Jara, Dr. Idethia Harvey PhD, and Rhama Mkuu, MPH, CPH

Introduction: Research has linked the associations between the social and physical environments and health. Studies also found that place-based exposures can have a harmful effect on health. Place-based physical environmental indicators are associated with antecedents of type-2 diabetes through risk factors such as dietary behavior, physical activity and obesity. This research focused on the factors that had influenced participation in type-2 diabetes self-management behaviors and their perspective behavior practice has impacted their health and wellbeing.

Methods: Semi-structured interviews (N = 6) guided photograph data collection. Interviews were digitally recorded and transcribed verbatim. Thematic analysis was used to examine the social and physical environments into self-management behaviors among African Americans. Photographs were sorted and coded individually into themes. Methodological triangulation was used for cross verification between qualitative data and photographs.

Results: The study found three themes: Food and nutrition; neighborhood characteristics, and sociocultural factors in health maintenance. Photographs depicted facilitators and barriers to environmental influences. the physical neighborhoods and food choices.

Discussion: Sociocultural and economic influences were found to engage or impede in behavioral practices. Photograph visually capture the social connections with their physical environment on individual’s self-management behavior. The strength of this pilot study is the use of participant-driven generated photographs in the research process. Data collection aided the study in understanding of the meaning and “insider” experience of place.

“Fracking Our Racist Perceptions: an Autoethnographic Archaeological Dig”

Department of Sociology, College of Liberal Arts
By: Bailey Morris, Vicki Mokuria, & Juan Carlos Laxa

This research is a self study of the continuing social influences in the lives of the researchers by means of self reflection and collaborative discussion. Using auto-ethnographic methodology, the influence of racism and "otherness" throughout a person's relationships can be acknowledged and observed through stages of social development. By beginning analysis on the early childhood memories, bias in adulthood can be followed from origin and stages of evolution. Discussion of discovered biases and specific memories, or lack thereof, allows for the issue of "resistance" to be challenged and overcome in addition to increased awareness of racial influences. The goal of this self archaeological dig is to begin dialogue between opposing ideas and mindsets to allow more understanding between them in addition to changing attitudes toward conflicting theories beginning with the individual.

"Breastfeeding Practices Among WIC Participants: Examination of Rural-Urban Differences"

By: Biomedical Science, College of Veterinary and Biomedical Science
By: Baylee Ann Glover

The WIC Program was created in order to meet the extra nutritional needs of low-income, postpartum, planning on becoming pregnant, and pregnant women. The program also takes care of the nutritional needs of infants and children up to the age of five. The most recent changes to the packages made in 2009 were created in order to promote breastfeeding among both rural and urban women by increasing the incentive values of the WIC-FP packages for mothers whom breastfeed. This study identified the different breastfeeding characteristics and trends that are associated with mothers from rural areas versus mothers from urban areas. Socio-demographic data such as, age of the infants and caregiver, language and race of the caregiver, region that the caregiver resides in, and the highest level of completed education by the caregiver, were all recorded. Results showed that there was a significant, national trend towards an increased amount of Fully Breastfeeding Packages before and after the WIC Package revision by a percentage of 4.36%. This positive trend was counteracted by the negative trend in the amount of Partially Breast Feeding Packages by -3.86%, and the small decrease in Fully Formula Feeding Packages by -0.50%, suggesting that more women switched from Partially Breastfeeding Packages to Fully Breastfeeding Packages. The small decrease in the number of Fully Formula Feeding Packages is a good indication that only a small amount of women began to breastfeed their children after the revision. This trend towards a higher number of women switching to fully breastfeeding after the package revision was supported by other national trends that suggested women also began to breastfeed longer after the package revisions were released, and the amount of women who initiated breastfeeding increased. The number of women who initiated breastfeeding after the package revision increased by 1.48%. It was also noted that the number of women who stopped breastfeeding after only one month decreased by a percentage of -1.36%, while the number of women who stopped breastfeeding after five to six months, the time period that is recommended, increased by a percentage of 0.31%. Finally, the statistics were broken down into rural versus urban scenarios, and the results concluded that there has been a larger increase in the amount of women who began to Fully Breastfeed after the package revision. Compared to urban mothers, rural mothers who switched to fully breastfeeding increased by 4.82%, while urban mothers increased by 4.28%. It was also noted that more rural mothers switched from Fully Formula Feeding to Partially or Fully Breastfeeding by 1.27%, while there was only a small change in the amount of urban mothers who switched by 0.27%. The data suggests that while there are differences in the data between rural and urban mothers who may or may not breast feed, the objective of the WIC-FP packages has been successful so far. There is an overall positive trend towards more mothers choosing to breastfeed with the new package revisions.

“The Effects of Caffeine Intake and Perceived Readiness on Visual Cognitive Performance and Training Responses in the IONSport Study”

Department of University Studies, College of Education and Human Development
By: Melanie Mascorro

BACKGROUND: Visual cognitive ability is an important characteristic on sport performance, however, determination of factors that influence this ability have been elusive. Caffeine is used extensively by athletes and well known to improve alertness. It is unclear whether caffeine itself can improve cognitive performance or whether it is the perceived mental readiness that influences performance. PURPOSE: The purpose of this sub-study of the Nutrition, Vision and Cognition in Sport Study (IONsport) is to determine whether caffeine and mental readiness can explain variability in visual cognitive performance and training responses between individuals. METHODS: Healthy men and women, age 18 to 35, performed 15 visual cognitive training (Neurotracker) sessions in 10 visits to the laboratory (all 10 visits within 15 days). Neurotracker is a 3D software program that uses moving targets subjects must track that vary in speeds based on their performance. On the days of training, subjects were asked about their level of vigor and energy, their motivation and readiness to perform, and their previous night’s sleep. On all days of training, total food intake was documented along with measurements of body composition, fluid intake, specific recent caffeine intake and recent exercise. RESULTS: In contrasts between different levels of caffeine intake, the no caffeine performed significantly better with no differences between other groups. Global assessments of readiness had a marginal positive association to performance. More sophisticated analyses are pending. CONCLUSION: Caffeine did not have the positive effect on visual-cognitive performance as expected although perceived readiness had some predictive value.

“Perceptions of Adding Collegiate Sports by Team Stakeholders”

Department of Sports Management, College of Education and Human Development
By: Greta Audrey Swift

As universities seek new ways to remain competitive, they’re quickly discovering that adding new sports can be an effective method of attracting potential students. The problem is that various stakeholders interested in adding their sport lack the necessary knowledge of the process to do so. The purpose of this study is to gauge the collegiate athletic stakeholder’s awareness and level of knowledge of the factors, priorities and processes that institutions use when considering adding new sports to their athletic offerings. Using a questionnaire, a sample population of key stakeholders, including collegiate club coaches, team captains, and student leaders, will be surveyed on the sport addition process. The data collected by this study will inform the creation of a proposal template to market their sport to their institution.

“Studying Effects of Muscle Representations and Levels of Interactivity in a Virtual Reality Canine Thoracic Limb Application”

Department of Visualization, College of Architecture

By: Preston Thorp White & Ben Heymann

We propose a virtual reality application that allows students to learn about muscle movements and to enhance spatial visualization abilities through interacting with a thoracic musculoskeletal model. We hypothesize that different visualizations of muscles will affect student’s knowledge gain and dynamic interactions with a musculoskeletal model will support student’s spatial visualization abilities. With virtual reality, we plan to make a laboratory setting where students can see and/or interact with 3D representations of bone and muscle from a canine thoracic limb to learn form, function, and movement. A virtual model of a thoracic model with relevant bones, muscles, muscle tendons and ligaments will be presented in a virtual reality environment. In the study, three major factors were considered: (1) spatial visualization ability of learners, (2) visualization styles of muscles, (3) interactivity of the system. Participants of differing spatial abilities (high and low) will study a virtual thoracic limb in one of two visual conditions (symbolic and realistic) and one of two interactive conditions (interactive, non-interactive). We plan to test these against each other to determine which method of muscle representation is the most effective form of retention, and what role interactivity plays in this retention. Regardless of which method shows to be more successful, we hope to revolutionize teaching methods, practices, and even test taking applications for anatomy students with this virtual reality teaching application.

Atmospheric Sciences; Geography; Geology & Geophysics; Oceanography

"Investigation of Changing Seawater Carbonate Chemistry Near Deep-Sea Coral Beds"

Department of Environmental Geosciences, College of Geosciences
By: Jahna Brooks

Anthropogenic impacts on the global ocean including increasing carbon dioxide levels and sea surface temperatures have significantly changed the chemistry of the seawater itself, by acidifying waters, creating low oxygen zones and changing nutrient levels. Deep-sea corals are vulnerable to these environmental changes, as calcification of their skeletons becomes much harder under acidified conditions. Nutrient availability from the surface may also change. This study will analyze the current chemistry of seawater around deep-sea coral beds in the Northwestern Hawaiian Islands with data from three cruises conducted in 2014, 2015, and 2016 and compare it to historical measurements from the 1990s from the same region taken from the World Ocean Circulation Experiment (WOCE). The possibility of shoaling calcium carbonate saturation horizons due to climate change will be assessed.

"Towards energy literacy in primary level classes in Texas: a geographic approach"

Department of Geography, College of Geosciences
By: Kate Merlock, Taylor Pampinella, Nicholas Miller, Sang Tran, Nguyen Huynh, Andrew Fleming, & Hannah Porter

In recent years, topics around energy types have been increasingly taught in primary schools. As this focus on energy becomes more prevalent, educational tools and strategies need to be further developed. Currently, however, many texts are outdated or misinformed, in addition to lacking deeper evaluations of each energy type. Educating children in America about energy will help cultivate a well-informed populace on the advantages and disadvantages of using different sources of energy. Here, we use data and information collected from various primary sources to provide an updated educational toolkit for 6th graders on the nine types of energy that are listed in the State of Texas TEKS. Information regarding the spatial distribution and scale at which each energy type is implemented in Texas, the United States, and around the world, which varies based on the conditions of the local area and availability of certain renewable and nonrenewable resources, is presented. Additionally, the environmental impacts of each energy type are assessed, along with their respective benefits and risks for our societies. We also present a comprehensive energy workbook that includes (1) reading sections and diagrams on each energy type, (2) vocabulary words and accompanying definitions for each of the energy type sections, (3) unique activities pertaining to the spatial distribution, scale, and impacts of each type, and (4) learning assessments that will demonstrate student' mastering of the pertinent TEKS. We intend to disseminate the energy workbook with an open-access publisher, making our documents freely available to all.

“Early to early late Miocene Carbonate Production and Burial in the western equatorial Pacific, IODP Site U1489”
Department of Geology, College of Geosciences
By: Jenna Chapman

Carbonate production and deposition in the equatorial Pacific from the early to early late Miocene was incredibly variable and ultimately led to a carbonate crash at ~10 Ma. This variability in deposition, especially concerning the Pacific Ocean, has far-reaching effects on the global climate. Here we use records from International Ocean Discovery Program (IODP) Site U1489 to learn more about the global carbon cycle and how it relates to climatic events on orbital timescales by examining carbonate production and burial in the western equatorial Pacific during the Miocene. Site U1489 is located at 2Â°07.19'N, 141Â°01.67'E in 3421 m water depth, on the western slope of the southern Eauripik Rise. We will collect bulk geochemical data for the Site U1489 cores using X-ray fluorescence (XRF) core scanning, and calibrate these data with discrete measurements of total organic carbon (TOC) and carbonate content. We will also collect calcareous nannofossil assemblage data to look at changes in nannoplankton productivity, which we will compare with the TOC-based productivity proxy. Preliminary shipboard results indicate that the calcium carbonate content at Site U1489 averages ~85 wt% for the lower to lower upper Miocene, varying between ~68 and 93 wt%. Over this interval, TOC was generally low but variable, ranging from ~0.01 to 0.4 wt%. We will use this multi-proxy approach to better understand changes in carbonate burial and production in the western equatorial Pacific in the Miocene and how these relate to climate signals and the global carbon cycle.

“Evolution of a suprasalt minibasin: Neoproterozoic Patawarta salt sheet, Flinders Ranges, South Australia”
Department of Geology, College of Geosciences
By: Sarah Giles

Neoproterozoic strata deposited above the allochthonous Patawarta salt sheet display thickness trends and stratal pinchouts that define the timing and location of initial suprasalt minibasin subsidence, salt inflation and cessation of diapir-related accommodation change. Patawarta suprasalt minibasin thickness and facies trends of the Wonoka Fm., Patsy Hill Member, and Bonney Sandstone were compared to distally obtained regional thicknesses stated in the literature. The Wonoka,outer shelf, silty turbiditic limestone facies on the distal margin of the suprasalt minibasin is 693 m thick, which is consistent with the regional 600m average thickness. The Wonoka thickens significantly from the distal margin into a suprasalt depositional syncline (1638 m). The Wonoka thins drastically to 1 m and displays a series of onlap stratal terminations onto the diapiric high of the proximal margin/syncline limb of the suprasalt minibasin. The overlying Patsy Hill peritidal dolomite and arkosic sandstone facies corresponds in trend to the Wonoka, with a distal margin thickness of 152m, which is consistent with the regional average thickness of 100m. The Patsy Hill thickens to 217m into the depositional syncline and thins by stratal onlap of the lower Patsy Hill to 20 m onto the proximal margin diapiric high. The overlying Bonney Sandstone, shoreface, siliciclastic facies however, retain a uniform 460m thickness across the suprasalt syncline, consistent with the regional 400m average thickness of the Bonney. Thickness and onlap trends of the suprasalt minibasin suggest subsidence initiated and was greatest during deposition of the Wonoka turbidite succession. Syncline axis strata are nearly 2.4 times the regional thickness and turbidite sheet sands strongly onlap syncline limbs, especially onto the proximal salt-inflated limb. We infer that subsidence rate progressively decreased during deposition of the Patsy Hill because syncline axis strata are only 1.4 times as thick and onlapping stratal terminations are rare. Bonney Sandstone displays isopachous thickness indicative of the halting of the mini-basin subsidence and corresponding salt diapir rise. We conclude from these relationships that differential loading and high sedimentation rates of the Wonoka turbidite succession initiated subsidence on top of the Patawarta salt sheet. However, the transition to the slower depositional rates of the Patsy Hill tidal carbonates substantially decreased the differential load driver of minibasin subsidence, which ceased prior to deposition of the Bonney sandstone.

“The Impacts of Hydraulic Fracturing: Hands-On Activities for Undergraduate Students”
Department of Geography, College of Geosciences
By: Collin Kohlmeyer

According to the US Energy Information Administration, over 50% of the oil and natural gas produced in the US came from hydraulically fractured wells in 2015. While the economic and geopolitical benefits of this new industry are numerous, hydraulic fracturing (fracking) is still controversial because of its negative impacts on the environment such as ground and surface water contamination, air pollution, and increases in seismic activity near deep injection wells. Yet, it is only briefly mentioned in mainstream Geography textbooks and rarely taught in introductory Geography courses at TAMU. To address the current educational gap on fracking, I am developing and implementing educational materials and associated activities that utilize several geographic learning methods. These activities include a graphing exercise where students analyze the relationship between earthquakes and injection wells, a debate activity where students research and present information on either the pros or cons of hydraulic fracturing, and an introductory fracking lecture to provide students with an overview of what fracking is and the effects it has on the environment, local policy, and economics. In 2016 and 2017, this fracking module was successfully implemented in GEOG 203, one of the top two core curriculum courses at TAMU related to environmental literacy. I intend to disseminate the fracking module with an open-access publisher, making our documents freely available to all. Likewise, the hands-on exercises will soon be freely available through the National Association of Geoscience Teachers (NAGT) website.

“Idealized Simulations of Supercells in Environments with Varying LCLs”
Department of Meteorology, College of Geosciences
By: Trenton Wade Spencer

Motivated by studies that have suggested that the height of the Lifted Condensation Level (LCL) can affect tornadogenesis and cold pool intensities in supercell thunderstorms, this study uses idealized simulations to investigate the influence of LCL heights on supercells. Three separate horizontally homogeneous environments were created with similar thermodynamic and wind profiles with differing LCL heights. Simulation results are analyzed and discussed, particularly as they relate to low-level rotation.

“Rethinking Tropical Cyclone Classification”
Department of Meteorology, College of Geosciences
By: Ethan Williams

The current process of classifying tropical cyclones known as the Saffir-Simpson scale uses only maximum wind speed to categorize their strength and therefore estimate their damage potential. With multiple variables other than wind speed contributing to the overall energy of a storm, the classification process for tropical cyclones is reconsidered in this project. Misconceptions of the possible strength of current category 1-3 storms have been life-threatening to coastal cities in the past. Physical characteristics of tropical cyclones like storm size and surge will be investigated and contrasted against their given classification. New ways of quantifying the “total energy” of a storm will be worked through in order to develop a new measurement technique or index that better represents the threat level of any tropical cyclone. The differing size and amount of energy associated with the same categorized storms is worrisome and this project aims to suggest alternate ways of classifying tropical cyclones.

“Evaluating Burn Severity within Prescribed Burn Units in the
Central Appalachian Mountains of western Virginia”
Department of Geographic Information Science and Technology, College of Geosciences
By: Jose Silva

Forest burn severity assessments are important for forest fire management and providing insight into broad scale fire ecology questions. Also, evaluating topographic variables’ influence on fire patterns are important for describing patterns of fire regime and vegetation response. This undergraduate research analysis evaluates burn severity within prescribed burn units and areas of wildfire in the central Appalachian Mountains of western Virginia. Variations in burn severity were determined from changes in the normalized difference vegetation index (NDVI) derived from remotely sensed Landsat images. Topographic variables including elevation, slope, aspect, curvature, topographic wetness index (TWI), and heat load index (HLI) were derived for the areas of interest from digital elevation models (DEMs) from the U.S. Geological Survey. Regression analysis was used to determine which combinations of DEM-derived terrain variables best predict change in NDVI. Results generally show that northern aspects combined with steeper slopes, produced more severe forest fires. Results also showed a relationship between larger fires and steeper slopes and higher elevations. Lastly, the research will highlight the undergraduate student's involvement with a graduate student's field research which served as a foundation and framework for this current project. The field research included quantifying variations in chestnut sprout size, abundance, and health and relating these variations to topographic variables including elevation, slope, aspect, topographic exposure, canopy closure.

"Spatial Analysis and Subsurface Visualization for Non-Invasive Identification of Unmarked Graves in Historic Camptown Cemetery in Brenham, Texas"

Department of Geographic Information Science & Technology, College of Geosciences
By: Jacqueline Clay, Hailey Duncan, Laura Everett, Daniel Huseman, & Hai Nguyen

The Camptown Cemetery in Brenham, Texas was an active African American cemetery in the late 1800s that became neglected and overgrown. Over the past several years, a local movement began to restore the cemetery and preserve the valuable history within it. To contribute to this, the Texas A&M Geography Society has conducted a land survey of the cemetery to produce a map of the features within. The group of over twenty-five undergraduate students collected over 450 points using a Topcon Total Station and traditional surveying techniques. Esri's ArcMap is being used to create a map to visually represent this spatial data, which consists of features such as fences, gravestones, and family plots. Using elevation data also recorded with the Topcon Total Station, the group is creating a digital elevation model to highlight areas of subsidence in the cemetery's topography indicating unmarked graves. Layering the elevation data with subsurface Ground Penetrating Radar data collected by a group of Texas A&M geophysics students will allow the analysis of potential sites of unmarked graves by comparing subsurface anomalies to points of low elevation, or subsidence, on the surface. While definitive non-invasive identification of these 150 year old unmarked graves is challenging, the results are important to descendants and provides a further understanding of the cemetery's history. These maps will be paired with a human geographic analysis on the cemetery's role within the community. The resulting visual representation, analysis, and maps of the cemetery's features will be given to the Brenham community and could be used for historic preservation purposes.

"Climatic Factors in the Tree Ring Growth Pattern of Betula utilis in Western Nepal"

Department of Geology, College of Geosciences
By: Daniel Hou

Many studies have documented a strong acceleration of tree growth in recent years in sub-alpine forests due to changes in climate. To investigate how tree-ring growth of Betula utilis (birch) is responding to a warming trend, we collected 40 cores from 20 trees in the Dhorpatan Hunting Reserve treeline ecotone in western Nepal, at an elevation of 3750 - 3900 meters. After sanding these cores with various sandpaper grits, ring widths were measured using the Velmex measuring system. Then, crossdating-related errors were addressed by using COFECHA software, and visual crossdating of induvial ring chronology was generated from a dplR package (Dendrochronology Program Library in R). Bad cores were removed from further analysis, and 18 cores were used for generating our chronology. Finally, the ARSTAN program was used to remove non-climatic signals. A 68-year (1948-2015) chronology was developed, in which we did

not observe any significant increase in growth trend in last few decades. In fact, the chronology fluctuated with time, showing narrow ring widths in 1968, 1989, 1999, and 2011, and wide ring width in 1960, 1994 and 2007. Further analysis revealed that January temperatures have a strong positive correlation with ring width index, but that other temperature and precipitation related variables have no significant correlation with ring width index.

"Early Holocene calcareous nannofossil assemblages from the New Zealand region as indicators of past surface-water temperature and nutrient conditions"

Daniel Morelos, Denise K. Kulhanek, Joe G. Prebble, Helen Bostock, and Giuseppe Cortese

Temperatures in the New Zealand region appear to have been up to 3Âº C warmer during the early Holocene (~12,000-6,000 years ago) than today, which is in the range of predicted temperatures for the coming century making it a good analog for future warming. In this study we use calcareous nannofossil assemblages to infer changes in sea-surface temperature and nutrient conditions in the early Holocene of the Southwest Pacific. We collected 15 sediment samples from piston core TAN1106-15, retrieved from off of the southwest coast of the South Island, New Zealand in a water depth of 2544 m. Today this location is within the southern part of the Subtropical Front. The samples are radiocarbon dated to between ~12300 and 5600 cal years BP. We also collected a single core top sample to use as a reference for modern conditions. We prepared the samples for analysis using the drop method. Using a Zeiss .A1 Axioskop transmitted light microscope, we counted a minimum of 300 nannofossils per sample to document the assemblage and to calculate the total number of coccoliths/g of sediment, which we use as a proxy for nannoplankton productivity. Initial results show that the assemblage includes Gephyrocapsa mullerae, Gephyrocapsa oceanica, Calcidiscus leptoporus, Emiliania huxleyi, Calcidiscus quadriperforatus, Helicosphaera carteri, and Coccolithus pelagicus. We will use changes in the assemblage to make inferences about changes in sea-surface temperature and nutrient conditions at this location during the early Holocene, which reflect changes in the position of the Subtropical Front.

"Stable Isotope Composition of Precipitation from 2015-2016 Central Texas Rainfall Events"

Department of Environmental Geosciences, Department of Geosciences
By: Celia Lorraine McChesney

The Southern Great Plains is a critical area of study due to its climatic diversity and resulting socio-economic importance. Little is known about the paleoclimate of the region, particularly hydrologic changes. Paleoclimate proxies, such as speleothems from central Texas caves, record rainfall oxygen isotope ratios (d18O). It is therefore important to know through what meteorological conditions the present day precipitation obtains its oxygen isotopic signature. Linking oxygen isotopic composition within such proxies to changes in meteorological conditions therefore allows historical events like drought and pluvial occurrences, as well as future rainfall changes, to be placed within the context of global past and future climate variability. Here I propose to analyze oxygen isotopic composition from daily precipitation samples collected from Austin, Texas, from 2015 to present, and assess potential controls such as storm type, temperature, and precipitation amount. My project will contribute to improving interpretation accuracy of oxygen isotope paleoclimate records from the Central Texas and southern Great Plains region.

“Reconstructing Early Holocene sea-surface temperature and nutrient conditions off South Island, New Zealand using calcareous nannofossil assemblages”
Department of Geology, College of Geosciences
By: Nathan Taylor Lakin

The early Holocene (12 “6 ka) is a target for paleoclimate research, as it was a time when sea-surface temperatures (SSTs) were >1Âº C warmer even though atmospheric CO2 concentrations were less than today. This study uses early Holocene calcareous nannofossil assemblages to infer past SST and nutrient conditions in the Southwest Pacific. We obtained 13 samples from piston core TAN1106-43 collected off the South Island of New Zealand in 3670 m of water. Today this location is under the southern part of the Subtropical Front. We prepared samples using the drop method and collected calcareous nannofossil assemblage data by identifying a minimum of 300 nannofossil specimens per sample using a transmitted light microscope. We also calculated the total number of coccoliths/g of sediment to use as a proxy for nannoplankton productivity. The assemblages primarily consist of Calcidiscus leptoporus, Gephyrocapsa oceanica, Gephyrocapsa muellerae, Emiliania huxleyi, Gephyrocapsa spp. < 3 Âµm, and Helicosphaera carteri. We use variations in the assemblages to make inferences about how SST and nutrient conditions changed with shifts in the location of the Subtropical Front during the early Holocene. This study is part of a larger project using different proxies from a latitudinal transect of piston cores spanning from north of the Subtropical Front to south of the Polar Front to understand how the ocean frontal systems changed around New Zealand when temperatures were warmer. This study will contribute information about past oceanographic conditions to help better predict how rising ocean temperatures will affect the New Zealand region.

“Calibration of O-H Bands in the Infrared Spectra of Synthetic and Milky Quartz Crystals”
Department of Geophysics, College of Geosciences
By: Shannon Castro

Hydrothermally grown synthetic quartz crystals incorporate large concentrations of molecular water defects when growth rates are rapid. As-grown synthetic quartz crystals are clear and colorless, with H2O inclusions that do not freeze, even at very low temperatures (77 K). However, annealed synthetic quartz crystals, heated above 750oC, appear milky with water inclusions that form by processes of H2O clustering. Fluid inclusions of heat-treated synthetic quartz freeze at low temperatures, much as do liquid H2O inclusions in natural milky quartz. Infrared absorption bands due to O-H stretching in untreated synthetic quartz differ in size and character from the broad O-H stretching absorption band characteristic of liquid water, and recent studies suggest differing O-H absorption coefficients for nonfreezable molecular water and for liquid water. Using Fourier transform infrared spectroscopy, absorption spectra were collected before and after annealing (900oC) wet synthetic quartz crystals, and compared to the O-H absorption spectrum of water. Using a modified liquid cell with ZnSe windows, absorption spectra of thin (1.48 ?m) layers of liquid water were measured, determining peak and integrated absorbances and calibrating these to O-H absorbers. Water film thickness was determined from interference fringes due to internal reflections, using t=1/2N?? equation and thus allowing for a less obscured water spectra, where NN is the refractive index, t is thickness, and ??is the fringe spacing. Our calibration for peak O-H absorbance agrees with the calibration of Thompson, et.al. (1965) to within 2.8%. In addition, we determined a calibration for the integrated O-H stretching absorbance of liquid water, 697.015 cm-2, over limits of 3762.53 cm-1 and 2854.88 cm-1. Our calibration of integrated absorbance for liquid water differs from the calibration for nonfreezable forms of water in synthetic quartz reported by Aines and Rossman (1984). We also find that peak absorbances shift to lower wavenumbers and integrated absorbance changes as synthetic crystals with nonfreezable water are heat treated in sequential annealing experiments, and fluid inclusions become freezable. Our results are significant for water weakening of quartz, as the mechanical properties of quartz depend on the concentrations and forms of water incorporated during crystal growth. In turn, the strength of quartz impacts and determines the mechanical strength of the Earth's crust and tectonics of continental lithosphere.

"Extreme Precipitation Events Along the Eastern Seaboard"

Department of Meteorology, College of Geosciences
By: Christian Kyle Landry & Chelsea Schwartz

The purpose of this project to find overall trends of extreme precipitation events along the eastern seaboard region of the US and Texas. This project utilizes a modified code to find climatological data for a given state. The region for this project was chosen to see the effects of increasing precipitation in a region of natural air damming and sea-breezes in contrast to planar areas further south. When determining the causality of these events, the data was evaluated by using various tests such as Mann-Whitney and Percent Change of Odds.

"Carbonate Clinoform Architectural Variability and the Role of Diagenesis in Porosity and Fractures"

Department of Geology, College of Geosciences
By: Josh Woosley, David Splawn, & Ivanakbar Purwamaska

Exploring the seismic scale mixed siliciclastic-carbonate clinoforms of Last Chance Canyon at the North West edge of the Delaware Basin in New Mexico to determine to what degree do the external controls of eustasy, tectonics, sediment supply, climate and ocean currents influence facies distribution, depositional geometries and depositional rates in carbonate clinoform systems. In addition to that, we are exploring the link between diagenesis and and its role in porosity and fractures of carbonate systems and the overarching effects of dolomitization. Through the 2D quantification of depositional geometry and facies distribution, the digitization of clinoform data and the creation of a photomosaic gigapan image we will develop a better understanding of ramp architecture and regional geometry. By integrating field data obtained from hand samples, thin sections, geologic measured sections and gamma ray profiles we will explore the link between diagenesis and porosity and create a model that can be applied to other carbonate clinoform systems throughout the permian basin.

“The effects of volcanic ash on dissolved Neodymium as a water mass tracer”
Department of Wildlife and Fisheries Sciences, College of Agriculture and Life Science
By: Alyssa Nycolle Schultz

"Dissolved Neodymium (Nd) in the ocean is often used as a water mass tracer to estimate what the oceanic circulation in a certain area may have looked like in the past (van de Flierdt et al. 2012). The incorporated Nd in fish teeth generally keeps a sound record of deep seawater (Martin and Scher 2003). However, continental input may alter or add to the dissolved Nd, which further leads to Nd isotopic compositions that reflect sediment input and not ocean circulation (van de Flierdt et al. 2012). More specifically, dispersed volcanic ash in the ocean affects the isotopic composition of pore water and the pore water Nd is incorporated into fish teeth (van de Flierdt et al. 2012). It is important to understand how dispersed volcanic ash affects dissolved Nd in order to have a clearer, more accurate picture of past oceanic circulation. We are going to compare the Nd isotopic composition with the isotopic composition across three leached sediment phases of the same site to establish an understanding of how volcanic ash input affects the Nd in fish teeth, as well as the Nd isotopic composition in the North Pacific over time.

My research will focus on sediment dating back to the Cretaceous period (125-180 Ma). It will be completed using samples collected from Ocean Drilling Program (ODP) Site 1149 in the North Pacific.

“Calcareous nannofossils as early Holocene paleoclimate indicators in the southwest Pacific Ocean: Results from a piston core from the north of New Zealand”
Department of Geology, College of Geosciences
By: Laura Davila

The early Holocene (~12“6 ka) in the New Zealand region was an interval when sea-surface temperatures (SSTs) were up to 3Âº C warmer but CO2 concentrations were lower than today. This offers an opportunity to use records from that time as an analog for future warming. Here we present results from 16 Holocene samples from piston core H214, collected from the Bay of Plenty, New Zealand (36.93ºS, 177.44ºE) in 2405 m of water. We imaged and identified ~a minimum of 300 calcareous nannofossil specimens per sample using a focused ion beam scanning electron microscope to determine the species composition and to calculate the total number of coccoliths/g of sediment. Initial results indicate that nannofossils are common and moderately preserved at this site. The assemblage includes Gephyrocapsa spp., Emiliania huxleyi, Calcidiscus leptoporus, Coccolithus pelagicus, and some reworked taxa. We use variations in this assemblage as a proxy for SST and nutrient availability. Preliminary results suggest variations in the abundance of Calcidiscus leptoporus and Calcidiscus quadriperforatus may be useful for tracking cool and warm sea-surface temperatures, respectively. Additionally, variations in the abundance Gephyrocapsa oceanica (warm) and Gephyrocapsa muellerae (cold) are also significant. Results from this piston core will be combined with data from other piston cores in a latitudinal transect from north of New Zealand to south of the Polar Front to understand how oceanographic conditions changed during the early Holocene.

“Early to early late Miocene carbonate production and burial in the western equatorial Pacific”
Department of Geology, College of Geosciences
By: David Valerio

International Ocean Discovery Program (IODP) Expedition 363 sought to determine the nature of and driving forces behind climate variability in the Western Pacific Warm Pool (WPWP) region throughout the Neogene on millennial, orbital, and geologic timescales. Our research focuses on studying the sediment record from Site U1490 to examine changes in carbonate production and burial in the WPWP as a record of variations in the regional/global carbon cycle from the early to early late Miocene. Site U1490 is located on the northern edge of Eauripik Rise at 05Â°58.95â€™N, 142Â°39.27â€™E in 2341 m water depth, in the northern part of the WPWP. We will use X-ray fluorescence (XRF) core scanning to measure the bulk chemistry of the sediment. We will also measure the weight percent calcium carbonate and total organic carbon of discrete samples to calibrate the XRF data to generate high-resolution carbonate and organic carbon records. Initial shipboard results show an average calcium carbonate content of ~87 wt% throughout the site, with the most significant variations in the lower to middle Miocene, with content ranging from ~20 to 85 wt%. Total organic carbon content is relatively consistent at ~0.3 wt% throughout the record. Our research will allow for comparison between records obtained from these cores located in the western equatorial Pacific to those obtained in the eastern and central Pacific, which will better elucidate the nature of the carbon system during that time frame.

“Radiocarbon Dating and Bulk Analysis for Bamboo Coral”
Department of Environmental Geoscience, College of Geosciences
By: Sara Ann Mendiola

In this research project deep-sea bamboo coral collected off the southeastern coast of the United States will undergo isotopic ratio analysis to compose information about the age and growth rate of the coral from the endoskeleton (Roark et al., 2005; Schiff et al., 2014; Owen A Sherwood, Thresher, Fallon, Davies, & Trull, 2009). This particular species of coral is a part of the family Isididae and are an important medium for understanding deep-water variability and past oceanic conditions considering that protein is synthesized from particular organic matter from surface waters (Schiff et al., 2014). Isotopic analysis will measure the d15N and d13 C ratios found within the corals proteinaceous gorgonin nodes. The information gathered in this study can potentially be used as a proxy for seawater temperature at a high resolution over time and provide valuable biogeochemical insight.

"Mapping and Spatial Pattern Analysis of Alpine Treeline in Northeast Nepal"
Department of Geographic Information Systems Technology, College of Geosciences
By: Min-Hung Chou

Alpine treeline represents as the high altitudinal limit of tree growth. Natural treelines are climate sensitive, and studies have documented higher altitudinal shift of treelines in some regions as temperature increases due to climate change. However, many regions with insufficient studies still need more data for accurate confirmations. Some areas, such as Nepal Himalaya, are inaccessible. With public accessible high-resolution satellite imageries, data acquisition was instead collected by utilizing Geographic Information System tools. The study focuses on Nurak Khola, a stream valley that locates in the Kangchenjunga Conservation Area, northeast Nepal. Results can contribute towards future treeline monitoring in response to climate change, track the rate of migration, and identify potential affected area in advance.

"The Effects of Saltwater Intrusion on Coastal Aquifers and Vegetation Dynamics at Padre Island National Seashore, TX"
Department of Environmental Geoscience, College of Geosciences
By: Laura Patricia Gloria

Since vegetation dynamics play an important role in dune development, it is important to understand how vegetation patterns can be affected by saltwater intrusion due to sea level rise. Freshwater stored in coastal aquifers are more susceptible to saltwater contamination because of their proximity to the coast. This increased likelihood of saltwater intrusion can cause vegetation to wither, decrease vegetation density, and decrease species richness. The resulting reduced vegetation cover causes dunes to become more active. The purpose of this research is to determine where the saltwater-freshwater boundary is along Padre Island National Seashore, Texas in order to evaluate the effects of saltwater intrusion in context of projected sea level rise along the Texas coast. The hydrogeology of Padre Island National Seashore remains unclear due to the lack of water logs on the island. Subsurface profiles of the beach where generated using GPR. Locations in the GPR profile that indicated noteworthy features were selected for further investigation. A vertical profile of the water table from the vegetation line to the foreshore was generated from the selected locations to confirm the presence of water and to provide information about the current groundwater dynamics. Vegetation species abundance and groundwater salinity were measured to explore the extent saltwater intrusion would affect the surrounding vegetation. It is important to know the maximum salt concentration a plant can take to reduce the risk of them being susceptible to a hypertonic relationship to the water. Areas with sparse information were substituted with data from Assateague Island National Seashore due to similarities in the environment and geologic framework at the two areas. Determining the saltwater-freshwater boundary is vital to identifying the effects of changing hydrogeology on vegetation dynamics.

"Calcareous nannoplankton assemblages across the Pliocene-Pleistocene transition in the southwestern Indian Ocean, IODP Site U1475"

Department of Geology, College of Geosciences
By: Zoé Cares, Clinton Layne Far, Leah J. LeVay, Luna Brentegani, Deborah Tangunan, and the Expedition 361 Scientists

The Indian-Atlantic ocean gateway contains a pronounced oceanic frontal system, the position of which has the potential to influence global climate on millennial scales. Owing to the physical differences between the frontal zones, this region has complex biogeochemistry, changes in phytoplankton distribution, and variations in primary productivity. Latitudinal shifts in the frontal zones have been associated with glacial intervals and it has been suggested that northward shifts of these frontal zones have led to intensified Northern Hemisphere glaciation (Bard and Rickaby, 2009). One of the scientific objectives of International Ocean Discovery Program (IODP) Expedition 361 was to determine the dynamics of the Indian-Atlantic ocean gateway circulation during Pliocene-Pleistocene climate changes in association with changing wind fields and migrating ocean fronts (Hall et al., 2017).

Site U1475 was cored on the Agulhas Plateau in the southwestern Indian Ocean, situated in the Indian-Atlantic Ocean gateway. A complete sequence of calcareous ooze spanning the last ~7 Ma was recovered (Hall et al., 2017). Previous studies at this locality have shown latitudinal migrations of the frontal zones over the past ~350 kyr. These frontal migrations resulted in prominent millennial shifts in primary production, biological pump efficiency, and microfossil assemblages that coincide with Antarctic climate variability (Ziegler et al., 2013; Romero et al., 2015). The record at Site U1475 covers the Pliocene-Pleistocene transition, which marks the change from the warmer Pliocene to a cooler Pleistocene climate and the onset of major Northern Hemisphere glaciation at ~2.7 Ma.

Here we present initial results comprised of calcareous nannoplankton assemblages to test if similar latitudinal frontal migrations occurred during the Pliocene-Pleistocene transition. Variations in nannoplankton assemblages are used to identify changes in primary productivity and sea surface temperatures, which could be related to frontal boundary migration.

"Quantification of Whitecap Foam Decay"

Department of Geology, College of Geosciences
By: Elizabeth Jimenez

Quantification of whitecap foam decay period by image processing using the program ImageJ in order to distinguish between whitecap foam and background noise. There is a total of 7 different types of waves previously created and recorded 60 frames per second with infrared cameras. Quantification of foam decay allows us to relate foam decay and its effects to global warming.

“Assessing Barrier Island Resiliency through Multi-Scale Topographic Anisotropy Distribution Patterns”

Department of Geographic Information Science and Technology, College of Geosciences
By: Jacob Davis Lehner

The resiliency of a barrier island, its ability to return to form and ecological function after storms, is of key scientific importance with further climate change and sea level rise. Response depends on relative height of the storm surge and the dunes, both heavily influenced by anthropogenic activities. Barrier island morphology and the anisotropic nature of barrier islands highlights the complexities of topographic evolution. Understanding this evolution is critical for assessing how barrier islands respond and recover through time. The purpose of this research is to assess the scale-dependent distribution patterns of topographic anisotropy to characterize changes in process regime influences (i.e., wind dominated, wave dominated, current dominated) and barrier island resiliency. The method presented is an evaluation of the scale-dependence of topographic relief and symmetry for multi-temporal LiDAR-derived DEMs of Padre Island National Seashore. We do not assume topographic symmetry in computing directional-dependence of the minimum relief. We generate false-color composite images of anisotropy parameters to examine scale-dependent relief, terrain orientation and symmetry patterns for multiple years. Results demonstrate that beaches, washover channels, foredunes, and back-barrier regions exhibit unique distribution patterns of terrain orientation and symmetry. Multi-temporal patterns of anisotropy parameters reveal variations in the spatial and temporal complexity of barrier island evolution. Consequently, it is possible to identify and map barrier island locations that are stable, recovering, or failing to recover. Objective spatial delineation of these areas can potentially be used to assess the polygenetic evolution of barrier island topography, thereby providing scientists with a better understanding of how coastal process regimes influence barrier island resiliency.

“Comparing Accuracy of Household Lightning Detectors against the HLMA (Houston Lightning Mapping Array)”

Department of Meteorology, College of Geosciences
By: Tyler Mitchell Fenske, Brittany Toy, Drew Koeritzer, David Grabbs, Chelsea Schwartz

The average consumer relies on easy-to-use safety devices in order to stay updated on dangerous situations that can arise quickly, such as weather phenomena. Lightning detectors are just one of these devices, and are used to alert people of nearby lightning. Lightning detectors have varying degrees of sophistication, with differences in detection ranges and accuracy, among other aspects. For this study, we are testing the accuracy of four household detectors. To complete this testing, we document the number of strikes that each detector records within each range category for a particular event over a period of time. We select events based upon their likelihood to produce lightning and its proximity to our location. We then compare this data to an established and precise regional lightning-detection network. This network is known as the Lightning Mapping Array (LMA), and is operated by the Department of Atmospheric Sciences at Texas A&M University. The number of lightning strikes per range category detected by each source will be compared to test the accuracy of the household lightning detectors. Results from this study, explaining how each detector's accuracy held up compared to the LMA, will be shown.

“Abrupt Climate Change in the Southern Great Plains during the Last Glacial Interval”
Department of Geology, College of Geosciences
By: Audrey Housson

Understanding how the climate of the North American Great Plains may change in the future is of tremendous socioeconomic importance, yet the regional response to previous abrupt global climate events, such as the Dansgaard-Oeschger (DO) cycles of the last glacial interval, are poorly known. Here we present two absolutely dated (U/Th), partially replicated oxygen isotope (d18O) records from calcite speleothems in central Texas (30’° N, 98’° W) that grew during marine isotope stage 3 (MIS 3) (31 to 49 ky BP). The study site experiences boreal spring and fall maxima in precipitation with rainfall moisture sourced almost exclusively from the Gulf of Mexico. The two samples exhibit reproducible d18O means and variability during overlapping growth intervals. Weak correlations between paired oxygen and carbon isotopic values coupled with reproducible d18O strongly suggest that dripwater d18O and calcite formation temperatures are the primary drivers of speleothem d18O variations through time. We interpret more depleted (enriched) d18O values to reconstruct warmer and wetter (cooler and drier) conditions based on observations of modern rainfall stable isotope variations at the study site. We find that warmer and wetter conditions in the Southern Plains are contemporaneous with MIS 3 DO interstadials, while cooler and more arid conditions prevail during stadials and Heinrich Events 4 and 5. Our results show a response opposite that of hydrologic reconstructions from the American Southwest, where wetter conditions occur with stadial conditions. Future work includes exploration of paleoclimate model results to examine potential mechanisms responsible for this opposite phasing. Our speleothem data indicate that further intensification of rainy seasons in the Southern Plains should not be ruled out as a response to anthropogenic global warming.

“Stratigraphic Correlation of the Late Pennsylvanian-Early
Permian Strata in the Delaware Basin”
Department of Geology, College of Geosciences
By: Kikelomo Komolafe & Kaela Demmerle

The stratigraphic interval from the Late Pennsylvanian Wolfcamp Formation to the Early Permian Bone Spring and Avalon formations are composed of interbedded shale, carbonate, and sandstone (Harris, 2000). The main focus of this project is to determine where the shale occurs within these units. Each group member has been given a specific county to determine where the shale occurs within these units; the two counties of interest are Loving and Winkler. The shale in these units are difficult to identify and can only be located by analyzing subsurface well logs. Thus, lithology and gamma-ray well logs from the Delaware Basin were analyzed with Techlog. Once these units were determined in each county, the shale layers were correlated from one county into the other. The data collected can be used to determine the optimal place to drill for oil/gas from these units.

"Analysis of western United States fire regime during the Holocene"

Department of Geographic Information and System Technology, College of Geosciences
By: Katherine Elizabeth Beall

The western United States frequently experiences wildfires, which has important consequences on our societies and the natural environment. To understand the key controls on fire frequency, severity, and intensity, charcoal data that span the Holocene are available for analysis of past fire-climate relationships. However, most analyses view the western United States as a whole "fire unit" despite clear climatic differences between the NW and the SW. By dividing the western United States into the Northwest (NW), the Southwest (SW), and a narrow buffer region between those two regions, I analyzed charcoal data from the Global Charcoal Database. Every site was checked for proper resolution (at least 1 chronological control per 1,000 years) and duration (at least 10,000 years old record). Once the sites were selected (total = 36), I used the R paleofire package to create Box-Cox, MinMax, and Z-Score diagnostics for every site to standardize the charcoal records, as well as to compare and combine them. Preliminary analysis of the composite curves shows that: (1) the NW is characterized by a steep upward curve, suggesting that the region has experienced an increase in fires over the past 15,000 years, which could be associated with warmer/drier conditions and/or plant communities that burn at higher frequencies, (2) the SW has a relatively flat curve, suggesting that the region has experienced a stable occurrence of fires throughout the Holocene, and (3) the buffer region shows a great degree of variability in trends. Due to the limited number of sites in the SW, additional sites would be useful for further study. Plotting individual Z-Scores in one chart would also be beneficial to verify that the apparent trends are representative of the regions and the West as a whole and that individual sites are not skewing the results.

"Eighteen Hundred and Froze to Death: Climate Response to the Tambora Eruption"

Department of Geophysics, College of Geosciences
By: Cassandra Vallecilla

An ocean atmosphere data record spanning the years from 1815-2013 is used to explore the climate response to the Tambora eruption that occurred in April 1815. The data record is composed of two loosely-coupled reanalysis products: the 20CR (20thCentury Reanalysis) system for the atmosphere and the SODAsi (Simple Ocean Data Assimilation's sparse input) system for the ocean. Although not directly coupled, the two reanalysis systems are coupled iteratively by exchanging surface boundary conditions. This system is significant because although there are few oceanic observations for period following the Tambora eruption, there are surface pressure observations that are used by the atmosphere reanalysis. Thus information from atmosphere gets into the ocean reanalysis.

The results show a robust response in both the atmosphere and the ocean in the year following the eruption. A region of anomalous low pressure is forced in the North Pacific that is connected to an anomalous SST (Sea Surface Temperature) cooling that reaches -3 degrees Celsius. Although weaker, there is also a response in the North Atlantic. Heat fluxes show a complex pattern of response, and show that ocean dynamics are required to explain the SST anomalies.

International Affairs; Public Service & Administration; Accounting; Finance; Information and Operations Management; Management; Marketing; Business Administration; Business

“Preconception Care Among Young Adults”

Department of General Studies, Transition Academic Programs
By: Ariel Tynesha Cene Wyatt

Due to the high risk of health disparities in the African-American community, there is a growing interest in studying preconception care among young adults at HBCUs. The lack of preconception care is a growing problem among black youth due to miseducation and lack of resources. In this study, we are seeking to understand some of the perceptions of preconception care and what this means in an ethnically diverse community. We are conducting this study through qualitative research using personal interviews. We will then take the data collected at HBCUs and compare it to the perspectives of students at PWIs.

Anthropology; Communication; Economics; English; Hispanic Studies; History; International Studies; Performance Studies; Political Science; Psychology; Sociology

"Resting Behavior Duration in the Mantled Howler Monkey (Allouata palliata) in Response to Tree Diameter at Breast Height"

Department of Anthropology, College of Liberal Arts
By: Joseph Edward Castillo

Deforestation and forest fragmentation is one of the main driving forces of Neotropical primate extinction, including that of many howler monkey species. Increased mortality and scarcity of large trees in small forest fragments is also indicative of the scarcity of howler populations in such areas; however, little research has been done on how this affects their behavioral repertoire beyond distribution. My hypothesis was that mantled howler monkeys (Allouata palliata) prefer to rest in large trees (>60 cm diameter at breast height [DBH]) for longer durations of time. A population of mantled howler monkeys located near La Suerte Biological Field Station in Costa Rica was point sampled for a total of 28 hours in one hour samples with data taken at two minute intervals over the course of 9 days in July 2016, with tree diameter at breast height (DBH) being measured if an individual rested in a single tree for at least 4 minutes. The hypothesis was supported, with results indicating that adult howler monkeys almost exclusively preferred to rest in trees with a DBH of 60 cm or greater. However, females used a broader range of resting trees than males, and tended to rest for shorter periods than males did. This holds important implications for reforestation efforts, suggesting that faster growing species of large trees may be more beneficial in helping to reintroduce howler populations into depopulated forest fragments. It can also help open the way for new research on sex differences in behavior in howler monkeys based on rest and tree density.

"Gender, Costs, and Non-Promotable Tasks: Breaking the Glass Ceiling with increased information"

Department of Economics, College of Liberal Arts
By: Adam James Williams & Ryan Mulvihill

We investigate whether introducing heterogeneous costs into a volunteer's dilemma game reduces the gender difference found in Vesterlund et al. (2016). Specifically, we ask if telling subjects they have a low or high cost for completing a non-promotable task decreases the high propensity for women to volunteer for non-promotable tasks. Our initial evidence indicates that the same gender gap in volunteering persists among high cost individuals, but there is no gap among low cost individuals. Furthermore, our results are significantly related to risk preferences but risk preferences alone cannot explain the gender difference.

“Effects of Psychopathy Manipulations on Punitive Outcomes”

Department of Psychology, College of Liberal Arts
By: Tiffany Truong

The purpose of this study is to replicate and extend on a previous investigation (Saks, Schweitzer, Aharoni, & Kiehl, 2014) about the potentially stigmatizing effects of mental health evidence in legal settings. Both the original research and the current experiment evaluated the effect of diagnostic status and expert evidence on mock jurors’ perceptions of dangerousness, criminal responsibility, and capital sentencing for a hypothetical defendant using a case vignette. Participants (n = 179) were randomly assigned to experimental conditions varying the defendant’s diagnosis (psychopathy, schizophrenia, no mental disorder) and type of expert evidence supporting the diagnosis (clinical, genetic, neurological, neurological with fMRI images). To supplement the original methodology, we included manipulation checks measuring the extent to which participants attributed psychopathic characteristics to the defendant. This provided examination of whether the diagnostic manipulations significantly differ and accomplish the intended effect of evoking heightened perceptions of psychopathy when the defendant is diagnosed with this condition. Additionally, we examined whether these perceptions of psychopathic features mediate any relationships between diagnostic conditions and legal judgments concerning the defendant. Preliminary results indicate that participants’ perceptions of the defendant as psychopathic did not significantly differ based on the manipulation of diagnostic testimony and expert evidence, as may have been previously assumed. Consistent with previous findings, however, participant perceptions of psychopathy, regardless of condition, were significantly associated with perceptions of dangerousness ($r = 0.244$, $p < .01$) and criminal responsibility ($r = 0.162$, $p < .05$), but was not significant for death verdicts ($AUC = 0.569$, $p > .05$).

“Salted Cod and its Health Effects on 17th Century English Sailors”

Department of Anthropology, College of Liberal Arts
By: Ruby Jean Velasquez, Melissa Dossett, & Holden Diserens

During the late 16th century, the rapid expansion of the fishing industry for Atlantic cod (Gadus morhua) occurred after the discovery of Newfloundland by John Cabot, an explorer sponsored by Henry VII of England. The English soon became major exporters of fish to the Iberian Peninsula as well as the New England colonies, and commonly provisioned their ships with salted cod. Although a staple naval food, little work has been done to analyze how salted cod affected the sailors’ physical health. Using historical and archaeological sources, this paper provides a brief history of the 17th century cod industry in England and investigates how the English butchered, preserved, and prepared the fish prior to its consumption. Nutritional and microbial analysis of cod, based on these findings, are used to determine how Atlantic cod influenced the health of sailors during this time.

“Self-Views and Behaviors”

Department of Psychology, College of Liberal Arts
By: Anna Beatrix Gould

Body-Focused Repetitive Behaviors (BFRBs), a group of disorders commonly classified under the Obsessive Compulsive Disorder-spectrum (OCD-spectrum), are significantly underrepresented within the psychological research community, despite the serious impairments they cause many individuals. These disorders are characterized by recurrent maladaptive behaviors directed towards one’s body, such as pulling out of one’s hair, picking and biting one’s skin, and grinding one’s teeth. Due to the limited amount of research on these disorders, little is known on the characteristics of BFRBs and their relationship to self-esteem.

Previous research suggests that higher self-esteem serves as a protective factor against significant distress and impairment from these disorders, and lower levels of body esteem, or self-esteem related to one’s appearance and body, were associated with greater hair pulling severity (Joubert, 1993; Altenburger, Tung, & Keuthen 2014). In addition, BFRBs are linked to the construct of organizational perfectionism, which has been tied to contingencies of self-esteem (Roberts, O’Connor, Aardema, & Belanger, 2015). Contingencies of self-esteem, such as appearance, academics, and virtue, are the factors that impact one’s self esteem depending on the value an individual places on that factor. For example, a person with academic contingent self-esteem highly values academics, and will have higher self-esteem when they get good grades, and lower self-esteem when they fail an exam.

Two hundred and ninety-five undergraduate students (M=18.61 years, SD=0.78) completed an online survey composed of measures related to BFRB presence and severity, personality, perfectionism, emotion regulation, emotional reactivity, narcissism, and global and contingent self-esteem. Results indicated that there were no consistent patterns across BFRBs for significant relationships between BFRB severity and contingencies of self-esteem. However, there were significant relationships across BFRBs between global self-esteem, vulnerable narcissism, emotion regulation, emotional reactivity, body dysmorphia, and disorder severity. In addition, organizational perfectionism did not have a significant relationship with severity for any BFRB other than hair pulling, but rumination, concern over mistakes, and conscientious perfectionism were consistently significant across BFRBs.

These findings suggest that despite a growing interest in employing knowledge on adaptive and maladaptive contingencies of self-esteem for treating OCD-spectrum disorders, specific contingencies are not characteristic across all individuals with BFRBs, and therefore an individual approach must be taken in clinical practice when considering the effects of contingencies on a person’s disorder severity. Also, greater attention should be paid to the role of vulnerable narcissism as well as other forms of perfectionism besides organizational in both research and treatment of these disorders. Finally, Teeth Grinding and Skin Biting may be clinically distinct from the other BFRBs, as they directly contradicted patterns observed by the other disorders in the group.

“There Will Come a Time When People Expect War: How Perceptions of War Have Influenced Beowulf Adaptations from World War II to the Iraq War”

Department of International Studies, College of Liberal Arts
By: Patrick Dolan

The goal of this presentation will be to conduct a survey of literature surrounding the Beowulf story and its many adaptations, specifically the ones relating to war and combat, for the purpose of determining how Beowulf adaptations reflect the increasingly complex nature of perceptions of and attitudes towards war throughout history. All too often, the martial aspects of Beowulf are dismissed as obvious and superficial, and scholars direct their efforts towards scouring the Beowulf story for more subtle subtext. However, the Beowulf story remains, at heart, a tale of soldiers and combat. This presentation will conduct a thorough investigation of Beowulf adaptations throughout history, from World War II to the Cold War (from both sides of the Iron Curtain) to modern adaptations that may yield insight into their creator’s feelings towards Middle Eastern conflict. As the nature of war shifts from national, conventional combat to occupation and counter insurgency, the feelings regarding war of the countries in question change, and their Beowulf adaptations reflect those changes. What are these changes, and why is Beowulf so often chosen to convey messages about war?

“STRIDE: A Diversity Training Program and its Effects on Awareness of Implicit Biases”

Department of Psychology, College of Liberal Arts
By: Katarina Nguyen

Although it may not be intentional, individuals may behave and react to others based on their own personal implicit biases. These actions can occur unnoticed on a regular basis, yet they can also create a large and sometimes negative impact on the lives of those that rely on decisions made on unconscious perceptions. In fact, even within the work environment, many job applicants experience implicit bias when recruiters must select applicants (Heilman 1995). Women tend to be seen as less competent and deserving of certain jobs than men and may even be expected to apply for and work more “feminine” jobs that do not involve leadership or managerial positions (Good and Rudman 2009; Fraser, Osborne, and Sibley 2015). Not only are women affected by this issue, but other minority groups such as non-whites fall victim to implicit biases as well within the workplace (Dovidio, Gaertner, Kawakami, and Hodson 2002). To prevent implicit biases that many are unaware are influencing their decision-making, implicit biases must become visible to those performing selections so that they may understand their personal biases and then take preventative action from letting it control their decisions without their consent. This study will explain the effects of implicit biases on minority groups and how Strategies and Tactics for Recruiting to Improve Diversity and Excellence (STRIDE), a diversity training program, may aid in making implicit biases salient during selection processes.

“Supporting Children with Diverse Needs: A Single Case Study with 3rd Grade Learners”
Department of Psychology, College of Liberal Arts
By: Brian Sejin Kim

Introduction. There are vast amounts of children diagnosed with learning disabilities in the United States. ADHD (Attention-Deficit/ Hyperactivity Disorder), one of the learning disabilities, significantly disrupts children and classmates from learning in a class setting (Fabiano & Pelham, Jr., 2003). This may result in being rejected from a learning opportunity, and poor interaction between the child and the teacher (Greene et al., 2002; Ohan et al., 2011). However, there is insufficient research on how teachers and parents can support children with ADHD. The support from teachers and parents can help children with ADHD maximize their learning in school and reach their full potentials. Objective. This study aims to examine how teachers and parents can support a third-grade boy to reach their full potentials in school. The study is unique in many aspects. First, the boy is being observed in an optional after-school program. In fact, many children with ADHD have been reported to have lesser opportunity to participate in curricular programs due to their behavioral issues (Pelham et al., 2005; Molinuevo et al., 2010). Second, the child is among one of the top learners in the program. This study will address two major research questions: 1) What challenges does the child with ADHD face in learning in the program? 2) How can teachers and parents can support children with ADHD to maximize their learning in school and help them reach their full potentials? Approach. The study is being conducted at a Chinese/ Korean After-School Program funded by a grant from the National Security Agency and directed by Dr. Li-Jen Kuo, Associate Professor at Literacy Education. A single-case study will be conducted with one student diagnosed with ADHD, and the student will be observed and provided with an appropriate intervention. Also, the student, teacher, and parent will be interviewed.

“Moving Beyond Race as Social Construct”
Department of Anthropology, College of Liberal Arts
By: Brianna Teague

There is a general consensus within the scientific community that the ideas of discrete racial categories are socially constructed. Therefore, people make the assumption that race has no biological basis. However, we should not ignore that humans have biological differences but rather take the study from “folk” racial categories that have been created for social, political, and economic reasons, to studies of human variation for historical and medical purposes. The purpose of this study is to demonstrate that human variation has a biological basis that needs to be further explored.

"Pollen Degradation During Sonicated-Assisted Filtering"
Department of Anthropology, College of Liberal Arts
By: Taylor Siskind

When a pollen sample contains debris smaller than 10 microns, the sample can be filtered through a screen. Because the screen openings can be too small, the sample must be agitated to facilitate the debris' passing through the screen. We recently developed a new method to agitate the sample by using a Branson S450 sonifier microtip; this method has been successful in ridding the sample of debris smaller than 10 microns. This research poster presents the findings of an investigation on potential pollen degradation as a result of sonication. Twelve fresh pollen types were chosen based on the unique range of morphological characteristics. This collection was sonicated for different lengths of time at various output settings. The study demonstrated that a sonifier microtip can aid in the removal of unwanted debris when used for 3 minutes at low to medium output intensities. No evidence was found suggesting that pollen colliding with other debris in the sample increased levels of degradation.

"Does a lack of biological significance repudiate the social ramifications of race?"
Department of Anthropology, College of Liberal Arts
By: Nadia Woods

Although a universal definition of race has yet to be agreed upon, it is widely accepted in the world of academia that race has no biological gravity. However, this is a fairly recent advancement, and there is still a considerable amount of variance on how to continue racial discussion after having acknowledged the lack of biological meaning. While contemporary arguments vary from avoiding racial research to implying genetic significance of race, I an analyses of the U.S. criminal justice system and its racial discrepancies make apparent that it is now more important than ever to research the implications of race.

"'Express Yourself:' Examining the Intrapersonal and Interpersonal Outcomes of Racial Identity Centrality Expression"
Department of Psychology, College of Liberal Arts
By: Dominique Smith & Katherine Sawczyn

This conceptual paper examines levels of minority racial identity centrality (RIC) and identifies how expression of RIC affects intrapersonal and interpersonal outcomes. Racial identity centrality can be defined as the extent to which an individual's race is central to their identity and the extent to which the individual believes that other groups hold negative attitudes towards their race (Sellers & Shelton, 2003). Previous literature has identified the antecedents of RIC using models presented by Cross (1971,1991) and Parham and Helms (1981, 1985, 1990). In these models, race becomes central after learning about the oppression and devaluation of your group, understanding the negative impacts of having low racial identity centrality and fully adopting the identity related to your oppressed group (Myers, Speight, Highlen, Cox, Reynolds, Adams, & Hanley, 1991). This work, however, has failed to examine the outcomes of exhibiting different levels of RIC. We hypothesize that minorities with high levels of RIC will experience more negative interpersonal treatment, especially for women vs. men. We also predict that expression of RIC will lead to more positive intrapersonal outcomes and that perceived congruency between minority RIC and expressed RIC will produce improved interpersonal outcomes. Our hypotheses stem from self - socialization theory (Heinz, 2002) and the identity centrality theory (Aquino, Freeman, Reed II, Lim, & Felps, 2009). These theories demonstrate how a person's identity influences their self-expression, and how self-expression changes with social settings. This research will provide a deeper understanding of the intrapersonal and interpersonal stress of minorities related to their RIC. It will also identify RIC expression as an important component to studying race.

"The Effect of Terrorist Attacks on the Turkish Stock Market"

Department of Economics, College of Liberal Arts
By: Brian Toney

The societal effects from terrorist attacks are well-known: the loss of life, destruction of property, and inspiration of fear. However, can these effects be seen in the markets through returns in different sectors of the economy? We examine a sample of 16 market indices in Turkey from February 2014 through December 2016 to assess market vulnerability to terrorist attacks. The severe terrorist attack in July 2015 serve as the start of the treatment period for our difference-in-difference methodology. Our findings suggest that investors in Turkish markets looking to protect against the effects from terrorism should invest in the real estate and the paper, printing, and wood sectors as opposed to the chemical and oil, telecommunication, and transportation sectors. Furthermore, during the month-long holiday of Ramadan in the treatment period, our results suggest that terrorism does not affect returns in the banking, financial, and the paper sectors; while terrorism negatively affects the returns of the real estate, industrial, transportation, telecommunications, tourism, and serving sectors. In order to minimize the omitted variable bias in the data, we introduce rainfall as an instrumental variable for the terrorism treatment period in a fixed-effect regression. This research contributes to recent literature on the adverse effect of rainfall on conflict. We find that the amount of rainfall in Turkey exogenously determines a larger, negative treatment effect on the returns in our sample of 16 indices.

"Does Science's Ethical History Matter? Group Status, Research Ethics, and Support for Science"

Department of Psychology, College of Liberal Arts
By: Emily Naveira

This study aims to expand upon research that examined the ethics of the Tuskegee experiment and how knowledge of that study affected African-American's willingness to participate in research (Shavers, Lynch, & Burmeister, 2000). The purpose of this study was to measure participant's willingness to increase or decrease contributions made to scientific research after reading a synopsis of the Tuskegee experiment or other examples of unethical experiments. Participants read a summary of one of three cases that actually took place and impacted historically disadvantaged groups (e.g., Black, Gay, or Women) or was edited to portray the unethical experiment impacting a historically advantaged group (e.g., White, Straight, or Men). Willingness to contribute to scientific research was measured via a survey that included items from prior research on the perception of experimental ethics (Korenman, Berk, Wegner, & Lew, 1998). I hypothesized that learning about unethical research would result in decreased support for science and that when majority groups were the primary victims of unethical research, support would decrease even further. There were few statistically significant interactions between group and case types on the dependent variables of interest. But, there was a statistically significant main effect of group when the ethics of the experiment were examined. The participants viewed studies as more ethical when advantaged groups were affected. There is a lack of existing literature concerning the interaction of group status and support for research in respect to ethics and this research hopes to help fill that gap.

"Letters from the "Fritz Ritz": German POWs in America during WWII"

Department of History, College of Liberal Arts
By: Daniel Joseph Welch

The personal writings of German POWs in the United States during WWII have the potential to grant a unique understanding into the often misunderstood motivations of the average German soldier. Preservation in the form of letters and diary entries as opposed to oral history is critical in this case because it removes the potential for post-war biases. Through the study of German POW letters, I have endeavored to provide depth to our understanding of life inside the average POW Camp in America during WWII. I have chosen a sample collection of letters and diaries that were written by two German POWs that were in very different stages of life but brought to similar circumstances by the fortunes of war. By examining their writings, I have been able to gain a better understanding of the daily lives of these German soldiers that were held in captivity far from home while fighting for a government that many of them did not support. The purpose of this research is also to encourage further inquiry into the variety of primary source documents written by German POWs during the war and their potential impact on our understanding of the war itself.

“The Impact of Social Norms: Solving the Spurious Correlation Dilemma”

Department of Anthropology, College of Liberal Arts
By: Katherine Daiy

In field studies documenting the behavioral impact of social norms, there often exists a “spurious correlation” dilemma with exogenous variables (Manski 1993; Young 2015). At Texas A&M University’s Memorial Student Center, a social norm mandates that individuals remove their hats upon entering the building (Bacon 2009). Previous research in this context, focusing on norm maintenance, has documented widespread compliance (Raterman et al. 2014). However, because hat removal upon entering any building is customary in Western culture (Storey 2008), behaviors observed in the MSC may not reflect the MSC’s norm. Observations of hat-removal behavior in the MSC, Evans Library and a local supermarket will measure and define the MSC hat-removal norm’s impact on behavior, thus testing for correlation. A significant difference between the rates of hat-removal at the MSC and the “control” locations would indicate that the MSC’s norm impacts behavior distinctively.

“Confirming the Priorities Factors and Processes used to Add a Sport to an NCAA Member Institution”

Department of Educational Administration and Human Resource Development, College of Education and Human Development
By: Ashley Rose

In 2014, a study was conducted to identify common process and procedures along with priority factors that are taken into consideration when a sport is added to NCAA Division I institutions across various school sizes (Milstein, 2014). From this study, the Collegiate Sports Addition Process (CSAP) model emerged. The CSAP tool identifies the critical elements of the process (i.e. Driving Forces, Justification, etc.) and priority categories (i.e. University Viability, Sport Popularity, etc.). Providing a tool that considers the whole institution and its stakeholders puts emphasis on the connectedness that must exist for a sport adoption initiative.

Taking steps to validate the model, this research is being conducted to confirm the priority factors and processes that emerged from the initial study. This model should yield consistent results when used in similar contexts and in this case, across all three NCAA divisions.

Data has been collected using Google Alerts (a Google Service that provides articles that include specified key words) to identify articles and press releases from institutions who are currently adding sports. These documents and are now being coded by three independent researchers through Atlas.ti coding software. Operational codes have been provided to assist with interrater agreement. Therefore, this research will attempt to answer the following research question:

R1: Are the factors, priorities and processes included in the CSAP model, consistent across all NCAA sports regardless of division, school size, sport, and classification?

This research will attempt to confirm the factors and processes of the CSAP model and determine if anything needs to be added or eliminated; results will be available for presentation.

“The Picture of Social Power: A Study of the Infectious Influence of Ideology and How Commodification Affects Agency in The Picture of Dorian Gray”

Department of English, College of Liberal Arts
By: Kimberly Marie Fayard

Many scholars who review Oscar Wilde’s writing regard his infamous novel The Picture of Dorian Gray with an emphasis on studies of sexuality in the Victorian era and the question of living in decadence. However, my research diverges from the study of sexuality and focuses on the struggle of power dynamics, influence, and objectification of people throughout the novel. I will focus on analyzing how power relations are constructed in society, and how a technique of commodification maintains control over people. The following thesis will examine Oscar Wilde’s The Picture of Dorian Gray as a psychological text of the ideology of social power in conjunction with recordings of historical colonial experiences, as well as philosophical and psychological studies on identity theory. After establishing the link between Wilde’s novel and the influence of ideology, my research will begin with a focus on the impact of the rhetoric techniques used by Lord Henry Wotton on Dorian Gray for the purpose of spreading and observing the effects of a particular ideology, in comparison with historical colonial rhetoric. The paper will then follow with an analysis of identity formation and an exploration of the strategy of the commodification of people in order to maintain power dynamics. Finally, the paper explores the concept of looking towards an effective process of reclaiming one’s identity formation through an analysis of Wilde’s own personal writing and in the final scene of the novel.

In exploring The Picture of Dorian Gray as a colonial text, I plan to present a differing perspective and in-depth view of social psychology, identity formation, and the construction of power dynamics and control in society, and how this analysis is reflected in the text.

“Effects of Study Abroad Participation Upon Selected Personality Measures”

Department of Psychology, College of Liberal Arts
By: Olivia King & Kayla Bull

Introduction: It is generally felt that studying abroad is a transformative experience for undergraduate students for a multitude of reasons including social skills, the ability to adapt to different surroundings, and character building. Nevertheless, some people do not take advantage of study abroad opportunities. The purpose of this study was to investigate personality characteristics of students who participated in a study abroad program in Germany during the summer of 2016. The Positive and Negative Affect Schedule (PANAS-X; Watson & Clark, 1994) measures of six negative and positive mood states, the Dark Triad (Paulus and Jones, 2011) which measures Machiavellian, Narcissism, and Psychopathy, and the Multidimensional Locus of Control Scale (Levenson, 1973) which assesses internal, powerful others, and chance locus of control orientation. Additionally, the Competitive State Anxiety Inventory (CSAI-2R; Cox, Martens, & Russell, 2003) was used to assess anxiety associated with study abroad experiences.

Method: Participants were 18 female undergraduate students who responded to a booklet concerning collegiate study abroad experiences. The booklet included the above described psychometric measures. SAS statistical analyses were employed to compare pre-trip and post-trip scale scores (correlated t-test).

Results: PANAS X findings: the participants were significantly more fatigued ($t = -2.18$, $p < .05$) and less shy ($t = 2.09$, $p = .05$). While not achieving statistical significance, the students were less attentive ($t = 1.76$, $p = .10$) and were less surprised ($t = .161$, $p = .13$). It is felt that had the number of participants been greater, these effects may have emerged as significant. All other PANAS-X subscales did not achieve statistical significance. Locus of Control results: participation in the study abroad resulted in increases in chance locus of control ($t = -2.51$, $p < .02$). The internal and powerful others orientation measures were not significant. Dark Triad findings: the Machiavellian scale ($t = 1.83$, $p < .08$) and the Psychopathy measure ($t = -1.54$, $p = .14$) approached but did not achieve statistical significance. Again, had a larger sample size been possible, these effects may have reached as significant. The Narcissism index was not significantly different. Cognitive and Somatic Anxiety Index results: there were no significant changes in somatic anxiety, cognitive anxiety, or self-confidence as a result of the study abroad experience.

Conclusion: These analyses demonstrated changes in personality characteristics resulting from participation in a study abroad program. Future research may compare study abroad experiences in Europe versus other countries. It would be interesting to study personality characteristics associated with other forms of international travel such as family experiences or internships, etc. Future studies might involve the effect of study abroad experiences upon a more thorough assessment of subjective experiences. A future increase in sample size should increase the power of the statistical analysis.

“Japanese Spiritual, Supernatural, and Folk Beliefs in Comparison to Edward Tylor’s Animism”

Department of Anthropology, College of Liberal Arts
By: Alexandra Nguyen

According to Edward Tylor, animism referred to the earliest religious states in which people connected souls and spirits with inanimate objects. In this definition, he portrays two beliefs: the belief in the human soul that survives a bodily death and the belief in other spirits, which would include deities and other worldly beings. Based on Tylor’s definition, this paper argues that Japanese societies have similar ideas, practices, and beliefs related to Tylor’s animism. Japanese folklore displays various spiritual, supernatural, and folk beliefs including the existence of ancestral and familial spirits, animal spirits, and the spirits of other beings. Tylor’s connection between spiritual belief and religion can also be seen in Japanese religion. These beliefs have become very important to Japanese history, religion, literature, and landscape. With the increase in supernatural popularity, some of these beliefs have been modernized to fit the standards of modern pop culture in Japan.

“Social Identity, Stereotypes, and Authenticity”
Department of Biology, College of Science
By: Bilaacha Boru Galgalo

Are people perceived as more authentic when they conform to stereotypes about their groups, or are they perceived as more authentic when they violate group stereotypes? Both possibilities are plausible, making this a compelling empirical question. The present study is a preliminary investigation into this question. Participants recruited online from Amazon's Mechanical Turk crowdsourcing platform were randomly assigned to evaluate a target belonging to one of three social identities (Black man, White woman, or gay White man) who either conformed to or violated common stereotypes about their respective social group. Participants indicated how authentic they thought the target was, as well as how likeable, interpersonally warm, and competent the target was. The results of this study provide initial evidence on how perceptions of authenticity relate to stereotypicality, as well as to other major dimensions of interpersonal perception.

“16th & 17th Century Sailors' Oral Health”
Department of Nutrition, College of Agriculture and Life Science
By: Meagan Bishop

Oral health in today's society is important because it is correlated to hygiene practices and dietary intake, and is indicative of one’s overall state of health. However, individuals from the past, such as sailors from the 16th and 17th centuries, did not have such knowledge. It is only now that we are filling in the large informational gaps as to how dietary and hygiene patterns affected oral health within those communities. To gain insight into factors within the sailors' lives, information over the generalized food provisions found on the ship Warwick, sailing from Plymouth, England, was analyzed along with the average dietary intakes gathered from documentation on Ayde, another ship from the same era. The oral hygiene practices, or lack thereof, that were used by the crews on these ships, combined with the overall physical properties of the foods ingested, allows for further assessment of the crew's oral health. Preliminary analysis shows that the lack of dental cleaning, paired with a diet low in vitamin D and C, and high in carbohydrates, led to increased amounts of dental carries, alveolar bone deterioration and other dental abnormalities.

“Bipedalism”
Department of Anthropology, College of Liberal Arts
By: Lauren Nicole Wilganowski

Discussing how bidpedalism is a fundamental key to evolution.

"Income, Wealth, and Charitable Giving"
Department of Economics, College of Liberal Arts
By: Elisa Wulfsberg & David Miller

Using the Panel Study of Income Dynamics, we will study the marginal propensity to give out of a dollar increase in income.   We will use the data from years 2001 to 2013 to study the relationship between giving and income within individuals over the business cycle. Using panel data will allow us to account for intangible aspects that would affect a personâ€™s propensity to give that cannot be accounted for using other methods. Charitable giving continues to grow every year and it is increasingly important for organizations and the government to be able to analyze it as best they can. We hope to produce a model that can predict individual giving out of one dollar of income.

"No Faith, No Trust: Interpersonal Treatment of Atheists in the Workplace"
Department of Psychology, College of Liberal Arts
By: Dan Nguyen

This study will investigate the mechanisms by which atheists face more negative treatment within a workplace context. Atheists face considerable prejudice in society and lag behind most other minority groups in measures of social acceptance (Franks & Scherr 2014). This is likely due to the fact that a moralizing god is widely viewed by society as a vital component of morality, which causes people to distrust and dislike those who do not believe in a higher power (Gervais, 2013). These prejudices are likely to lead to adverse workplace outcomes, such as interpersonal discrimination by coworkers and supervisors. Prior studies have shown significant differences in mean levels of likeability and trustworthiness between atheists and non atheist. We corroborate these findings and also examine their impact on subsequent, workplace outcomes of job satisfaction, job stress, and interpersonal discrimination. The findings of this study will be used in a follow-up study to identify effective identity management strategies that atheists can use to alleviate the barriers and discrimination that they experience within the workplace.

"Sedimentological Studies of an Ice Age Encampment: Examining Site-Formation Processes at the Ryan-Harley Underwater Archaeological Site (8JE1004), Florida"
Department of Anthropology, College of Liberal Arts
By: Martin Kallus & Morgan Smith

This poster presents the findings of sedimentological studies conducted on two geologic cores collected from the Ryan-Harley archaeological site (8JE1004) in 2017. Ryan-Harley is a Paleoindian (~13,000-12,000 B.P) campsite located in the Wacissa River of North Florida that was inundated during widespread sea level rise following the last Ice Age. The null hypothesis regarding Ryan-Harley is that it represents an intact archaeological deposit from a single occupation. We sought to test the alternate hypothesis that the artifacts found at the site are located within a sediment package deposited during a high-energy flood event, thus representing a palimpsest. We conducted particle size analysis following USGS standard methods on these cores to analyze the sediments that were deposited prior to, during, and immediately after the accumulation of the archaeological material. Sediment samples were collected from throughout the cores at 2 cm intervals. Each sample was weighed, pre-treated to remove organic and carbonate fractions, and wet screened through nested geological sieves. We quantified proportions of clays, silts, and sands to determine how each sample was deposited. Additionally, we observed grain morphology via light microscopy to augment the results of the particle size analysis. We also collected chemostratigraphic data with pXRF scans of both cores to quantify the geochemical make-up of each geologic layer present at Ryan-Harley. We synthesized these data to determine whether or not the archaeological material at Ryan-Harley is a natural accumulation of material resulting from post-depositional processes.

“Coming of Age: A Mental Division with the Genre”
Department of English, College of Liberal Arts
By: Meghan Collier

This research looks at the genre of coming-of-age stories, specifically the possibility of a subgenre in coming-of-age stories with the primary examples being “The Outsiders” by S.E. Hinton, and “Looking for Alaska” by John Green. The research draws upon primary sources including several books that would fit into the new subgenre as well as a traditional bildungsroman story for comparison. Secondary sources are also used, including articles over the Youth Lens and a book about the typical structure of the bildungsroman. Most coming-of-age stories follow the typical bildungsroman layout. However, when examined through a Youth Lens, a new subgenre that defies the normative expectations of traditional coming-of-age stories becomes apparent. This subgenre will have a new value in literary tradition for changing the way we write about youths and their capacity to be of age while coming of age.

“A Time Paradox: The Effects of Time on the Creation of Self-Sustaining Communities”
Department of Sociology, College of Liberal Arts
By: Jose C. Avila-Patino

Community sustainability is affected by an array of factors. A very important factor that is most often overlooked when examining sustainability is time. Time is a very familiar, yet abstract concept to measure. Subsequently, this research will attempt to identify how community sustainability is affected by the concept of time.

Through a qualitative analysis of the General Sociological Survey (GSS) Codebook, I will look into different factors related to time. Concepts such as human capital, social capital, and free time will be further explored. These are important for the understanding of sustainability because communal socialization is a natural thing among all actors of a community. By analyzing these factors, the study may show a relational cause and effect on one’s ability to have “proper” food access for sustainability. Effectively, this study will contextually define the concept of time.

It is important then that an individual’s perception of time be analyzed to study how a community or society is affected. Community then must be further examined as it is formed by like-minded individuals. The analysis of time as a socially constructed concept will be significant to address in this research, this will underline an understanding for why this research is important. Furthermore, this study will look into the major impact on one's ability versus their desire to create a sustainable community. Conclusively, this research will report statistical findings to provide reasons for why the creation of self-sustaining communities is important.

"Building an Inclusive Campus Culture through Courageous Conversations: Examining issues of well-being with undergraduate female students of color"

Department of Psychology, College of Liberal Arts
By: Jamyia Barrett

Inclusive environments provide a feeling of recognition and empowerment for most individuals. Students of color, who perceive their collegiate experiences to be marginalized, suffer distinct consequences that influence rates of retention and degree completion, compared to general targets of social exclusion (Carter-Sowell et. al., 2016). Researchers (Stephens, Fryberg, et al., 2012) find that cultural mismatch at the college level can be a distinct burden for under-represented, racial/ethnic minority students. However, with strategic social support efforts, students of color can thrive in predominately white institutional (PWI) academic environments (Watkins, Green, et. al., 2007). Over one academic year, we programmed six different topics to foster relevant and courageous conversations among undergraduate female students of color. Using both qualitative and quantitative methodologies, we evaluated how interpersonal dynamics can foster a more inclusive campus culture. We recruited female participants (n = 72), who self-identified as members of under-represented racial/ethnic groups to attend a series of semi-structured interviews and assessment cycles conducted by the investigators. After each session, participants were debriefed and thanked for their time in the study. Results suggest that the impact of chronic ostracism experiences in this collective group, compared to the majority population on a PWI campus, is significantly different. Moreover, we extend the existing research on the "chilly" climate in academia for marginalized, undergraduate students and propose a novel, evidence based intervention that may reduce perceptions of isolation by this underserved student population.

"Romantic Literature and Natural Philosophy, Science, and Medicine: Mary Shelley's Frankenstein"

Department of English, College of Liberal Arts
By: Grace Nicole Jones

The Focus: I have carried out a reading of Mary Shelley's Frankenstein, placing special emphasis on the cross currents of Romantic Literature, Natural Philosophy and Medicine exemplified in the novel's blend of Gothic terror and Promethean science. I attempt to analyze the novel in the frameworks of both literary history/criticism and the history of science and medicine.

The Purpose: Victor Frankenstein's, experimentations imitate similar scientific inquiry of the Romantic era, reflecting the rising interest in the boundaries between life and death. Though a product of the imagination, the fundamental theme of Mary Shelley's Frankenstein is based on the theoretic and scientific eradication of death. The novel reflects the interest of 18th and 19th century physicians who explored galvanic experimentation that later led to the pursuit of ultimate vitality.

Methods: I frame my research around the theories and questions Shelley represents in the novel. I will present my theories and later based on literature and philosophy required for the project.

Result: I have written three chapters in which the objective of showing how knowledge of natural philosophy, medicine, and ethics of the eighteenth century illuminates the cultural, ethical and philosophical meanings of the science and medicine of the era.

Conclusion: The revolutionary novel Frankenstein or the Modern Prometheus, penned by the inventive Mary Shelley, explores the scientific pursuits of the extermination of death based on theoretical notions and philosophies of the eighteenth century. The exaggerated text ultimately defies death resulting in devastating catastrophe, artistically illustrating these gruesome pursuits, concluding that mankind cannot usurp God.

“Can Women Have It All? Wait! What Does It Mean To ‘Have it All?’”

Department Psychology, College of Liberal Arts
By: Jamara Parnell & Anjelica Mendoza

In 2002, Sylvia Ann Hewlett published a highly cited article in Harvard Business Review claiming it was a myth that executive women could “have it all.” The article summarized a study conducted by Hewlett (2001) and published in her new book at the time entitled “Creating a Life: Professional Women and the Quest for Children.” In 2012, Anne-Marie Slaughter published an article in The Atlantic explaining why women “still can’t have it all.” In an effort to further explore the boundaries and hindrances for women to have it all, we must first define both conceptually and operationally exactly it means to “have it all.” Recognizing the meaning of this phrase may vary based on an individual’s age and education among other variables, we examined how college students define this phrase for individuals between the ages of 25 and 45. Our survey included 209 student participants who responded to 16 multiple choice and open-ended questions. Respondents were asked to describe in their own words what it means (or looks like) to them to “have it all,” if they thought men, as well as women, could have it all, and how likely it is they will have it all. The results of the survey revealed undergraduate students perceived the meaning of “having it all” to include family, job/work, and financial resources. Ratings of the perceived likelihood for women and for the individual themselves to have it all did not differ significantly among men and women. However, male responders were significantly more likely to report that men are more likely to have it all.

“Vitamin D Deficiency in 16th Century Sailors”

Department of Nutritional Science, College of Agriculture and Life Science
By: Monica Montgomery

Vitamin D, obtained from the diet and exposure to sunlight ultraviolet-B (UVB), plays an important role in maintaining proper bodily functions that affect bone formation, calcium absorption, and immunity. Analysis of skeletal remains of sailors during the 16th century conveys they experienced vitamin and mineral deficiencies, specifically Vitamin D. Using analysis and other methods, the purpose of this study was to ascertain whether nutritional factors influenced Vitamin D deficiency in sailors, leading to bone diseases such as rickets and osteomalacia. Research has shown sailors’ diets consisted of foods with little to no Vitamin D or calcium which negatively affected absorption, excretion, and activity of Vitamin D, leading to bone malformations. In addition, voyaging sailors consumed a high salt diet which increased calcium excretion in the urine, causing bone diseases. Even so, it is unlikely that low Vitamin D levels would have accounted for what is seen in the osteological remains because of the sailors’ suspected exposure to UVB. Rather, this is likely due to other nutritional factors such as Vitamin C deficiency. Vitamin C is important for the development of normal bone and cartilage, and acts as a cofactor in several enzymatic reactions, including collagen production. Scurvy, a common disease caused by a Vitamin C deficient diet, was prevalent among sailors during the 16th century supporting that the bone attrition seen on osteological remains could likely be caused by Vitamin C deficiency as well. We suspect that sailors during the 16th century had a Vitamin D deficient diet, but further research is needed to determine other nutritional deficiencies that could have contributed to sailors’ poor health.

“’What Kinship Should Mean:’ An Examination of the Ethnic Themes Within Beowulf Adaptations”

Department of History, College of Liberal Arts
By: Claire Nowka

The purpose of this research presentation is to critically examine Beowulf adaptations for moments in which the adaptor chooses to emphasize themes of a community drawn along ethnic or national lines. These authorial choices reveal how different historical translations and retellings of the story of Beowulf have used the epic to justify or define their national and ethnic identities. Many retellings of the poem use the story to provide insight into their own national and ethnic identities. The particular nature of Beowulf adaptations have often encouraged these discussions, and provide a variety of viewpoints on the issue. This survey of literature will include sources from Victorian children’s adaptations to Hollywood blockbusters, as well as graphic novels and modern translations.

For this analysis, adaptation is defined as the retelling of source material in a way which requires to author to add, change, or leave out potions of the original, coupled with other creative decisions. Ethnicity is defined as the state of belonging to a group with a shared cultural or national tradition. Nationality is defined as self-identifying as a member of a sovereign state. Otherness is defined as those who are either deemed as outside of, or perhaps even a threat to the community by those within. This thesis will scrutinize the frequently complex relationship between ethnic and national boundaries. These are frequently revealed in retellings of stories which are deemed part of cultural heritage, because adaptations expose what attitudes are held to be shared by an ethnic group in an unguarded setting.

As it stands, this presentation will mimic the structure of my thesis, which is a study in three parts: a scrutiny of Beowulf adaptations in which the author identifies with the culture of the protagonist, in what manner Beowulf adaptors deal with the concepts of monstrosity and outsiders, and how those authors who do not identify Beowulf as part of their own heritage approach the poem. However, if I need to shorten it due to time constraints, I may simply do my presentation over the Victorian adaptations.

Veterinary Integrative Biosciences; Veterinary Large Animal Clinical Sciences; Veterinary Pathobiology; Veterinary Physiology & Pharmacology; Veterinary Small Animal Clinical Sciences

“Identification of PTEN Modifier Genes and Their Impact on Cancer”
Department of Public Health, Rangel College of Pharmacy
By: Rachel Thomas & Hannah Otiker

Inactivation or mutations of phosphatase and tensin homolog (PTEN), a tumor suppressor gene, is implicated in unregulated cell proliferation, leading to tumor growth and the development of cancer. Identification of modifier genes, genes that alter the phenotype of another gene, and their role in altering PTEN activity could provide insights into relationships between PTEN and cancer. The purpose of this study was to identify PTEN modifier genes by QTL mapping and the effect of their relationship on tumor growth in three murine cancer models. To do so, we crossed transgenic mice on a C57BL/6J background that overexpress PTEN (super-PTEN) to 33 lines of the Collaborative Cross (CC), a genetically diverse mouse population that models the diversity seen in the human population. We evaluated body weight at weaning as a surrogate for PTEN activity because it has been previously reported that super-PTEN expression is associated with reduced weight at weaning. Difference in body weight at weaning of super-PTEN pups compared to wild-type littermates was used for QTL analysis to identify modifier genes of PTEN. This approach identified candidate genomic intervals harboring PTEN modifier genes. The next phase of this project aims as investigating the relationship between the PTEN surrogate phenotype, small body weight at weaning, and tumor progression through cancer models. These models include the ApcMin/+ model of hereditary gastrointestinal carcinoma, MMTV-PyVT model of metastatic mammary carcinoma, and 3-methylcholanthrene-induced sarcoma. The results from this project could provide insight into the causes, susceptibility, and prevention of cancer.

“Population Variability and the Teratogenic Effects of Exposure to
2, 3, 7, 8-tetrachlorodibenzo-p-dioxin during Cardiogenesis”
Forensic Investigative Science, College of Agriculture and Life Sciences
By: Amy Cooper, Ashlyn Kinard, & Ali Bodovsky

2, 3, 7, 8-tetrachlorodibenzo-p-dioxin, also known as TCDD, is a toxicant that causes carcinogenic and deleterious effects on various tissues and organs throughout the body. The heterogeneous nature of maternal and fetal susceptibility to dioxin varies in response, including an overall increase or decrease in risks of fetal malformations. We aim to incorporate genetic variability found within the population in assessing exposure risks to dioxin during pregnancy. By using 20 different strains of pregnant female mice, we will mimic individual genetic types found in the human population. Over a 10-day period, pregnant mice will be exposed to different doses of TCDD (1, 10, 50, 100 ng/kg). The embryos will then be removed and the heart excised to analyze the molecular and histological changes in development. Ultimately, the results of this study will elucidate the importance of including population heterogeneity in assessing toxicant exposure risks and potentially aiding in the underlying mechanisms and treatment.

"Risk Assessment of Hepatotoxicity of TCDD During Pregnancy"

Department of Biomedical Sciences, College of Veterinary and Biomedical Sciences
By: Francis Takudzwa Mtuke, Delanie Moses, & Diana Bueso-Mendoza

2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) and similar compounds are aryl hydrocarbon receptor (AhR) mediated, combustion by-products to which humans are exposed mainly through ingestion, and partially through industrial processes such as fossil fuel combustion. Exposure to TCDD has been shown to lead to chloracne "a severe acne mimicking disorder- in addition to birth defects and deleterious effects during embryonic development, such as skeletal deformities and kidney defects1. Our study aims to assess the risk of the TCDD hepatotoxicity during pregnancy. We will use mice of variable backgrounds in order to assess how genetic makeup impacts susceptibility. If successful, we expect to discover a correlation between physiological and histological response in response to increasing TCDD exposure levels. This will ultimately aid in the identification of genetic susceptibilities and provide information that will assist in the development and application of innovative methods in assessing human health risks.

"Algebraic formula predicting interstitial fluid pressure homeostasis from the interaction of microvascular filtration and lymphatic transport"

Department of Biology, College of Science
By: Syed Qasim Hasnain, Trisha Nguyen, Courtney Newman, Megan Conley, Patryk Tomaszkiewicz, & Anson Harris

Interstitial fluid pressure remains relatively low despite fairly large increases in capillary and lymphatic outlet pressures. This maintenance of interstitial fluid pressure imposes competing requirements on lymphatic function. Edema results when lymph flow fails to adequately increase when interstitial fluid pressure rises, or when lymph flow fails to stay constant when lymphatic outlet pressure rises. This critical insight has not been incorporated in mathematical models that predict interstitial fluid pressures arising from the interaction of microvascular filtration and lymphatic transport. Although critical approximations made it possible to predict interstitial fluid pressure with a general algebraic formula, the assumption that lymph flow is equally sensitive to interstitial and outlet pressures neglects a fundamental homeostatic mechanism. Therefore, the purpose of the present work was to develop an algebraic formula predicting interstitial fluid pressure homeostasis that incorporates a differential sensitivity of lymph flow to interstitial and outlet pressures. A new model was constructed using three simple assumptions: 1) equilibrium is established when microvascular filtration into the interstitium equals lymph flow out of the interstitium, 2) microvascular filtration is governed by the Starling-Landis equation, and 3) lymphatic flow increases linearly with interstitial fluid pressure and decreases linearly with lymphatic outlet pressure. Interstitial fluid pressure was solved algebraically as a function of capillary and lymphatic outlet pressures, as well as the microvascular filtration coefficient, protein reflection coefficient, and two new empirical parameters characterizing lymphatic function. Adding complexity to the model reproduces interstitial fluid pressure homeostasis with perturbations in capillary or lymphatic outlet pressures. Nonetheless, because interstitial fluid pressure is expressed as a simple algebraic formula, the results retain generality beyond a particular assumed set of parameters, make explicit how parameters interact synergistically, and enable new methods to derive values of critical parameters from experimental data.

“Evaluating Parabacteroides distasonis in attenuation of colorectal cancer incidence in familial and carcinogenic mouse models”

Department of Biomedical Science, College of Veterinary and Biomedical Science
By: Camilo Anthony Gallarde Gacasan, Edeline D'Souza, & Laura Deus Ramirez

Colorectal cancer (CRC) is the second leading cause of cancer related deaths in the United States. Interindividual differences in genetic background and gut microbiome composition form a complex and dynamic system that has large potential for mitigating CRC risk. Our lab has previously shown a correlation between a specific species of bacteria, Parabacteroides distasonis, and colorectal tumor multiplicity in a carcinogenic (azoxymethane (AOM) injected) model of FVB/NJ (FVB) and C57BL6/J (B6) mice fed a ketogenic diet (high fat, low carbohydrate), western (high fat, high carbohydrate), or standard mouse chow. Tumor multiplicity increased four-fold in FVB mice fed ketogenic diet relative to those fed standard mouse chow, but was not significantly impacted by the Western diet. Diet did not significantly impact tumor load in B6 mice. To examine the relationship between diet, genetic background and gut microbiome composition, we performed metagenomic sequence analysis. We found that FVB mice fed ketogenic diet have a highly significant 20-fold decrease in the abundance of the bacterial species P. distasonis that is not observed in FVB mice fed standard or Western diets and is not altered by diet in B6 mice. P.distasonis has been previously implicated in colonic inflammatory responses in humans and mice, and negatively correlated with tumor load in a familial model of CRC in mice. These previous studies combined with our results suggest that P. distasonis may be regulated in a genotype-by-diet specific manner which could contribute to CRC susceptibility. We aim to evaluate P.distasonis’ potential to reduce CRC incidence using two well-established murine models of colorectal cancer, the caricinogenic AOM and the genetic (ApcMin/+) model. FVB mice fed a ketogenic diet will receive biweekly gavages of P.distasonis and a PCR-based assay will be used to determine P. distasonis abundance in feces. Upon necropsy, tumor load will be compared to mice receiving control gavages. Ultimately, we aim to determine if a causative relationship exists between P.distasonis and CRC tumorigenesis in both familial and carcinogenic mouse models to further understand the etiology of colorectal cancer.

“Analysis of CNS Lymphatic Systems of C57BL/6 and SJL Mice Post-Infection with TMEV”

Department of Biomedical Sciences, College of Veterinary and Biomedical Sciences
By: Connor Johnson

Theiler’s Murine Encephalomyelitis Virus (TMEV) infection is an important murine model for epilepsy and multiple sclerosis, however, it does not affect all mouse strains equally. SJL and C57BL/6 mice can both be infected with the BeAn strain of TMEV and experience the initial encephalitic phase. C57BL/6 mice develop seizures during the first week of infection and then clear the virus from the CNS, however, infected SJL mice do not develop seizures, are unable to clear the virus, and develop a chronic immune-mediated demyelinating disease similar to multiple sclerosis. One factor that may contribute to these different disease phenotypes may be the newly discovered CNS lymphatic system. To test this hypothesis, the two strains of mice were infected with TMEV and comparisons were made of the lymphatic systems found in the dura mater surrounding their brains. Expression of the chemoattractant CCL21 as well as the lymphatic system’s morphology were observed through immunofluorescence microscopy to determine any differences. Any large differences between the two strains could help to elucidate why C57BL/6 mice are resistant to the demyelinating phase while SJL mice are not, a critical question in understanding the TMEV multiple sclerosis model.

“Streamlining Genotyping for a Large-scale Laboratory Mouse Colony”

Department of Genetics, College of Agriculture and Life Sciences
By: Andrew Klopfer, Alison Zill, Pedro Gonzalez, & Shivani Chandramohan

Highly accurate and rapid genotyping is necessary when maintaining a large laboratory mouse colony. Our undergraduate research team is responsible for developing and implementing the genotyping pipeline for the Threadgill mouse colony housed at the Laboratory Animal Resources & Research Facility (LARR) at TAMU. With approximately 11 different genotyping protocols, and 150-200 samples that need to be processed each week, we developed a streamlined approach to increase throughput and decrease costs. The genotyping results are used to correctly funnel mice into numerous ongoing research projects within the Threadgill group. We now utilize a Google Sheets-based approach to organize samples and track the status of each sample throughout the process, allowing for accessing and editing of the database by multiple users. When mice are weaned, they are given a unique Mouse Identification Number and entered into the Google Sheet with a listing of genotyping assays needed for each mouse. All processes needed for genotyping, including obtaining tissue, extracting DNA, performing appropriate polymerase chain reactions (PCRs) and gel electrophoresis, and recording progress are tracked on the Google Sheet. We are currently working on optimizing and multiplexing existing PCR protocols to reduce costs, as well as developing PCR protocols for our new mouse models.

“G Protein-Coupled Estrogen Receptor (GPER)-Mediated Relaxation of Coronary Arteries is Mitigated by Phosphorylation of ERK1/2”

Department of Biomedical Sciences, College of Veterinary and Biomedical Science
By: Rebecca Harlow

GPER is a membrane-bound estrogen receptor, distinct from ERa or ERÃŸ, and exerts genomic and non-genomic effects. GPER’s effect on the cardiovascular system has been controversial; evidence indicates it relaxes arteries, whereas other findings suggest it contracts arteries. Our objective is to better understand the dual nature of GPER. Previous work has demonstrated that G-1 stimulates cAMP production. We hypothesize GPER mediates relaxation response through cAMP and constriction via ERK1/2. Isometric tension studies were used to measure GPER-mediated coronary tone response in porcine coronary arteries. Western blots were applied to detect pERK1/2 in primary cell culture of smooth muscle cells. The identity of smooth muscle cells was validated by immunohistochemistry techniques using a actin as a marker. Under adenylyl cyclase inhibition by SQ22536, G-1 stimulated phosphorylation of ERK1/2. The effect of G-1 was blocked by G36, a GPER inhibitor. A time course of G-1 (1 nM) demonstrated that detection of pERK1/2 peaked at 2 and 5 min, decreased at 15 min, and returned below baseline by 30 min. Similar results were found for a time course of E2 (1 nM) detecting pERK1/2, however, under no adenylyl cyclase inhibition. Tension studies demonstrated that G-1 caused concentration-dependent relaxation of PGF2a (1 ÂµM) precontracted, endothelium denuded coronary arteries. PD98059, a MEK 44/42 inhibitor which blocks the phosphorylation of ERK1/2, led to further relaxation than G-1 alone. We conclude that phosphorylation of ERK1/2 lessens the coronary artery relaxation caused by GPER.

"Using Behavioral Tests to Identify Comorbidity in Theiler's Virus Infected Mice"

Department of Biology, College of Science
By: Lani Kaspar, Tara O'Sullivan, M. Bijalwan, C.R. Young, J.L Leibowitz, & C.J. Welsh

Epilepsy affects 3 million people in the United States alone, with 1 in 26 Americans being diagnosed with the disorder in their lifetime. $15.5 billion are spent by the United States annually treating this disease. Along with seizures, a large number of epilepsy patients have developed symptoms of anxiety and memory impairment. Within our lab, we study Theiler's virus-induced epilepsy as an experimental model using mice. With this model, we are able to test for both anxiety and memory impairment using three behavioral tests. The Novel Object Recognition Test (NORT) and Novel Object Location Test (NOLT), used to test memory impairment, utilize a simple arena and objects. After acclimating mice to the arena, they are introduced to two similar objects. The following day, one object is replaced with a novel object for NORT; likewise, the location of one of the objects is changed for NOLT. In control mice, more time will be spent examining the novel object in NORT or the displaced object in NOLT. The Elevated Maze Test, a test for anxiety, incorporates 4 elevated arms, 2 of which are open, and 2 of which are sheltered and dark. This test takes advantage of the fact that anxious mice should spend more time in the enclosed arms, and less time exploring the open arms. Groups of 8 mice were infected with one of two variants of Theiler's Virus, either DA-DS, which induced seizures, or the attenuated DA-CL, which did not induce seizures. The performances of these two experimental groups in both behavioral tests were compared to sham-infected control mice. Data showed no significant difference between control mice and both groups of Theiler's virus infected mice in NORT. For NOLT, both DA-CL and DA-DS mice spent significantly less time examining the displaced object. In the Elevated Maze Test, the mice infected with the Theiler's virus strain that induced more seizures (DA-DS) had fewer entries into the open arms of the maze. These results do correspond with the noted comorbidity of anxiety and memory impairment documented in epilepsy patients.

" Development and Analytical Validation of an Assay for the Quantification of Canine Fecal Bile Acids"

Department of Forensic Investigative Science, College of Agriculture and Life Science
By: Michelle Jonika, BC Guard, JB Honneffer, JA Lidbury, JM Steiner, & JS Suchodolski.

The gut microbiota is important in maintaining intestinal health. Bile acids are increasingly appreciated to play a role in regulation of gut microbial composition and intestinal health. Bile acids are synthesized from cholesterol, conjugated in the liver, and once secreted into the gastrointestinal tract (GIT), undergo modification by certain members of the intestinal microbiota. Numerous bile acid receptors (e.g., farnesoid X receptor and G protein-coupled membrane receptor) have been identified along the GIT and are responsible for regulating metabolism and maintaining an anti-inflammatory environment in the gut. The aim of this study was to develop and analytically validate a gas chromatography/mass spectrometry (GC/MS) assay for the identification and quantification of bile acids in canine feces.

Fecal bile acids (cholic acid [CA], chenodeoxycholic acid [CDCA], lithocholic acid [LCA], deoxycholic acid [DCA], and ursodeoxycholic acid [UDCA]) were measured in their unconjugated form after undergoing butyl esterification for chromatographic separation. A capillary DB-1ms Ultra Inert column was used with a 20:1 split sample injection ratio. Validation parameters included the lower and upper limits of quantification (LLOQ and ULOQ, respectively). Additionally, precision of the assay was calculated by assaying 6 aliquots taken from a single fecal sample from 4 dogs on the same run/day followed by calculating intra-assay coefficients of variation (CV%). Reproducibility of the assay was determined by analyzing 6 aliquots taken from a single fecal sample from 4 dogs on 6 consecutive days followed by calculating inter-assay variation (CV%).

The LLOQ and ULOQ in µg/mL were as follows for each compound: cholic acid (3.9 and 1000), chenodeoxycholic acid (6.25 and 200), lithocholic acid (1.9 and 500), deoxycholic acid (31.3 and 1000), and ursodeoxycholic acid (0.78 and 50). For intra-assay variability, the average CV%s were: 6.0, 5.6, 7.1, 7.3, and 8.8% for CA, CDCA, LCA, DCA, and UDCA, respectively. For inter-assay variability, the average CV%s were: 8.3, 8.0, 4.8, 8.6, and 13.2% for CA, CDCA, LCA, DCA, and UDCA, respectively.

In conclusion, the present assay was found to be both reproducible and precise for the quantification of select bile acids in canine feces.

“Investigation of Neurological Effects of Theiler's Murine Encephalomyetlitis Virus in Varying Strains of Collaborative Cross Mice”

Department of Genetics, College of Agriculture and Life Science
By: Caitlin Edwards & Raena Eldridge

Theiler’s murine encephalomyelitis virus (TMEV) is a picornavirus that produces various effects in mice of different genetic strains, similar to neurological conditions seen in humans such as multiple sclerosis (MS). The purpose of this study was to evaluate whether mice of the Collaborative Cross (CC) resource could be used to demonstrate the differences in behavioral phenotypes and immune response seen in genetically diverse human populations, with an ultimate goal of furthering our knowledge about how viral infections can lead to different neurological effects based on one’s genetic makeup. This study involved 37 mice (19 females, 18 males) from 4 CC strains (CC013, CC019, CC041, and CC061). These mice were injected with either TMEV or phosphate buffer saline (PBS) as a control. Approximately half of the mice were evaluated for 7 days post infection (dpi) to determine the acute phase effects of the virus. The remaining mice were evaluated for 28 dpi (start of chronic phase). We measured weights and quantitative neurological phenotypes (e.g. gait parameters, rotarod) of the mice to evaluate TMEV responses. The phenotypic differences between the strains demonstrated diverse effects of TMEV on different genetic backgrounds. We quantified levels of TMEV RNA in the brain via qRT-PCR at 7 and 28 dpi to compare immune response/viral clearance. In general, the strains with higher TMEV levels over time demonstrated progressive symptoms such as paralysis and prolonged encephalitis, while strains with reduced levels of TMEV began to resemble the control mice in relation to weight gain and phenotypic symptoms.

"Novel Mammalian Similarity Principle Predicted From the Standard Minimal Closed-Loop Cardiovascular Model"

Department of Biomedical Science, College of Veterinary and Biomedical Sciences
By: Danielle Morea, Emily Duhon, Emily Rhimes, Teylor Nealy, & MaKenzie Lee

Allometric scaling laws are relationships that relate observed physiological values to body mass. Many hemodynamic parameters, when combined, create constants that are independent of a mammal's weight. Investigators have only reported a fraction of the possible allometric invariants pertaining to the mammalian cardiovascular system. Optimality principles typically are applied to identify allometric invariants, although the principles governing blood pressures flow impose limitations in possible parameter values. Therefore, the purpose of the present work is to derive a novel mammalian similarity principle, assuming a closed-loop cardiovascular model. In order to accomplish this, the standard minimal closed-loop model was assumed. This model consists of two ventricles, four vascular compartments, and two resistances. More specifically, the ventricles were characterized by the time-varying elastance model, where contractility of the heart was characterized by end-systolic elastance (Ees). Next, it was assumed that systemic arterial pressure (Psa) is regulated by renal control of blood volume. The model was then solved algebraically for stroke volume (SV). The resulting non-dimensional relationship (EesSV/Psa) was expressed as a function of cardiovascular parameters. This value of this novel relationship was then evaluated for multiple mammals. Even though values of Ees can vary at least four orders of magnitude, EesSV/Psa varies less than a factor of two. In conclusion, we have developed a novel mammalian allometric invariant. Unlike conventional approaches, mammalian scaling principle was derived from the rudimentary concepts governing blood flow instead of teleological arguments.

"Integration of Biomechanics and Mechanobiology to Predict Chronic Ventricular Wall Stress, Thickness, and Contractility"

Department of Biomedical Science, College of Veterinary and Biomedical Science
By: Hanifa Mohiuddin, Laura Turpen, Hyunjin Lee, & Wesley Fuertes

The ability of investigators to relate indices of cardiac function to structure, mechanical properties, and adaptive processes of ventricles suffers from isolation of complementary fields of study. On one hand, the field of biomechanics has clarified how ventricular wall stress (WS) varies with changes in contractility and wall thickness (WT). On the other, the less-established field of mechanobiology has focused on how ventricular wall thickness and contractility vary with chronic alterations in ventricular wall stress. The purpose of the present work was to create a computational model that integrates biomechanics and mechanobiology to predict chronic ventricular wall stress, wall thickness and contractility. To capture fundamental behavior, we made six simplifying assumptions to mathematically model the left ventricle: cylindrical geometry, LaPlace's Law, time-varying elastance, regulation of systemic arterial pressure, and end-systolic elastance proportional to wall thickness. Most importantly, we made the critical assumption that wall thickness increases linearly in response to chronic wall stress. The result is a simultaneous prediction of wall stress, wall thickness, and end-systolic elastance. This model not only predicts observed ventricular hypertrophy in response to elevated systemic pressure, but also reveals the central role of the sensitivity of the adaptive response (i.e., dWT/dWS) in modulating cardiac function, structure, and mechanical properties.

"Population Variability and the Teratogenic Effects of Exposure to 2, 3, 7, 8-Tetrachlorodibenzo-p-dioxin During Pregnancy"

Department of Public Health, Rangel College of Pharmacy
By: Shelby Zumwalt, Malynn Ilanga, & Megan Nitcher

2, 3, 7, 8-tetrachlorodibenzo-p-dioxin, also known as TCDD, is a toxicant that causes carcinogenic and deleterious effects on various tissues and organs throughout the body. It is of great concern when exposed during pregnancy. The heterogenetic nature of maternal and fetal susceptibility to dioxin varies in response, including an overall increase or decrease in risks of fetal malformations. We aim to incorporate genetic variability found within the population in assessing exposure risks to dioxin during pregnancy.

By using 20 different strains of pregnant female mice, we will mimic individual genetic types found in the population. Over a 10-day period, pregnant mice were exposed to different doses of TCDD (1, 10, 50, 100 ng/kg). Post exposure, we found that some strains showed no significant differences in implantation trends or the stage of embryonic development when compared to untreated controls. These mice were deemed resistant to all doses of dioxin. It was also found that in some strains high dose exposure led to a significant decrease in implantation rate and the number of viable embryos.

Our data has shown inter-strain differences in the number of viable embryos and absorptions but there were no significant intra-strain differences. Ultimately the results of this study will emphasize the importance of including population heterogeneity in assessing toxicant exposure risks and potentially aiding in the underlying mechanisms and treatment.

"Metabolic Dysfunction as a Legacy of Paternal Preconception Ethanol Abuse"

Department of Biology, College of Science
By: Gabrielle Sutton

It is now well-accepted that parental history and exposures encountered prior to conception exert a significant impact on offspring health through epigenetic means, and in some cases, have the potential to induce the development of disease later in life. Preliminary studies in our lab have identified prenatal / postnatal growth restriction and altered epigenetic programming in a mouse model of chronic, preconception male alcohol exposure. These studies challenge the current maternal-centric exposure paradigm and implicate paternal exposure history as an additional mediator of alcohol-induced defects. In clinical studies, fetal growth restriction is associated with the early onset of multiple adult diseases including type II diabetes, non-alcoholic fatty liver disease and a collection of pathologies commonly referred to as metabolic syndrome. How prenatal growth restriction is able to induce this sequela is poorly understood. Recently, disruptions in complex networks of genes regulated through genomic imprinting have emerged as major regulators of metabolism. In this study, we assayed the expression of genes participating in these imprinted regulatory networks within the placenta, fetal liver and pancreas. Using real-time qPCR, we quantified the expression of Cdkn1c, Dcn, Dlk1, Gatm, Gnas exl, Gnas exL, GnasXL, GH2, Grb10, H19, Igf2, Igf2r, Mest, Ndn, Sgce, Meg3, Peg3, Zac1, and Slc38a4. From these assays, we observe altered expression of Grb10 (males) and Sgce (females) in the placenta, as well as Cdkn1c (males) and GH2 (females) in the fetal liver. However, all of these candidate genes exhibit decreased expression with no evidence of inappropriate contributions from the normally silent opposite allele. Thus, there is likely another epigenetic mechanism at the root of this metabolic phenotype.

"Generation of a Diverse Population of Murine iPSCs using Sendai Virus Vectors

Department of Biochemistry, College of Agriculture and Life Sciences
By: Annie T. Nguyen

Recent advances in stem cell research show that somatic cells can be successfully reprogrammed to induced pluripotent stem cells (iPSCs). This type of stem cell is especially appropriate for translational research because it can give rise to most other cell types in the body and can be generated in a patient-derived, genetically-matched manner. We will generate a population of iPSCs using the Sendai Virus vector in multiple cell lines of mouse embryonic fibroblasts (MEFs) and use a novel genetic reference population, the Collaborative Cross, to approximate the genetic diversity present in the human population. Previous work has shown that other viral vectors are capable of generating these murine iPSCs, however, some problems remain with genome integration and variation of efficiency among cell lines with different genetic backgrounds. We will use the Sendai Virus Vector to deliver the reprogramming factors because it can infect a wide range of hosts, does not integrate into the host genome, and with the presence of temperature-sensitive mutations, can be easily removed from the cells at non-permissive temperatures. Several different RT-PCR primer sets will be used to detect the persistence of the virus in the different cell lines, or to later detect expression of endogenous markers of stem cells. While this project is ongoing, we hope to reprogram a diverse genetic reference population of MEFs to become iPSCs, with the goal of creating a powerful in vitro testing panel that more accurately recapitulates the genetic diversity found within the human population.

Graduate Student Oral Presentations

Agric Econ; Agric Leadshp, Edu & Comm; Animal Sc; Biochem & Biophy; Bio & Agric Engr; Ecosys Sc & Mgmt; Entomology; Horticulture Sc; Nutrition & Food Sc; Plant Pathology & Microbio; Poultry Sc; Recreatn, Park & Tour Sc; Soil & Crop Sc; Wildlife & Fishrs

“Investigating How the Small Heat Shock Proteins Inhibit Protein Aggregate Growth and Assist in Aggregate Disassembly”

Department of Biochemistry, College of Agriculture and Life Sciences
By: Andrew Roth

Over evolutionary time cells have developed highly conserved protein chaperones to assist in cellular function and homeostasis by inhibiting protein misfolding and aggregation. Despite the presence of these protein chaperones, some misfolded and aggregated proteins persist in the cell and cause a variety of problems, including disorders like type II diabetes and numerous amyloid neuropathies. The small heat shock proteins (sHsps) are family of chaperones, present in all domains of life, that are capable of inhibiting aggregation while also assisting in more efficient reactivation of aggregated protein. sHsps are critical for normal protein homeostasis and mutations in this chaperone family are a main cause of cataracts and desmin-related myopathy. Nevertheless, the mechanisms by which sHsps protect cell viability and enhance aggregate disassembly and subsequent activation is poorly understood. We have initiated a mechanistic study utilizing the E. coli sHsps IbpA and IbpB (IbpAB). We identified two substrate proteins, RuBisCO (from R. Rubrum) and PepQ (an endogenous E. coli protein) as excellent candidates for studying aggregation inhibition and enhanced disassembly in the presence of IbpAB. To accomplish this goal, we employ a single particle fluorescence technique called Burst Analysis Spectroscopy (BAS) to monitor the size and concentration distribution of heterogeneous aggregate populations and, more importantly, any changes in those aggregate populations over time. Using BAS and electron microscopy, we established PepQ and RuBisCO both form large heterogeneous amorphous aggregates with RuBisCO also capable of forming fibril-like aggregates. Interestingly, when IbpAB are present during aggregation, both aggregate types (amorphous and fibril-like) decrease in aggregate size and form a very specific homogenous size distribution. However, while amorphous aggregates can be disassembled rapidly in the presence of IbpAB, fibril-like aggregates do not disassemble in the same manner. This suggests that while IbpAB can limit ongoing aggregation of different aggregate structures in a similar manner, this ability is not directly linked to enhanced aggregate disassembly.

“Molecular function of the prototype unimolecular spanin gp11 from phage T1”

Department of Biochemistry, College of Agriculture and Life Sciences
By: Ramchander Rohit Kongari

Spanins are bacteriophage lysis proteins responsible for disruption of outer membrane (OM), the final step of Gram-negative host lysis. The absence of spanins results in a terminal phenotype of fragile spherical cells. The phage T1 employs a unimolecular spanin (US) gp11 that has an N-terminal lipoylation signal and a C-terminal transmembrane domain (TMD). Upon maturation and localization, gp11 ends up as an OM lipoprotein with a C-terminal TMD embedded in the inner membrane (IM), thus connecting both the membranes as a covalent polypeptide chain. Unlike the two component spanins (2CS) encoded by most of other phages including: the u-spanins haven’t been studied extensively yet. The aim of this research is to investigate the molecular mechanism behind US function and further gain insights into phage lysis as well as the bacterial cellular envelope.

A detailed bioinformatics based, biochemical and genetic approach was used to study gp11. Using the ability of gp11 to complement the RzRz1 lysis defect, we showed that both the OM and IM localization signals were true and necessary for gp11 function. Furthermore, 14 lysis-defective single missense mutants, distributed throughout the periplasmic domain of gp11, were isolated from a mutant library created with error-prone PCR mutagenesis. Fluorescence spectroscopy time lapse videos using gp11-gfp showed gp11 accumulating in distinct punctate foci, suggesting localized oligomerization within the peptidoglycan meshwork.

In addition to these findings, our model for gp11 function will be presented. The results from the novel spheroplast fusion assay designed to test our model, indicating gp11 works through the fusion of IM and OM, will also be discussed. Along with the clues about 2CS and US evolutionary differences from bioinformatics, this work has significantly advanced our understanding about gp11 and other US's role in phage lysis.

"Characterizing the impact of the highly endosomolytic agent dfTAT on human cells"

Department of Biochemistry, College of Agriculture and Life Sciences
By: Helena Kondow

One of the challenges of delivering molecules into live cells is maintaining normal cell function after delivery. This is important because the effects of a delivered molecule may not be evaluated accurately if the delivery system itself causes cellular dysfunction. In many reported delivery systems, cell viability decreases as a function of increased delivery efficiency. Our lab has generated a highly endosomolytic cell-penetrating peptide, dfTAT, that aids in the delivery of macromolecules into live cells without impacting cell viability or gene expression. dfTAT enters the cell by endocytosis, and is subsequently released from late endosomes to enter the cytosol. With its highly efficient endosomal release, dfTAT would be expected to be toxic to cells as a result of calcium and protease release into the cytosol. However, because dfTAT-mediated delivery does not elicit the same toxic responses as other delivery systems, it is of interest to investigate what is happening to the cell post-release. Preliminary experiments have indicated that dfTAT-mediated late endosomal disruption triggers a galectin-3 response, a hallmark signal of vesicle damage that is often associated with autophagy induction. It is hypothesized that the cell may be masking physiological changes by triggering response mechanisms, such as autophagy or repair of damaged organelles. Overall, the relevance of this work goes beyond intracellular delivery, in that the highly endosomolytic efficiency of dfTAT can be exploited to learn about membrane damage that occurs in other biological systems. In addition, further elucidating the proteomic profile, as well as kinetics, of a cell's response to endosomal membrane damage can be applied to understanding the fundamental biology of a cell.

“Maintaining blunt ended telomeres in Arabidopsis thaliana:
evidence for protection by a novel RNP complex”

Department of Biochemistry, College of Agriculture and Life Sciences
By: Sreyashree Bose

In the model plant Arabidopsis thaliana, telomeres exist in two different forms: those with a 3’ G- rich overhang structure (G - overhang) and those with blunt ends. The mechanism involved in blunt end telomere protection is yet to be uncovered. Previous studies revealed that A. thaliana mutants lacking the Ku heterodimer are unable to maintain their blunt ends and the DNA is processed into a 3’ G“ overhang. This finding which indicates a possible role of Ku in blunt end telomere protection, is curious since Ku is a major player in the Non Homologous End Joining (NHEJ) pathway for repairing DNA double - strand breaks, an activity that must be blocked at telomeres. In plants as in yeast and mammals Ku is also a component of the telomerase ribonucleoprotein (RNP) enzyme, raising the interesting possibility that Ku acts as a part of an RNP complex to protect blunt end telomeres in A. thaliana. Telomerase reverse transcriptase with the help of a long noncoding RNA called TER and accessory proteins including Ku70/80 protein complex to synthesize telomeric DNA. A. thaliana is unusual as it contains several different isoforms of TER” TER1, TER2, TER2AS. TER1 is the canonical TER used for addition of the telomeric DNA while TER2 acts as a negative regulator of the telomerase enzyme. Ku interacts with both TER2 and TER2AS, with higher binding to TER2AS. Therefore we hypothesize that TER2/TER2AS and Ku assemble into an RNP that is involved in are maintaining blunt ended telomeres.

To test this hypothesis we measured the G overhang status in ter2 mutants we find a similar increase in 3’ G“ overhang signal as that of ku mutants consistent with our hypothesis. Experiments are currently underway using ku ter2 double mutants to precisely measure their 3’ G overhangs and blunt ended telomere structures to directly confirm whether Ku and TER2 act in the same genetic pathway for maintaining blunt end telomeres. Preliminary localization studies show that TER2 accumulates in the cytoplasm while TER2AS is present in both cytoplasm and nucleus. As a result, further imaging experiments will be performed to investigate if TER2 or TER2AS is located specifically at the telomere ends. This will be achieved by performing a combination of telomeric DNA “FISH and RNA FISH. Probing specifically for either TER2 or TER2AS at the telomeres may indicate a possible lncRNA trafficking pathway functional in A. thaliana. All together these studies will provide new insight into the roles of lncRNAs in telomere biology.

"Impact of long-term tillage practices (34 years) on soil carbon mineralisation and carbon-dioxide emission in continuous sorghum"

Department of Soil and Crop Science, College of Agriculture and Life Sciences
By: Prabhu Govindasamy, Jake Mowrer, Tony Provin, Frank Hons,
Nithya Rajan and Muthu Bagavathiannan

Experiments were conducted in a long-term cropping system field study initiated in 1982 at Texas A&M University research farm near College Station, Texas (300 37'16.8" N, 960 32' 47.2" W), to understand the impact of tillage practices on carbon mineralisation and CO2 emission. Two tillage regimes were compared in continuous sorghum production: conventional tillage (CT) and no-tillage (NT). The incubation study revealed that C-mineralization was significantly greater (22 g kg-1 of soil greater) in the soils of NT system compared to CT system at 0-20 cm soil depth. However, this trend was reversed at 40-60 cm depth (16 g kg-1 of soil greater in the CT compared to NT). This might be due to the presence of large soil aggregates as well as the transport of soil carbon to the lower layers due to mechanical soil inversion in the CT system. Further, the NT system had an overall high cumulative C-mineralization rates compared to the CT system, indicating that carbon is available to the plants for longer periods in the NT system compared to the CT system. Soil CO2 flux was measured in the field after crop harvest by improving the laboratory titration method given by Anderson (1982). Preliminary results have revealed that tillage-induced CO2 emissions were greater in the CT system (5.69 g m-2 CO2 day-1) than in the NT system (4.33 g m-2 CO2 day-1). Similarly, the highest cumulative CO2 emissions were recorded in the CT system (25% higher than the NT system). Results also demonstrate that the long-term NT system had a positive impact on carbon mineralisation and carbon- dioxide emission and the improved titration method used here is a novel and cost-effective method for estimating CO2 emission under field conditions.

"Forest structure and terrain mapping using photon counting LiDAR for ICESat-2 mission"

Department of Ecosystem Science and Management, College of Agriculture and Life Sciences
By: Tan Zhou

A critical task for the ecosystem community is to identify the ground and canopy surface over the global scale to meet science objectives of determining global canopy heights hinges upon the ability to detect both the canopy surface and the underlying topography. The upcoming spaceborne satellite, the Ice, Cloud and land Elevation Satellite 2 (ICESat-2), has enabled these objectives to become achievable. However, the automated algorithms for classifying photons from the ICESat-2 or simulated data are inadequately explored. Therefore, the overall goal of this research is to develop fully automated algorithms for reducing noise and retrieving canopy height in different forest types and noise levels using MABEL data and simulated ATLAS data, both of which were similar to actual ICESat-2 data.

The preliminary results show that the algorithms can generate satisfactory performances with the overall root mean square errors (RMSEs) 5.62 m and 6.98 m for ground and canopy top identification using MABEL data, respectively. Compared to the results of MABEL data, the algorithms can more precisely capture the ground and canopy top with smaller RMSEs (3.49 m for ground and 3.27 m for the top of canopy) in temperate forest. Further studies will apply the algorithms to various vegetation condition datasets to pre-validate the upcoming ICESat-2 mission and prepare robust algorithms for ATLAS (Advanced Topography Laser Altimeter System) data once available.

“Competition, Cooperation, and Confusion between Phages Guide Subcellular Decision-making”

Department of Biochemistry, College of Agriculture and Life Sciences
By: Jmmy T Trinh

The consequences of the decisions made within single cells are felt by whole organisms and entire populations. As development and disease are products of intracellular decision cascades, proliferation and extinction are similarly the results of individuals’ choices, so studying decision-making offers us a means both to fundamentally understand certain ailments and to provide us insights on how evolution shapes biological systems. To investigate the complicated process of decision-making, we aim to distill its complexities into basic questions using a simple, natural system.

Bacteriophage lambda is a virus that infects Escherichia coli, and must then make a choice in order to propagate. Phage lambda will undergo either lysis, cloning new virions and bursting the host cell, or lysogeny, integrating itself into the E. coli genome and dividing as one with the host, and this decision is a paradigm for studying gene regulation resulting in cell-fate selection. Backed by decades of prior research, we choose to explore this classic system using modern technology to uncover the underlying mechanisms behind this decision-making, beyond previous limitations. Revisiting the lambda paradigm has yielded new models about how decisions are processed within cells, including a suggestion that individual co-infecting phages can “vote” for decisions within a single cell. This particular peculiarity potentially redefines how a choice is made in a cell, and our lab is excited to probe this further by using an interdisciplinary approach consisting of quantitative experimentation and computational modeling. We developed a 4-color fluorescence system capable of distinguishing between different phages within single cells, and built simple mathematical models describing key processes, to both directly observe the decisions and interactions of individual phage DNAs, as well as to feed into our modeling, helping to guide our experiments. Using our unprecedented resolution, we discover that phages interact in a surprising variety of ways in varying situations: they compete during lysis to dominate each other, they cooperate during lysogeny to propagate mutually, and they display “confusion” where dissenting decisions delay development. These behaviors may profoundly improve the evolutionary fitness of these phages, as competition in lysis enables favorable genetics to flourish, cooperation in lysogeny promotes the diversification of the gene pool, and confusion may actually allow survival in niche situations to save some doomed infections.

Our combined experimental/computational approach has elicited previously unknown mechanisms from one of the best-studied biological systems, and provided support for our decision-making voting model. Additionally, this reporter system can serve as a platform to study the numerous effects of different growth conditions, temperatures, and host backgrounds on phage lambda decision-making, and can even be adapted to work with other phages, to further refine our understanding of how cells choose their fates.

“Regulation of brain and heart development in zebrafish by the autism risk factor CHD8”
Department of Biochemistry, College of Agriculture and Life Sciences
By: Jessica Ann Tracy

Nucleosome location and stability determines the accessibility of regulatory elements to the transcription machinery. Remodeling these regions to allow binding of transcriptional regulators depends on the ATP-dependent movement of nucleosomes within the chromatin structure. The focus of this work is the ATP-dependent chromodomain helicase DNA-binding protein 8 (CHD8). CHD8 interacts with several factors which are essential to the regulation of transcription and modulation of expression of genes implicated in crucial developmental processes. Large-scale sequencing studies have identified loss-of-function mutations within CHD8 in multiple patients with autistic spectrum disorder (ASD). The number of novel CHD8 mutations observed suggests that it is highly unlikely they occur by chance, which implies that disruption in one copy of CHD8 could contribute to increased risk of ASD. There are at least two isoforms of CHD8 that result from alternative splicing, CHD8S and CHD8L. In addition to chromatin remodeling, CHD8 contains an A-kinase anchoring protein (AKAP) domain. AKAP proteins anchor protein kinase A (PKA), a kinase activated by the cAMP-signaling pathway of gene regulation, to subcellular structures, thus allowing for spatial control and specialization of the PKA phosphorylation. Defects in AKAPs lead to various types of heart disease. Through the use of morpholino oligonucleotides and CRISPR/Cas9 to disrupt CHD8 expression, we have determined that CHD8 is necessary for proper brain and heart development in zebrafish embryos. Reduction in CHD8 leads to disruption of expression patterns of several genes known to be involved in brain and heart development. There are at least two isoforms of CHD8 that result from alternative splicing, CHD8S and CHD8L. Interestingly, while CHD8S lacks the essential helicase domain required for nucleosome remodeling, we have shown that both isoforms of CHD8 are capable of activating gene expression at a ZNF143 targeted promoter but are differentially expressed during zebrafish development.

“Evaluation of Microalgae Concentration as Fishmeal Replacements for Hybrid Striped Bass Morone sp. Including Effects Growth and Utilization of Feed”
Department of Wildlife & Fisheries Sciences, College of Agriculture and Life Sciences
By: Clement De Cruz

The use of processed microalgae concentrates in aquafeeds in recent years has been considered a potentially viable alternative to fishmeal (FM) and fish oil. Two comparative feeding trials of 7 weeks duration were conducted to evaluate the replacement of FM with different types of microalgae in the diet of juvenile hybrid striped bass. The microalgae evaluated in feeding trial 1 included dried products from monocultures of Phaeodactylum tricornutum and Nanochloropsis salina, as well as mixed cultures of those two species. In addition, several preparations of Chlorella sp. extracted by various means and bluegreen algae biomass were evaluated. In feeding trial 2, the microalgae products that showed greatest potential in feeding trial 1 were reassessed including mixed cultures of Phaeodactylum tricornutum and Nanochloropsis salina as well as bluegreeen biomass algae. Furthermore, two additional mixed cultures of microalgae, Nanochloropsis salina and Amphora sp. as well as Nanochloropsis salina and Cylindro sp. were evaluated. The various algae products were substituted to replace either 10, 15 or 20% of the protein provided equally from a mixture of menhaden FM and soy protein concentrate in the reference diet. All diets were kept isonitrogenous at 40% CP and isocaloric at 3.3 kcal digestible energy g-1, and each were fed to triplicate groups of juvenile fish with average initial weights of 15.1 (n=15) and 21.4 (n=14) g/fish in feeding trial 1 and 2, respectively.

Weight gain and feed efficiency (FE) ratio of hybrid striped bass were affected significantly ($P<0.05$) affected by dietary treatments in feeding trial 1 but no mortality was observed. Fish fed the reference diet and the one containing blue green algae biomass had the greatest and similar weight gain. Substitution of the other algae meals tended to reduce weight gain by 8.2 to 14.7% compared to that of fish fed the reference diet. In general, most diets containing algae meal yielded similar FE ratio as the reference diet except for those containing Chlorella sp., at both 10% and 20% substitution, Phaeodactylum tricornutum (10%), Phaeodactylum tricornutum x Chlorella sp (10%), and Phaeodactylum tricornutum x Chlorella sp (20%) in which FE ratio was reduced by 5.8 to 8.1%. Whole-body proximate composition and protein retention efficiency values revealed no significant differences. In feeding trial 2, the various dietary treatments did not significantly affect growth performance or whole-body composition. Therefore, based on both comparative feeding trials, replacement of up to 15% crude protein in reference diet with blue green biomass, Phaeodactylum tricornutum and Nanochloropsis salina mixture, Nanochloropsis salina and Amphora sp. mixture and Nanochloropsis salina and Cylindro sp. mixture was possible without affecting the performance or body composition of hybrid striped bass.

“POT1b gets a new job besides telomeres”

Department of Biochemistry, College of Agriculture and Life Sciences
By: Borja Barbero Barcenilla

Telomeres are DNA repeats located at the end of chromosomes, which function as a physical cap to prevent an undesired DNA damage response. Telomeric DNA is synthesized by telomerase, containing a reverse transcriptase TERT and a long non-coding RNA TER that serves as a template. Of special importance in telomere biology is the Protection of Telomeres 1(POT1) protein. Human POT1 is involved in chromosome end protection and in the recruitment of telomerase to telomeres. The flowering plant Arabidopsis thaliana is unusual as it encodes three POT1 proteins. Unlike hPOT1, AtPOT1 proteins assemble into ribonucleoprotein complexes with different isoforms of TER. AtPOT1a associates with TER1 forming a canonical telomerase enzyme, while AtPOT1b associates with TER2 forming a novel negative regulator of telomerase. To learn more about the function of AtPOT1b, CRISPR was used to generate a POT1b mutant. Unexpectedly, this mutant showed decreased root length and produced fewer seeds than wild type, phenotypes indicative of reproductive malfunction and not telomere biology. In addition, POT1b accumulates in the cytoplasm, away from chromosome ends and telomerase. The root length phenotype of POT1b mutants was further pronounced in plants also lacking the telomerase catalytic subunit TERT. Altogether, these findings indicate that POT1b functions beyond telomerase regulation to promote fundamental aspects of plant development.

"OLI2 is a major regulator of telomere length and cell proliferation in Arabidopsis thaliana"

Department of Biochemistry, College of Agriculture and Life Sciences
By: Callie Kobayashi

All eukaryotic species have specific telomere tracts, ranging in length from 250bp in WT yeast to 150kb in mice. Variations in telomere length are known to be under strong genetic control; however, the factors that establish the telomere length set point within natural populations are unknown.

We took advantage of the model plant Arabidopsis thaliana to identify novel genes that have large effects on the telomere length set point. A. thaliana has genetic variation within different ecotypes, giving rise to natural variations in telomere length. In addition, recombinant inbred lines, which are not possible in mammalian model system, offer a unique opportunity for the analysis of natural telomere length variations in a multicellular eukaryote.

Using quantitative trail (QTL) analysis, we identified that the OLI2 gene encodes a major regulator of telomere length in natural Arabidopsis populations. We also correlated this gene specifically to the Sf-2 ecotype, which exhibited longer telomeres, whereas the OLI2 knockout mutant in the Col-0 ecotype showed shortened telomeres. Interestingly, higher OLI2 expression was seen in Sf-2 compared to Col-0, suggesting that the elevated OLI2 expression level may be responsible for the increase in telomere length. Further analysis of the OLI2 promoter and 3â€™ UTR region of the 19 parental ecotypes used for the QTL analysis showed a single SNP in the Sf-2 promoter in addition to a 3â€™ UTR region that differentiates Sf-2 from the other 18 parental ecotypes. This suggests that it is increased transcription efficiency and/or enhanced transcript stability of OLI2 that allows for higher expression in the Sf-2 ecotype. Our work identifies OIL2 as a major regulator of telomere length and furthers our understanding of how its expression is regulated. Expression of OLI2 homologues in humans and mice has previously been correlated with tumor progression, indicating that the expression of these genes can be considered prognostic markers of cancer, making these genes a very interesting candidate to study in the function of telomere length regulation.

"Dehydration stress affects Solanum lycorpesicum susceptibility
to Bactericera cockerelli colonization"

Department of Entomology, College of Agriculture and Life Science
By: Ordom Brian Huot

Recent outbreaks in plant diseases associated with Liberibacter pathogens have impacted large areas of the western and southern North America. The increase in frequency and severity of drought could render plants more susceptible to the colonization of the insect vectors. The scarcity of water may induce plant water stress and provide the opportunity for insects to exploit and colonize plants. Experiments were conducted in a controlled laboratory setting to evaluate the influence of water scarcity on the dehydration stress (DS) of Solanum lycorpesicum plants. Weekly water treatment of 200 mL, 100 mL, and 50 mL resulted in unstressed (C, ?w = -0.55 MPa), mildly water-stressed (LDS, ?w = -0.70 MPa), and moderately water-stressed (MDS, ?w = -0.87 MPa), respectively. By controlling for both water availability and plant DS, the effect of

DS on S. lycorpesicum susceptibility of to Bactericera cockerelli (Hemiptera:triozidae) was evaluated. MDS plants had significantly higher average number of B. cockerelli nymphs than C plants in the no-choice study. However, plant susceptibility to B. cockerelli colonization was not due to the oviposition preference for MDS but rather was due to higher B. cockerelli survival on MDS than C plants. The average survival percentage of B. cockerelli on MDS plants was consistently and significantly higher than C plants. Throughout all nymphal developmental times from egg to adults, B. cockerelli had higher survival on MDS plants than on C plants.

“Elephant utilization of a land-use mosaic, Kavango-Zambezi Region: Implications for conflict and conservation”

Department of Ecology & Evolutionary Biology, College of Agriculture and Life Sciences
By: Erin Buchholtz

Habitat fragmentation has long been heralded as a challenge to conserving wildlife populations. While setting aside protected areas is an important strategy, it is insufficient in many ways, particularly for wide-ranging species. The African elephant (Loxodonta africana) is one such species, and conservationists are increasingly recognizing the role unprotected, mixed-use land plays in maintaining functional connectivity through the elephants’ range. Where elephant range overlaps with human land-use and development, interactions increase and so does the potential for human-wildlife conflict. In order for elephant populations to persist in the mosaic landscape that exists outside of protected areas, and for human lives and livelihoods to be protected, it is crucial to understand the movement and interactions between the populations. For this research I will use spatial analyses to characterize elephant utilization distributions (UDs) across a land-use mosaic, as well as human population density in the same region. Overlap in the two distributions will identify areas with potential for conflict, which can play a role in recognizing areas for mitigation and management. Moreover, identifying temporal and spatial associations between elephant movement and land-use type will increase understanding of how human development affects elephant populations. Expected results will show when and where elephants move through a mosaic landscape characterized by human land-use, in the form of seasonal and cumulative UDs. The findings will have important implications for land-use planning, conflict mitigation, and elephant conservation and management.

“Does flooding impact the germination and growth of different rice weeds?”

Department of Soil and Crop Science, College of Agriculture and Life Sciences
By: Seth Bernard Abugho

Organic rice is increasing in popularity in Texas and weed management is a major challenge in organic rice production. Flooding is considered an important cultural tactic for weed management in organic rice. However, little is known on the impact of flooding on the germination and growth characteristics of some of the dominant weeds present in Texas rice production fields. To address this, two experiments were conducted in a greenhouse at Texas A&M university, College Station. The first experiment was focused on understanding the impact of flooding on the germination and emergence pattern of Amazon sprangletop, Nealley’s sprangletop, hemp sesbania, barnyardgrass, Palmer amaranth and weedy rice, whereas the second experiment investigated the impact of flooding on continued growth and development of these weeds when flooding occurred at different seedling growth stages. In the first experiment, 250 seeds each of the study species were planted in plastic containers filled with a 1:1 ratio of field soil and potting soil mix and flooded at three depths: 0, 2.5 and 7.5 cm. This experiment was conducted in a randomized complete block design with four replications. Emerged seedlings were counted and removed once every four days for a month period. The second experiment has been complete only for barnyardgrass, hemp sesbania and weedy rice. Seedlings (stages: just emerged, 1, 2, 5 and 10 cm tall) were transplanted to Styrofoam cups (17 cm tall x 15 cm dia) filled with the field soil-potting soil mix described above and were flooded at two levels: 0 and 10 cm. Each treatment had 8 replications and were arranged in a completely randomized design. Flooding severely reduced the germination of most species, but more germination was observed under the flooding depth of 2.5 cm compared to 7.5 cm. Flooding at 7.5 cm delayed the emergence of hemp sesbania by 12 days and barnyardgrass by 8 days. Weedy rice had the highest germination with ~40 and 6% germination under 2.5 and 7.5 cm flooding, respectively. Hemp sesbania and barnyardgrass did not survive when flooding occurred prior to the 1 cm seedling stage. There was an increasing trend in plant height and above-ground biomass production with hemp sesbania and barnyardgrass, especially when flooded at the 5 and 10 cm tall seedling stages. Further, there was a significant increase in root biomass when hemp sesbania was flooded at later growth stages; this trend was not observed in barnyardgrass or in weedy rice. Preliminary results of this study show that flooding can influence the germination, growth, and development of weeds, but the degree of response varied across the weed species. More research is currently underway to fully understand the effect of flooding as a tool for weed management in organic rice production.

"Early Ontogeny of Selected Digestive Enzymes in Larval Southern Flounder (Paralichthys lethostigma)"

Department of Wildlife & Fisheries Sciences, College of Agriculture and Life Sciences
By: Brittany Peachey

The southern flounder (Paralichthys lethostigma) is a commercially and recreationally important species in the Gulf of Mexico. Stock enhancement programs throughout the state of Texas seek to supplement wild production in order to sustain a healthy population. In order to effectively raise healthy larvae, the development of their digestive tract must be better understood. The present study was conducted to characterize the ontogeny of several digestive enzymes as a function of fish age.

Eggs were collected from natural spawns of captive southern flounder broodstock at the hatchery of the CCA Marine Development Center in Flour Bluff, Texas. Starting at 3 days post hatch (dph), larvae were fed with enriched rotifers (Brachionus sp.) and were then transitioned onto enriched Artemia nauplii at 20 dph. Larvae were collected on 0, 3, 5, 7, 9, 11, 13, 15, 18, 21, and 24 days post hatch. After collection, larvae were rinsed on an appropriately sized mesh and immediately frozen with liquid nitrogen. Larvae were homogenized in cold 50 mM Tris-HCl, 20 mM $CaCl_2$ buffer and the supernatants were stored at -80Â°C until further analysis. The amount of protein in each sample was determined by the Bradford method using bovine serum albumin as a standard.

The larvae were analyzed in triplicate for the following digestive enzymes from each sampling day: pepsin using hemoglobin as a substrate, trypsin using N-a-benzoyl-DL-arginine 4-nitroanilide hydrochloride as a substrate, chymotrypsin using 5 mM-N-benzoyl-L-tyrosine ethyl ester as a substrate, aminopeptidase using L-leucine p-nitroanilide as substrate, a-amylase using soluble starch as a substrate, lipase using sodium cholate hydrate and ÃŸ-naphthyl-caprylate as a substrate, and acid/alkaline phosphatases using 4-nitrophenylphosphate as a substrate. Enzyme responses were measured spectrophotometrically and expressed as units of enzyme per mg sample. One unit is defined as the increase of 0.01 units of absorbance/minute.

Several of the enzymes measured, such as lipase, alkaline phosphatase, acid phosphatase, and trypsin, were present at hatching. Pancreatic enzymes (trypsin, a-amylase, lipase), phosphatase enzymes and aminopeptidase are thought to help enable the larvae to absorb the yolk sac. Amylase appeared to peak around first feeding, 5 dph, at which point the absorbance/mg sample decreased significantly. Aminopeptidase was first evident at 3 dph and the absorbance/mg sample continued to increase until 15 dph, when it decreased slightly. These results provide further characterization of digestive tract development in southern flounder larvae and may be used to help refine feeding protocols for this species.

“The changing habitat of fire: Quantifying the impact of regionality on predicting wildland fire occurrence in Texas”

Department of Ecosystem Science and Management, College of Agriculture and Life Sciences
By: Chase Brooke

Fires are responsible for the historical shape, structure, and composition of the fire-adapted ecosystems of Texas. Today, these fires are primarily ignited via lightning and human activity. However, the patterns and connections between these fire occurrences and the landscape characteristics that these fires occur in is unclear. In order to analyze the effects of these environments on fire ignitions, this project used Maximum Entropy (Maxent), a Species Distribution Model (SDM), to generate fire occurrence predictions from 15 years (2001-2016) of remotely sensed fire occurrences and a suite of 13 environmental variables. Maxent models were built for 7 different regions of Texas, representing different combinations of climate, terrain, human development, and landcover. These models were compared on variable importance and contribution, as well as the fire prediction map itself. Additionally, these regional predictions were compared to state-wide model prediction distributions to identify areas of prediction anomaly. Our expectations that variations in fire prediction corresponded with precipitation were upheld, and our predictions of improved model predictions were also upheld. Overall, the use of SDMs for generating fire occurrence predictions is effective when the areas of analysis are constrained within areas with less drastic variations in local environmental characteristics. Additionally, these models may provide a better assemblage of predictions within Texas, and could better represent the ground conditions and factors that affect fire occurrences which would be otherwise weighted inappropriately at a larger, statewide level.

“Private Land Management: Preserving the Beauty of America Landscapes”

Department of Recreation, Park & Tourism Science, College of Agriculture and Life Sciences
By: Evgenia Spears

Actions taken by landowners today shape the present and future stewardship of private lands, which comprise over 60 percent of American territory. The benefits of private lands go beyond the legal boundaries of ownership: improved air, water and soil quality, support of sensitive plant and animal habitats, opportunities for recreation, education, and aesthetic enjoyment are among the long list of benefits that the public can derive from private lands. Therefore, to preserve the beauty and quality of American landscapes, it is necessary to understand land-management decisions of private landowners. Despite a clearly identified need for more research in this area, private land-management remains poorly understood and requires further scientific inquiry. Landowners’ decisions have been a focus of multiple studies in the fields of environmental psychology, social geography, and social psychology. An inquiry into such variables as landowners’ attitudes, motives, values, and objectives has undoubtedly provided valuable information for understanding land-management decisions. However, the relationship of landowners with their land holdings as an influential psychological factor shaping land-management decisions has been largely ignored. The purpose of the current presentation is to provide an overview of the existing research focusing on the factors that affect land-management decisions of private landowners. Data obtained through informal interviews with six private landowners will be presented as well as study implications and future research needs.

“Online CME Accredited Nutrition Education Course Used to Facilitate Learning by Practicing Physicians”

Department of Nutrition, College of Veterinary and Biomedical Sciences
By: Kristen Hicks

It has been well documented that medical students have an inadequate amount dedicated nutrition hours in school, thus practicing physicians are not well equipped to provide nutrition counseling to patients. Physicians acknowledge their limited nutrition knowledge and are seeking convenient ways to learn nutrition. Our Physician Nutrition Education Program (PNEP) was created to combat the currently deficient nutrition knowledge by practicing physicians. We developed research-based nutrition education courses in the format of both a webinar and a self-study module. The first course was launched on the education library at Texas Medical Association and is accredited for 1 CME credit and 1 Ethics credit. The course is constructed to increase knowledge on nutrition and type 2 diabetes and to provide resources to incorporate nutrition discussions with patients. Unique to these courses, they also highlighted the importance of collaborating and referring to a Registered Dietitian (RD) to communicate nutrition concepts. We hypothesized that providing nutrition education opportunities to physicians via webinars will increase their knowledge of nutrition, with hopes to improve confidence on nutrition counseling and facilitate referrals to RDs all which may ultimately decrease recurring visits and improve overall health outcomes in patients. For successful completion of the course, physicians must pay for the course, complete a pre-test, read the entirety of the course, and complete a post-test and an evaluation survey. Since January 2016, we have had 11 physicians complete the course (with ongoing registration) with successful improvements in gained knowledge, as determined by pre

vs. post scores. Of our participants, there were 6 males, 5 females with years in practicing ranging from 1-35 years. We had 100% (11/11) of physicians improve their score by at least 10% with the average improving 30%. All physicians passed the nutrition CME course (>70%) after taking the course; compared to only 1 physician with passing scores in the pre-test. This drastic improvement in pre-vs-post test scores demonstrate physicians improved their knowledge. An online delivery of CME an effective way to deliver nutrition education to practicing physicians. With a majority of chronic diseases related to nutrition and lifestyle, a course, for a variety of conditions, could be a possible way to mitigate the continued trend by increasing knowledge of nutrition by practicing physicians.

"Texans Buy Texan: a Qualitative Study Exploring the Great Blue Bell Famine of 2015 from a Social Identity Perspective"

Department of Agr Leadership, Edu & Comm, College of Agriculture and Life Sciences

In the spring of 2015, Blue Bell Creameries recalled eight million gallons of ice cream after it was found to be contaminated with Listeria. Many consumers responded to this food safety incident by refusing to eat any brand of ice cream, despite media assurances that other brands were safe to eat. Consumers claimed that if they could not have Blue Bell, they just would not eat ice cream. The purpose of this study was to explore the impact of social identity on brand loyalty and response to a food safety incident. We used a qualitative design, building on the foundational tenets of social identity theory, with semi-structured interviews as the data collection instrument. We found that perceptions of the Blue Bell brand were not impacted by the Listeria contamination, in fact brand loyalty was affirmed in most cases. Texans remained just as loyal to the Blue Bell brand post-crisis as they were pre-crisis, and actively pursued reconnection with the brand after the recall. A major factor in the extreme brand loyalty shown by consumers during the "Great Blue Bell Famine of 2015" stems from Blue Bell Creameries' Texas roots. Consumers in Texas strongly self-identify as Texans, and therefore are more loyal to Texas-based companies such as Blue Bell Creameries. Implications for other regional brands include connecting with regional social identities and communicating historical and geographical significance of brands to consumers to increase consumer loyalty.

"DDM1 protects against telomere rapid deletion in Arabidopsis thaliana"

Department of Biochemistry, College of Agriculture and Life Sciences
By: Xiaoyuan Xie

Telomeres are specialized nucleoprotein structures that prevent the end of linear chromosomes from being mistaken for a DNA double-strand break (DSB). Previous studies in mammals and plants reveal that epigenetic pathways, including DNA methylation, are crucial for telomere maintenance. Deficient in DNA Methylation1 (DDM1) encodes a nucleosome remodeling protein, essential for maintaining DNA methylation in Arabidopsis thaliana. Although ddm1 mutants can be propagated, in the sixth generation (F6) hypomethylation leads to rampant transposon activation and infertility. Here we examine the role of DDM1 in A. thaliana telomere homeostasis. We report that bulk telomere length in ddm1 mutants remains within the wild type range (2 - 5 kb) until F6, where it precipitously drops so that telomeres now span 2.1 Â± 0.3 kb.

Plants lacking DDM1 exhibit no dysregulation of the known telomere-associated transcripts, including TERRA. Telomerase activity declines modestly in successive generations of ddm1 mutants, which cannot account for the abrupt telomere shortening in F6 ddm1 mutants. Instead, telomere attrition correlates with a significant increase in extrachromosomal telomeric circles and G-overhang signals, suggesting that telomeres devoid of DDM1 are subjected to deletional recombination. Finally, telomere shortening in F6 ddm1 coincides with the onset of DNA damage hypersensitivity in the root apical meristem. Since DNA damage is known to stimulate homologous recombination, we postulate that telomere truncation in F6 ddm1 mutants is a byproduct of elevated recombination in response to genotoxic stress caused by transposon activation. Further, we hypothesize that deletion of telomeric DNA is beneficial overall for the integrity of stem cell pool by culling inviable stem cells. Collectively, these observations demonstrate a linkage between epigenetic player DDM1 and telomere maintenance and extend the understanding of telomeres in defending against genome instability.

"Simulated Effects of Juvenile Survival on Adult Population
Dynamics of the Houston Toad (Bufo houstonensis)"

Department of Wildlife & Fisheries Sciences, College of Agriculture and Life Sciences
By: Rebecca Aden

Amphibian populations have been documented to be declining worldwide for the last three decades. Determining the risk of extinction is one of the major goals of amphibian conservation. Low juvenile survivorship is a common issue among amphibians and the effects of juvenile survivorship on Houston toad populations (Bufo houstonensis) have not been studied extensively. The sex ratio of reproductively mature individuals within a population is an important determinant of population dynamics, particularly for endemic species such as the Houston toad, a species native to east central Texas. The species demonstrates differences in the age at sexual maturity for males and females thus causing a large intrinsic sex-ratio disparity. The objective of our research was to determine how juvenile survivorship affects this disparity along with population growth rates. We conducted a thorough literature review to obtain the best basic demographic data available and developed a stage- and sex-structured population dynamics model for the Houston toad using STELLAÂ®7.0.1. The model was then applied to simulate variations in mortality rates and the resulting sex ratio of reproductively mature individuals within the population as well as growth rates. Finally, we evaluated the performance of the model based on published literature. Our results showed that the sex ratio was most influenced by changes in juvenile and adult female mortality rates. As the juvenile survivorship increased, the sex ratio disparity increased as well as the growth rates. As adult female survivorship increased, the sex ratio disparity decreased and growth rates rose. Thus, as long as juvenile survivorship increases, the Houston toad population may not be affected by sex ratio disparity if enough juvenile females survive to reproductive age.

“Bacillus subtilis encodes a third Cid/Lrg-like operon with roles during biofilm formation”

Department of Biochemistry, College of Agriculture and Life Sciences
By: Sarah Elizabeth Hartman

The cid/lrg operons encode putative transmembrane proteins and their respective regulators. Despite their conservation among bacteria, there lacks a concise described function for these gene products. In Staphylococcus aureus, the cid/lrg operons are annotated as holin/antiholin-like proteins that control cell lysis; however, in the Gram-positive organism, Bacillus subtilis, the roles of the Cid/Lrg proteins are unclear. In B. subtilis, there are three Cod/Lrg operons: the lrg-like operon, ywbHG, is regulated by acetic acid, the cid-like operon, ysbAB, is regulated by pyruvate, and the yxaKC operon is uncharacterized. A recent study indicates that B. subtilis lacking all three Cid/Lrg-like proteins has a defect in biofilm formation. We seek to elucidate the role of Cid/Lrg proteins in biofilm formation. By monitoring expression of the yxaKC promoter to ÃŸ-galactosidase on biofilm media containing X-gal, I have shown that yxaKC is expressed in a concentric ring around the center of the biofilm, indicating that yxaKC is differentially activated in a subset of cells comprising the biofilm structure. Using RNA-seq, I have identified a repressor of yxaKC, the MarR-like protein yxaD, and obtained mutants of YxaD that are no longer able to repress the yxaKC promoter. Alignments of MarR-like proteins indicate that these variants of YxaD are likely in the DNA-binding region. Additionally, I have shown that YxaD interacts with ScpA, a component of the Structure and Maintenance of Chromosome complex (SMC). ScpA has been proposed to regulate gene expression by interacting with various transcriptional regulators. These results suggest that ScpA may mediate regulation of yxaKC through interactions with YxaD.

“The role of housing environment and nutritional composition
in influencing gut microbiota in chickens”

Department of Poultry Science, College of Agriculture and Life Sciences
By: Shawna Peer

Chickens are the most popular source of protein in the world (eggs, and meat), and also have a smaller environmental footprint compared to beef and swine. In contrast to mammals, chicken are unique in having a shorter digestive tract and faster digestive processes. This allows for a unique intestinal microbiome; the interactions of which have large impacts on poultry nutrition and health. Gut microbiota research (especially in mammals) has shown that nutrition and feeding times both influence the composition of the gut microbiome, which in turn interacts with the host immune system. Poultry housing environments are important considerations for the health and welfare of the birds, as well as consumer perception of poultry. Understanding how housing environments and feed composition affect the intestinal microbiome can provide insights into how immune function and metabolic processes are regulated, leading to the implementation of environments that promote health and food quality.

In this study, we investigated the cecal microbiome of both caged and cage-free laying hens that were reared on a standard industrial versus soy-free diet. Caged hens were reared in typical industry layer-style cages with one bird per cage and the cage-free hens were reared in a poultry barn with an outdoor enclosed yard with many birds per pen. We hypothesized that both the housing environment and diet both elicit unique gut microbiota profiles. Furthermore, we hypothesized that cage-free environments elicit the acquisition of greater microbial diversity, irrespective of diet.

The hens were euthanized with CO2 gas and dissected within 40 minutes of their death. Cecal content was collected and placed in RNALater and stored at -80C until further analysis. The DNA was extracted from the cecal content using the MoBio PowerFecal DNA extraction kit. PCR to amplify the V4 16S rRNA gene sequence was performed for microbiome metagenomic analysis. The 16S rRNA gene sequences were sequenced on an Illumina MiSeq sequencing system and analyzed using the MOTHUR pipeline and the statistical program R.

Our analyses show that the gut microbiota compositions of chicken raised in caged versus cage-free environments are significantly different and that cage-free hens had a more diverse cecal microbiome compared to the caged hens. Our results suggest the possibility that housing-environment based differences in gut microbiota of chickens influences differential immune responses in chickens.

“Antibacterial polymeric nanoparticles against Escherichia coli O157:H7 and Salmonella enterica Typhimurium”

Department of Food Science & Technology, College of Agriculture and Life Sciences
By: Yagmur Yegin

This study demonstrates the rose essential oil component (EOC) geraniol can be loaded into polymeric nanoparticles (NPs) with sustainable release profile. Geraniol-loaded NPs were prepared by flash nanoprecipitation and characterized for size, encapsulation efficiency, payload release during storage, inhibition of Escherichia coli O157:H7 and Salmonella enterica Typhimurium in vitro and on spinach surfaces, and NP-assisted transport of EOC into cellular membranes. Adjusting concentrations of stabilizing polymer, PluronicÂ® F-127, and geraniol produced NPs ranging in size from 26 to 412 nm. Antimicrobial NPs inhibited S. Typhimurium and E. coli O157:H7 growth at 0.25 and 0.2 wt.%, respectively. Geraniol-loaded NPs displayed sustained release with a time constant of 24 h, maintaining their antipathogenic properties over a prolonged time period. Pathogen reductions on treated spinach surfaces ranged from 0.3 to 4.2 log10CFU/cm2. Antimicrobial NPs may be useful for post-harvest decontamination of foods such as fresh produce from cross-contaminating microbial pathogens.

“Elucidating the molecular features that impact cytosolic penetration of the highly endosomolytic delivery agent, dfTAT”

Department of Biochemistry, College of Agriculture and Life Sciences
By: Kristina Najjar

Endosomal entrapment is a critical limiting step in the field of macromolecular delivery, which severely restricts the application of delivery tools. Cell penetrating peptides (CPPs), for instance, have been a widely used approach for cellular delivery, however generally only about 1% of endosomal content is released to the cytosolic space of cells, a step required for interaction of the macromolecule with its nuclear/cytosolic targets. Recently, my colleague and I generated the endosomolytic agent dfTAT, based on the protoypical CPP, TAT, which can deliver a variety of macromolecules, such as antibodies and transcription factors into the cytosol of live cells with a remarkable high efficiency and extremely low cellular toxicity. Due to its unprecedented high endosomolytic activity, we were interested in elucidating the mechanism by which dfTAT escapes from the endocytic pathway. By modulating the trafficking of dfTAT through the endocytic pathway, we identified the late endosome as the gateway from which dfTAT escapes the endocytic pathway to access the cytosolic space of cells. We established that dfTAT causes leakage of these vesicles by interacting with bis(monacylglycero)phosphate (BMP), a lipid highly-enriched in the membrane of late endosomes. This can be viewed as a unique lock and key system, in which dfTAT / BMP can be exploited for the development of future delivery agents. These results have led to my current work, which focuses on establishing the structure activity relationships for dfTAT. In this study, a focused library of peptide analogues based on the prototype dfTAT was synthesized and characterized for cellular uptake and endosomolytic activity. This information will provide an in-depth understanding of the unique molecular properties of CPP’s that are required to achieve efficient endosomal escape and cellular penetration. In addition, this work will help to lay a foundation for the design of improved cellular delivery agents and increase their potential use for therapeutic, cell biology and biomedical research application.

“Phase one laying hen performance of Hy-line Brown layers fed soybean and soybean free diets using a caged and cage free rearing system”

Department of Poultry Science, College of Agriculture and Life Sciences
By: Morouj Al-Ajeeli

Table egg quality is a major consumer concern in the U.S. The objective of this study was to evaluate soybean and soybean-free diets fed to Hy-Line Brown Commercial Layers based on egg production and quality parameters. A total of 246 layers 20 wks old were divided into 2 groups (120 hens) housed individually in wire cages and (126 hens) housed in a cage free rearing system. The cage system consisted of 6 replicates/treatment of 10 birds/replicate, and the cage free system consisted of 3 replicates/treatment of 21 birds/ replicate. Diets were formulated based on the nutrient requirements suggested by the management guide for those hens. Feed and water were offered ad libitum, and the hens were checked twice daily. All methods were approved by the TAMU Animal Care and Use Committee. Feed consumption was accessed every 2 wks and body weight was recorded every 28 d during the experiment for both facilities. Eggs were collected daily and egg weight (g) was recorded weekly. Egg quality data was collected at 2 wk intervals during the study to evaluate albumen height (mm), shell thickness, eggshell strength, and Haugh unit. For both facilities, results indicated that egg weight was greater in hens fed soybean meal than soybean free diet after only 2 wks of feeding ($P < 0.05$). For egg production, there was no significant difference between diets in cages system. However, in the cage-free system, hens fed the soybean diet produced significantly more eggs ($P < 0.05$) beginning at 26 wks of age. Feed conversion ratio (g egg/g feed) was significantly better ($P < 0.05$) in the cage system for hens fed the soybean diet beginning at 22 wks of age, and cage free system at 25 wks of age. For egg quality parameters, dietary treatments had no effect for both systems. In conclusion, soybean free diet can be a substitute diet to typical soybean diet with no impact on egg quality characteristics although it may influence egg weight and conversion ratio.

“An analysis of Facebook as a communication tool in Texas State Parks”

Department of Recreation, Park & Tourism Science, College of Agriculture and Life Sciences
By: Jieun Song

The purpose of this study was to examine the use of social media, i.e., Facebook, in Texas State Parks using secondary and primary data. Working together with the Texas Parks and Wildlife Department (TPWD), we collected data in two phases. The first phase measured the level of engagement by fans of ten state park’s Facebook pages, based on the number of likes, shares, and comments in 2016 (Jan. 1, 2016 â€“ Dec. 31, 2016). In the second phase, semi-structured interviews with social media administrators identified similarities/differences in the social media strategies of each park, and factors that contributed to high/low level of engagement on Facebook. The results will help TPWD understand practices that promote higher user engagement on the state parks’ Facebook pages, and develop an effective training program for social media administrators. Future research suggestions focus on the use of social media in state parks.

“Towards a Robust Framework of Sustainable Community-Based Tourism (SCBT): Exploring Destination Justice and Equity as a Part of Governance, A Case Study of Bryan-College Station, Texas, USA”

Department of Recreation, Park & Tourism Science, College of Agriculture and Life Sciences
By: Dr. Tek B. Dangi

Definitions and descriptions of Sustainable Tourism (ST) and Community-Based Tourism (CBT) abound. ST emerged in opposition to the negative impacts of mass tourism with the former being manifested in various forms such as community-based tourism, ecotourism, volunteer tourism, responsible tourism, and so on. Meanwhile, CBT has gained some prominence alongside ST, but it is unknown how it relates to ST? Multiple definitions, diverse principles, indicators and criteria in each make the concepts of ST and CBT highly problematic and at times pose research and practical challenges. Therefore, this dissertation was conducted by taking a scoping review type comprehensive literature review (CLR) on ST and CBT to develop a research framework, which then led to an empirical study.

The CLR found that the literature was consistent with key dimensions of sustainable tourism including economic, social, and environmental aspects. However, though the key dimensions remained the same, some specific aspects such as justice, ethics, and equity in the domain of governance were found to be under-represented in both the ST and CBT literatures. Based on the CLR and the gaps identified, a preliminary framework of SCBT was proposed retaining all the existing dimensions and criteria and adding the under-represented issues. The empirical study employed the tourism community in Bryan-College Station (BCS), Texas, which consisted of literature reviews, participant observation, and in-depth interviews with 40 participants. The analysis used an iterative approach to the qualitative data. The findings of the study suggested that issues of justice and equity were largely addressed by the governing bodies through mechanisms of collaborative participation and decision-making. Results suggest tourism has contributed to heritage preservation and enhanced community pride and cohesion. It was further found the emotional solidarity between the stakeholders, visitors and residents appear very strong. However, suggestions from a few participants for inclusion in decision-making, and inability of some ethnic minorities to take full advantage of equal employment opportunities, and their reduced work hours in summer suggest a need for a more pro-active and collaborative type of tourism governance. The recommendations of the study may be helpful in addressing justice and equity issues in tourism.

“Evaluating the effect of yeast cell wall supplementation on ideal threonine to lysine ratios in broilers as measured by performance, intestinal mucin secretion, morphology, and goblet cell number”

Department of Poultry Science, College of Agriculture and Life Sciences
By: Raghad Abdaljaleel

The objective of this study was to investigate whether or not prebiotic yeast cell wall previously shown to improve performance in challenge studies, effects threonine requirements by measuring performance, morphology, mucin secretion and goblet cell number per villi in the intestine. Two hundred forty 1-day-old Ross 308 broiler chickens were distributed in two Petersime battery brooder units (48 pens; 5 birds per pen). Different threonine to lysine ratios (0.65, 0.70, and 0.75) with 1.23 available lysine with and without yeast cell wall (YCW) at 250 ppm was feed for a 21-day trail. A basal diet with 22% protein and 2980 Kcal/Kg ME was used for the dietary treatments. The calculated lysine concentration was 1.35 while threonine was 0.88, 0.95, and 1.02 respectively. Birds and feed were weighted by pen and the weights recorded at day 1, 7, 14 and 21 of the experiment for general performance data. At day 21, samples from excreta and small intestine (jejunum and ilium) were collected. Crude mucin was analysed from excreta samples while villi height, crypt depth, villi width, muscular thickness and goblet cell number were measured in intestinal sections. The yeast cell wall did not show any significant effect with respect to the variables evaluated in this non-challenge study. Threonine to lysine ratio 0.75:1 showed the numerically higher body weight throughout the study with significant main effects for jejunum villi height, crude mucin, and goblet cell number. Increasing the ratio between threonine and lysine led to an increase the mucin secretion probably due to the increase in the number of the goblet cells per villi.

“The Hydroxyproline-Glycine Pathway for Glycine Synthesis in Neonatal Pigs”
Department of Animal Science, College of Agriculture and Life Science
By: Shengdi Hu

Glycine has crucial roles in nutrition and metabolism and is the most abundant AA in the plasma of newborn pigs (~1 mM; 2- to 3-fold greater concentrations than in plasma of other species). Quantitative analysis has shown that the classic pathways for glycine synthesis (from serine, threonine, and choline) are insufficient to meet the metabolic requirements of neonatal pigs. Thus, we hypothesized that there is an additional pathway for endogenous synthesis of glycine. On d 1, 7, 14 and 21 of lactation, milk samples were obtained from 6 sows. Six piglets were euthanized on each of those days to obtain plasma and tissue samples for analyses of amino acids, enzyme activities, and expression of proteins and mRNAs. Data were analyzed by one-way ANOVA. Our results indicated high concentrations of hydroxyproline as a tripeptide in sow’s milk and plasma from piglets. The specific activities of hydroxyproline oxidase (OH-POX), alanine:glyoxylate aminotransferase (AGT), and 4-hydroxy-2-oxoglutarate aldolase (HOG), which are key enzymes for synthesis of glycine from hydroxyproline, decreased ($P < 0.05$) in liver and kidneys between d 1 and 21, but increased ($P < 0.05$) in the pancreas and small intestine. Similar results were obtained for the expression of mRNAs for those enzymes and for proline oxidase (POX). For the serine- and threonine-dependent glycine pathways, specific activities and expression of mRNAs for serine hydroxymethyltransferase (SHMT) and threonine dehydrogenase (TDH) increased ($P < 0.05$) between d 1 and 21. Immunohistochemistry (IHC) revealed that the localization of OH-POX and POX proteins in liver switched from periportal to perivenous hepatocytes with age, which indicated a change in hepatic catabolism of hydroxyproline and proline. In the kidneys, the abundance of OH-POX and POX proteins appeared to decrease with age. Results of IHC also revealed the presence of OH-POX and POX in the pancreas, small intestine, stomach, skeletal muscle, and gallbladder. These findings indicate the presence of the hydroxyproline-glycine pathway for the synthesis of glycine from milk- and endogenous collagen-derived hydroxyproline via interorgan metabolism in neonatal pigs which may compensate for a severe deficiency of glycine in sow’s milk.

“Evaluation of Statistical Process Control Procedures to Monitor Feeding Behavior and Ruminal Temperature Changes Associated with Experimental Inoculation of Mannheimia haemolytica”
Department of Animal Science, College of Agriculture and Life Sciences
By: William C. Kayser

Objectives of this experiment were to determine if statistical process control (SPC) procedures coupled with remote collection of rumen temperature (RT) and feeding behavior (FB) patterns could accurately differentiate between animals experimentally inoculated with Mannheimia haemolytica (MH) or phosphate buffer solution (PBS), and determine if live yeast (LY) supplementation would mitigate responses to MH challenge. Thirty-six crossbred steers (BW=352 Â± 23 kg) seronegative for MH were allocated within a 2X2 factorial treatment arrangement: Factor1 = roughage-based diet with or without LY (Saccharomyces cerevisiae boulardii.I-1079 at 1x1010 cfu/d, Lallemand), Factor2 = bronchoselective endoscopic inoculation with MH or PBS. Electronic feed bunks (GrowSafe) were used to measure DMI and FB traits, and ruminal thermo-boluses (Medria) used to measure RT at 5-min intervals. Data was collected 28-d prior to and following inoculation. Steers inoculated with MH exhibited elevated levels of haptoglobin, white blood cells and neutrophils ($P<0.02$), indicating that the MH challenge effectively stimulated immunologic responses. However, only 1 animal displayed overt clinical signs of disease. Shewhart charts (SPC procedure) were used in this analysis, and sensitivity, specificity and accuracy computed to evaluate univariate and multivariate models based on principal components analysis (PCA). Of the FB traits monitored, time to bunk had the highest model sensitivity (94%) and accuracy (94%), with model accuracies for head-down duration, and bunk visit duration and frequency being less (80, 79 and 56%, respectively). Model accuracy for DMI was intermediate at 85%. To address the diurnal nature of RT, data were average over 6-h intervals, and quarterly RT models evaluated separately. Model accuracy for the first quarter RT was more accurate (84%) then the other respective quarterly RT periods (82, 76, 79%). Two PCA models were constructed separately using all FB and RT traits. Model sensitivity and accuracy were relatively higher for the FB PCA (94 and 95%) then the RT PCA model (78 and 85%), with both PCA models performing slightly better than the best respective univariate trait model. The performance of a combined PCA model (all traits) was intermediate in accuracy at 91%. In this study, LY supplementation did not influence the sensitivity or accuracy of the univariate or PCA models. These results indicate that Shewhart procedures can effectively identify deviations in FB and RT patterns for the purpose of sub-clinical BRD detection. Furthermore, the PCA models were numerically more accurate than univariate traits and should be more robust in application due to their multivariate nature.

“Boll weevil (Anthonomus grandis) population genomics as a tool for monitoring and management”

Department of Entomology, College of Agriculture and Life Sciences
By: Tyler Jay Raszick

Despite the success of eradication efforts across most of the cotton-producing regions of the U.S., the cotton boll weevil (Anthonomus grandis grandis Boheman) remains a major pest of cotton in much of the New World. The area along the Texas border with northern Mexico has been a particularly troublesome area for eradication efforts due to political and environmental constraints, and the fact that the region is the northern edge of the weevil’s natural sub-tropical range. In order to improve boll weevil eradication efforts, we have developed a robust population genomics approach to determine the genetic relationships and patterns of gene flow among weevil populations along the Texas-Mexico border. This approach enables identification of source populations for re-introductions in previously eradicated areas (should they occur) and will guide preventative control measures along the border. Using double digest restriction site-associated DNA sequencing (ddRADseq), we generated 6901 SNP markers for 48 individual weevils from four major cotton-growing regions in northern Mexico and from a domestic population in southern Texas. Here, we present the analysis and interpretation of these data, as well as ongoing work towards further elucidating the patterns of gene flow in this economically important species across its range.

"Human Wildlife Conflict- Case of the Royal Bengal Tiger"
Department of Recreation, Park & Tourism Science, College of Agriculture and Life Sciences
By: Amit Ghoshal

The mangrove forests are quintessential for protecting the ecosystem of the Sunderbans, along with the majority of the world's last wild Bengal tigers. The wild tiger population was 100,000 in the early 1900â€™s but has been reduced to less than 1,800 tigers by 1971, with the Tiger Task Force predicting their extinction by the end of the 21st century. However, Sunderban tigers have recorded the maximum decline in their population size with India having a paltry 74 tigers and Bangladesh has about 100 individuals (Guardian report, July, 2015). The World Wildlife Fund (WWF) has reiterated that the Bengal tigers, along with the worldwide tiger population, are in serious danger of becoming extinct in the wild. Human Wildlife Conflict issues are major contributors to the tiger depredation along with the poachers who kill the remaining majestic animals for pecuniary gains. The collateral damage is caused to the fragile mangrove ecology and to the equally endangered associated wildlife of the Sunderban forests.

"Reduction of Salmonella and Shiga-Toxigenic Escherichia coli on alfalfa seeds and sprouts using an ozone generating system"
Department of Animal Science, College of Agriculture and Life Sciences
By: Zahra Hassan Mohammad & Castillo, A

Several outbreaks have been associated with consumption of alfalfa sprouts contaminated with Shiga-Toxigenic Escherichia coli (STEC) and Salmonella. Sprouts have become public health concern. Since chemical treatments to inactivate pathogens on alfalfa seeds and sprouts have shown little effect, the ozone application was investigated as an intervention. This study evaluated the application of ozone to reduce STEC and Salmonella on the surface of alfalfa seeds and on sprouts. Inoculated seeds with a cocktail of 3 strains of Salmonella and 3 strains of STEC and sprouts obtained from the same inoculated seeds were separately subjected to aqueous ozone treatment containing 5 mg/L ozone for 10, 15, 20 minutes respectively. The samples were immersed into ozonated water with continuous oxygen feeding pressurized with 10 psi. On inoculated seed, the mean log reductions achieved after treatment were 1.6, 1.7 and 2.1 and 1.5, 1.6 and 2.1 for Salmonella and STEC, respectively. For sprouts obtained from the inoculated seed, the log reductions after treatment for 10, 15, and 20 min were 0.7, 1.1 and 3.6 and 0.7, 1.2 and 1.8 for Salmonella and STEC, respectively. There were significant differences between log reductions after the different times of treatment in both seeds and sprouts. There were no significant difference ($P>0.05$) between Salmonella and STEC in the log reductions achieved on seeds. However, there were significant differences between Salmonella and STEC in the log reductions achieved on sprouts. In addition, Visual examination showed no negative effects on ozone treatment on seeds or sprouts. More research is needed to confirm these findings. In conclusion, ozone may be a feasible intervention to eliminate STEC and Salmonella from the surface alfalfa seeds and sprouts if used with appropriate concentration and proper time of exposure.

“DNA methylation is a possible basis of phenotypic alterations observed in suckling Brahman calves”

Department of Physiology of Reproduction, College of Agriculture and Life Sciences
By: Brittni Littlejohn

The objective of this experiment was to examine DNA methylation as a potential basis for phenotypic alterations observed in prenatally stressed (PNS) compared to control calves (Littlejohn et al., 2016). Previously, 41 of 85 mature Brahman cows were transported for 2-h periods at 60, 80, 100, 120, and 140 d of gestation, while the remaining cows were controls (n=44). All calves born to control and transported dams (PNS group) were evaluated to determine phenotypic differences in temperament, circulating concentrations of cortisol, immune function, and metabolism as suckling calves. At 28 d of age each calf was restrained for collection of jugular blood samples. Buffy coat cells were harvested from whole blood and stored at -80 C. DNA was isolated from buffy coat cells of 7 PNS and 7 control bulls using phenol-chloroform extraction procedures and the samples were analyzed using reduced representation bisulfite sequencing (Zymo Research; Irvine, CA) to determine differential methylation of DNA. Reported genes were differentially methylated ($P < 0.015$) in PNS compared to control calves (Table 1). Genes that were defined as strongly hypermethylated (n=41) were =33% more methylated in PNS than control bulls, while genes that were defined as strongly hypomethylated (n=49) were =33% less methylated than controls. Reported genes were related to immune function, metabolic function, behavior/stress/neural function, reproductive function, and cell signaling/gene function. Several genes were ascribed to multiple functions. Differentially methylated genes related to phenotypic alterations observed in PNS compared to control bull calves suggest epigenetic programming of biological systems in utero.

Biology; Chemistry; Mathematics; Physics & Astronomy; Statistics

"Electrostatic Interactions Control the Selectivity of NHC-Catalysed Kinetic Resolutions"
Department of Chemistry, College of Science
By: Rajat Maji

N-heterocyclic carbenes (NHCs) have emerged as powerful organocatalysts in a number of enantioselective transformations including kinetic resolutions (KR). While the appeal of NHCs alone continues to expand, their recent use in cooperative catalysis involving organocatalysts, lewis acids, metals, adds further incentive to their theoretical study. A molecular level understanding of these processes holds the key for the improvement of existing protocols and the rational design of new reactions.

NHC mediated KR of alcohols and amines remain at the forefront of catalytic applications due to the abundance of these functionalities in drugs and other chiral biologically active molecules and numerous methods have been developed over years which can be broadly classified into three distinct categories: while most strategies relies using a chiral catalyst with an achiral additive or vice versa, intriguingly there are few methods that doesnâ€™t require any co-catalyst to achieve selectivity.

We have applied modern computational quantum chemistry methods using Gaussian suites to unravel the mystery of reactivity and catalytic selectivity of different NHC catalysed KR's. Lowest transition state structures were identified by an exhaustive manual conformational search, topological analysis of electron density was performed using wavefunctions, AIM and Distortion-Interaction analysis were performed to identify key non-covalent interactions. Our findings suggest a common electrostatic mode of stereo-induction in these transformations, as well as by-product mediated co-catalysis to ensure high turnout and catalytic efficiency. Ultimately this points towards a more general understanding of the requirements for both high degrees of activity and stereoselectivity in NHC-catalyzed KR. We hope, insights uncovered in this study will not only have implications for the design of more effective catalysts and future reaction development of challenging bio-active substrates, but also help to guide judicious choice of protic additives by exploiting such underappreciated non-covalent interactions.

"Ethanolamine alleviates oxidative stress and mitochondrial supercomplex assembly defects in cardiolipin deficient cells: implications for Barth syndrome"
Department of Biochemistry, College of Agriculture and Life Sciences
By: Charli D Baker

Barth syndrome (BTHS) is a severely debilitating genetic disorder characterized by perturbations in mitochondrial phospholipid composition, with a primary defect in cardiolipin (CL) biosynthesis. Studies on BTHS patient cells as well as a number of model systems, including the yeast Saccharomyces cerevisiae, have shown that decreased CL levels result in reduced mitochondrial respiratory chain supercomplex formation and increased oxidative stress. CL, like phosphatidylethanolamine (PE), is a non-bilayer forming phospholipid that is highly enriched in mitochondrial membranes. Due to their similar biophysical properties, PE and CL have been proposed to have overlapping functions, raising an intriguing possibility that elevating mitochondrial PE levels may compensate for CL deficiency in BTHS mitochondria. To test this hypothesis, we used an ethanolamine (Etn) supplementation strategy to elevate mitochondrial PE and demonstrated that Etn supplementation rescues the respiratory growth of CL deficient cells. Surprisingly, Etn-mediated rescue was independent of PE biosynthesis and was solely dependent on the cellular incorporation of soluble phospholipid precursor Etn, but not choline. Etn rescued respiratory growth by restoring mitochondrial respiratory chain supercomplex assembly and reducing oxidative stress in CL deficient taz1? cells, a yeast model of BTHS. Interestingly, Etn failed to rescue supercomplex formation in crd1? cells that are completely devoid of CL, suggesting supercomplex formation requires a critical amount of CL. Etn supplementation did not rescue respiratory defects caused by the loss of mitochondrial supercomplex assembly factors and thus was specific to CL deficiency. Taken together, our work highlights a new role of Etn in attenuating mitochondrial dysfunction caused by CL deficiency and offers a novel therapeutic approach for the treatment of BTHS.

"Synthetic, Functional Thymidine-derived DNA Analogs from a 6-Membered Cyclic Phosphoester"

Department of Chemistry, College of Science
By: Yi-Yun Timothy Tsao

Nucleosides play an important role in Nature, yet there are only few routes that allow access to well-defined synthetic DNA and RNA derivatives. Although the incorporation of non-natural bases into DNA allows for significant fundamental investigations of structure and function, it remains a challenge to synthesize well-defined, functional DNA analogs. The presented work aims to develop chemistry to allow for a synthetic strategy that includes organocatalytic ring-opening polymerization of a 6-membered cyclic phosphoester monomer at ambient temperature to afford a new type of thymidine-derived 3',5'-linked polyphosphoester with a butenyl group located on each repeat unit and number-average molecular weights (Mn) up to 11 kDa. The monomer was prepared in two steps, and the polymerization proceeded in a controlled fashion to afford polymers with low dispersities.

"The Heteromorphism in Category Theory"

Department of Mathematics, College of Science
By: Christian Williams

Category Theory is the study of mathematics. Any type of mathematical object forms a category by considering the collection of these objects with the arrows between them which preserve the type. For example, since sets are just collections of elements, the category Set has objects sets and arrows functions; but if the object has structure, such as numbers with an operation, the arrows must be compatible. This insight is the culmination of a mathematical revolution, through which abstraction has begun to attain self-reflection; our conceptual systems have become pervasive and interpenetrating by their mutual exploration, and this understanding has purified our theoretical foundations almost to transparency.

I argue that we have not seen this revelation in its true light because of philosophical indifference. Despite our knowledge of the deep symbiosis of the three aspects of thought - logic, type theory, and category theory - they are still artificially separated by formal representation. Right now, a ""category"" is just a graph, with only an external interpretation of those ""objects"" being actual mathematical objects. This is an unnecessary obfuscation which has put us in the very strange position of studying more complex logical processes than we can faithfully represent. There are several ways forward, clues as to the immanent unity of these conceptual foundations; I happened to discover that one such niche was still completely unexplored - the heteromorphism.

In certain subtle and complex parts of category theory, one considers ""arrows between objects of different categories,"" or heteromorphisms. This is impossible in conventional category theory, because the language is always internal to one particular category. This is casually overlooked as a formal curiosity, but I believe it is actually at the heart of the interrelation of logic, type theory, and category theory. The ""rules"" of a given category are trivially determined by the definition of that category, but once you allow the notion of morphisms between objects of different types, one begins to address the real meat of mathematics - how to learn more about objects by actually changing them.

In this paper, I demonstrate how this neglected concept is deeply involved in the central notions of category theory, such as universal property. My hope is to raise awareness to the idea that there are fascinating processes even at the very core of thought, and that if we understand this clearly, we may even understand truth itself.

“Analysis of skeletal part proportions of mammalian microvertebrates taken by barn owls (Tyto alba) in southern Africa”

Department of Anthropology, College of Liberal Arts
By: Mr Timothy Lee Campbell

Owls are predators of small animal communities and are useful in studying them as they preserve parts of prey consumed in the form of regurgitated pellets. Analyses of pellet contents have long contributed valuable information on modern microfaunal community composition. Additionally, the contribution of owls to the fossil record is also well documented with the fossilized remains of prey commonly used to reconstruct paleoenvironments. In many studies prey craniodental remains feature prominently in analyses, while postcrania are generally not considered. As studies have noted inter and intraspecific variation among owls in prey skeletal part proportions recovered, sole reliance on craniodental remains may underestimate the true number of prey taken, thus influencing analyses relying on count data. Here we present results on the skeletal part proportions of mammalian microvertebrates recovered from six barn owl roosts: three from Namibia, two from South Africa, and one from Botswana. Individual skull (mandibles and maxillae), appendicular long bone (femora, tibiofibulae, humeri and radii), and girdle elements (scapulae and os coxae) were sided, identified to order, and used to calculate minimum number of individuals (MNIs) per skeletal region. Results show that for most roosts, MNIs calculated using the appendicular elements are higher than those calculated using skull elements, with the tibiofibula being the most common postcranial element found. Counts of girdle elements produced the lowest MNIs, while the highest were calculated using all elements combined.

Supporting previous studies, these results further highlight the need for including postcrania in any analyses dependent on accurate prey count data.

“Challenging the ‘evolutionary museum’ concept:
Phylogeographic patterns of 70 Afro-tropical avian species”

Department of Wildlife & Fisheries Sciences, College of Agriculture and Life Sciences
By: Jerry Huntley

The lowland forests of Africa make up the second largest contiguous block of tropical forest in the world and house substantial amounts of avian biodiversity. Early biogeographic hypotheses seeking to explain avian diversity in Africa categorized these forests as “evolutionary museums,” or ecologically stable areas where very little diversification has taken place over the last three millions years. However, recent biogeographic investigations have begun challenging the “evolutionary museum” concept by revealing complex cryptic patterns of recent genetic diversification. Through a combination of field sampling and GenBank, we compiled mitochondrial sequences for over 70 avian Afro-tropical lowland forest species, representing a diverse range of life history strategies. We estimated genetic distances within all species on two levels: a broad comparison between traditionally recognized forest blocks and a narrower regional comparison. Our results reveal that a substantial amount of avian cryptic diversity, largely originating over the past three millions years, is harbored within the lowland forests of tropical Africa. Additionally, the genetic data displays substantial amounts of intra-regional structuring, likely due to climate-induced refugial scenarios during the Plio-Pleistocene. The results of this investigation offer a strong counter to the present classification of Afro-tropical lowland forests as “evolutionary museums.” Instead, our data suggest that African lowland forests have been historically dynamic regions, fully capable of creating genetic diversity. In light of conservation issues created by deforestation, it is imperative to integrate cryptic diversity patterns into modern taxonomy and recognize the important role of lowland forests in creating unique avian genetic diversity.

“Distance Metrics for Measuring Joint Dependence with Applications to Causal Discovery”

Department of Statistics, College of Science
By: Shubhadeep Chakraborty

Szekely et al. (2007) introduced the concept of distance covariance for measuring statistical dependence between two random vectors of arbitrary dimensions. Distance covariance is zero if and only if the two random vectors are statistically independent. However, many statistical applications require the quantification of joint dependence among more than two random vectors. Examples include model diagnostic checking for directed acyclic graph and independent component analysis. In this work, we generalize the notion of distance covariance to quantify joint dependence among $d >= 2$ random vectors. We introduce high order distance covariance to measure Lancaster interactions [Lancaster (1969)], and define Joint Distance Covariance (Jdcov) as a linear combination of distance covariance and its higher order counterparts, which completely characterizes joint independence. In the population case, the value of Jdcov is zero if and only if the d random vectors are mutually independent. Empirical estimators are constructed

based on certain Euclidean distances between sample elements. We study the large sample properties of our estimators and propose a bootstrap
procedure to approximate their sampling distributions. We further propose a bootstrap-assisted non-parametric test for independence and show the asymptotic consistency under both null and alternative hypotheses. The new metric is employed for model selection in causal inference which is based on joint independence testing of residuals in structural equation models. The effectiveness of our method is illustrated via simulated and real datasets.

"Uncovering the Role of Two Small Regulatory RNAs in Infection in the Causative Agent of Lyme Disease the Spirochete Borrelia burgdorferi"

Department of Genetics, College of Agriculture and Life Sciences

The etiologic agent of Lyme borreliosis, Borrelia burgdorferi, is responsible for more arthropod-borne infections than any other pathogen in the United States with over 300,000 cases diagnosed each year. In areas where B. burgdorferi infections are prevalent, morbidity associated with this infection is high and is seen mostly in the form of cardiac, neurologic, or arthritic sequelae. Although B. burgdorferi has a simplistic genome relative to most living systems, it is adept at altering its gene regulatory pattern as the pathogen moves from the arthropod vector and mammalian species it can occupy during its lifecycle. Although we understand the role of several transcriptional regulators in this adaptive response, there are additional layers of regulation for some borrelial genes (e.g., bosR and dbpBA) that have not been elucidated. Given their emergence as important regulatory effectors in many bacterial systems, including a linkage to virulence gene expression and protein production in a number of pathogens, we hypothesized that small, non-coding RNAs (sRNAs) were required for similar regulatory functions in B. burgdorferi. Using a collaborative approach, the B. burgdorferi Tn library coupled with Tn-seq, as well as RNA-seq technologies, identified several putative sRNA mutants that were attenuated following experimental infection. These same sites encoded sRNA previously identified via RNA-seq of total transcript profiles as well as libraries specific for sRNAs. Subsequent infections with individual Tn mutants at these sites indicated that 4 of the mutants were impaired in their ability to colonize mice. From those four sRNA we were able to make deletion strains of two of the sRNAs which are localized in intergenic (IG) regions of linear plasmid 17 of the spirochete's genome. We then infected mice using in vivo imaging with bioluminescent B. burgdorferi isogenic strains to temporally and spatially characterize borrelial dissemination. We found that the sRNA IG bbd18-bbd19 has an attenuated phenotype and is important for optimal colonization of tissues and is required for colonization of the heart. The sRNA IG bbd05-bbd05.1 colonization and dissemination patterns were similar to wild type levels. The work presented here provides a link between sRNA regulatory pathways and B. burgdorferi infection. We predict that the subsequent characterization of these sRNAs will provide insight into genetic factors that contribute to normal physiological processes as well as those that impact the pathogenic potential of B. burgdorferi.

"Vertebrate Midbrain Development is Highly Responsive to Wnt8a Signaling During Early Anterior Posterior Patterning"

Department of Biology, College of Science
By: David Green

The earliest symmetry breaking event within the vertebrate neural ectoderm occurs shortly after it is specified. The neural ectoderm, which initially carries a default forebrain fate, is transformed through posteriorizing morphogen signals emanating from the posterior edge of the embryo. This establishes an anterior posterior gradient that allows the development of midbrain, hindbrain and spinal cord fates. Our lab has focused on the gene wnt8a which has been shown to repress anterior neural fates in a dose dependent manner. How the neural ectoderm responds to different doses of wnt8a signaling and whether this response is consistent or dynamic during early symmetry breaking has been poorly studied. Through a combination of pharmacological drugs and heat shock inducible transgenes, we have investigated the response of the zebrafish neural ectoderm to temporally regulated Wnt signaling. Our findings suggest that the response to Wnt signaling is highly dynamic depending on the timing of signal reception by the neural ectoderm. Here we will focus on the midbrain, which is suppressed by Wnt signaling before 7 hpf, but becomes resistant to suppression afterward 7 hpf. Our findings suggest that timing of these posteriorization signals is critical for proper establishment of the major domains of the brain.

"Tailored Supercontinua via Spatial Beam Shaping"

Department of Physics, College of Science
By: Aleksandra Antonovna Zhdanova

Stable, coherent, broadband and bright sources of light are essential for a variety of applications, from spectroscopy to imaging and wireless communication. Supercontinuum generation offers just such a source and serves as a promising tool for these multidisciplinary uses, but challenges remain in terms of optimizing consistency and spectral width. In this poster, we propose that spatial manipulation of the pump beam may solve both of these challenges. Recently, the enhancement of a variety of nonlinear effects has been demonstrated using beam-shape optimization. We extend these results and methods to the regime of supercontinuum generation. Our preliminary results indicate that we may not only broaden the supercontinuum spectrum using this method, but we may also influence which spectral regions are covered and arbitrarily "tailor" our spectrum to end-user applications. This is a demonstration of a wholly new effect in nonlinear optics, providing a way to dramatically improve efficiency in using spectroscopic tools for early cancer detection, lowering the cost of making such science available for all.

"Genetic Pest Management Technologies to Control Invasive Rodents"
College of Medicine
By: Dona Kanavy

Many strategies exist to manage invasive pests on islands, ranging from poison to trapping, with varying degrees of success. Genetic technologies are increasingly being applied to insect pests, but so far, not to vertebrates. We are implementing a genetic strategy to eradicate invasive mouse populations as another tool for pest control.

Mus musculus, the common house mouse, is one of the most widespread invasive species. Mice threaten human health, agriculture, and biodiversity on many islands, particularly seabirds. Seabirds are endangered indirectly through competition of resources or predators being attracted by the mice or directly with mice attacking chicks and eggs. Rodenticides are the most common method of eradicating mice, but their use leads to poisoning of non-target species and has limited efficacy against mice. An approach that could eliminate non-target species impact would be to engineer daughterless mice linked to a gene drive system for self-sustained propagation. For this project, we have investigated exploiting a naturally occurring gene drive, the t-complex. Using the tw2 haplotype of the t-complex, we observed the tw2 haplotype being transmitted to offspring with a transmission distortion ratio of 95.3%.

The daughterless phenotype is being accomplished by inserting the Sry gene (male sex-determining gene) into an autosome containing the tw2 haplotype via CRISPR/Cas9 gene editing. The presence of Sry will induce testis formation, regardless of the sex chromosomes naturally inherited. When Sry is inserted into the t-complex, the desired gene will spread through the population, eliminating female offspring. This model system will support studies to evaluate the effectiveness of crashing an invasive population without adversely affecting other species. While still in the beginning stages, this is a novel idea and once this method has been perfected, it will open the way to use this genetic strategy for the eradication of other invasive mammal species.

"Molecular analysis of epidermal growth factor receptor (EGFR)-independent colorectal cancers"
Department of Genetics, College of Agriculture and Life Sciences
By: Carolina Mantilla Rojas

According to the American Cancer Society, colorectal cancer (CRC) is the third most common type of cancer, with approximately 50,000 deaths expected this year. One of the first targets for molecular targeted therapies is the epidermal growth factor receptor (EGFR). The efficiency of anti-EGFR therapy is influenced by the genetic context of the tumor development. In this study, we used a conditional Egfr allele (Egfrf) within the ApcMin/+ mouse model and identified EGFR-independent tumors with faster growth rates than those that develop in EGFR-wild type mice. To assess aggressiveness of EGFR-independent tumors, we used a metastatic CRC mouse model containing conditionally inactivated Apc alleles (Apcf/f) in combination with a conditionally active allele of Kras (KrasLSL-G12D). It has been reported that delivery of Cre recombinase-expressing adenovirus to the distal colon of these mice results in tumors that progress to carcinoma in 50% of the cases within 20 weeks, and liver metastases develop in approximately 20% of mice at 24 weeks. We discovered a 10% increase in the penetrance of tumors arising in the absence of EGFR (Egfrf/f, Apcf/f, Kras LSL-G12D/+). Endoscopic analysis suggests an increase in tumor multiplicity in EGFR-deficient tumors when compared with tumors developing in EGFR-wild type mice. In addition, biweekly colonoscopies confirmed that colonic tumors have a faster growth rate in the absence of EGFR. High-frequency abdominal ultrasound suggests liver metastasis at 16 weeks in 20% of mice lacking EGFR. These findings support the existence of an EGFR-independent mechanism of CRC progression.

"De novo transcriptomic analysis of density-dependent phase plasticity in a locust (Schistocerca piceifrons) and two closely related non-swarming grasshoppers"

Department of Entomology, College of Agriculture and Life Sciences
By: Dr. Bert Foquet

Locusts are grasshoppers showing density-dependent phase polyphenism. In response to changes in population density, solitarious, cryptically colored individuals transform into a conspicuously colored gregarious form that forms dense migratory swarms. In contrast to the morphological and behavioral characteristics of this phase polyphenism, its molecular basis is not well known. Up to now, only two locust species are well studied: the migratory locust (Locusta migratoria) and the desert locust (Schistocerca gregaria). In these species, EST-libraries and RNA-sequencing were used to shed a first light on the molecular differences between both locust phases. In our study, we continue the search for genes involved in density-dependent phase polyphenism in another locust species, the Central-American locust (S. piciefrons), and two closely-related grasshoppers: S. americana and S. serialis cubense. These two species are not known to swarm in the wild, but show clear characteristics of density-dependent phase plasticity in the lab. RNA sequencing in this interesting set of species confirms results found in other locust species, and further gives us the unique opportunity to not only compare the expression of RNA between solitarious and gregarious locusts, but also between species showing different degrees of density-dependent phase plasticity and swarming.

"Simultaneous Velocimetry and Thermometry of a Hypersonic Flow Field via the VENOM Technique"

Department of Chemistry, College of Science
By: Joshua Winner

One of the most important unsolved problems of classical mechanics is turbulence. The Navier-Stokes equations provide a set of coupled differential equations, which can be utilized to model flow field properties. However, experimental data is needed to test the validity of these models. The vibrationally excited nitric oxide monitoring technique (VENOM) can measure instantaneous three-component velocity and two-dimensional thermometry through a combination of molecular tagging velocimetry and planar laser-induced fluorescence. These experimental measurements in hypersonic flow fields can provide a real world comparison to turbulent models being developed today. Our current experimental measurements involve probing a hypersonic turbulent boundary layer, an environment which provides a wide range of velocities and temperatures.

“Laser Initiated Photochemistry as a Means to Modify Turbulent Hypersonic Flows”
Department of Chemistry, College of Science
By: Niclas Allen West

The coupling of microscopic energy transfer/relaxation and macroscopic turbulence impacts the behavior of the flow around control surfaces for hypersonic vehicles. To study the interaction of this thermal non-equilibrium with the macroscopic behavior of turbulence, we seek to utilize lasers to generate thermal perturbations in specific molecular modes in canonical hypersonic flow fields. Characterization of this Laser Induced Non-thermal Equilibrium (LINE) technique relies on understanding mechanistic details of energy transfer from highly excited molecules to the flow. It is believed that both energy transfer magnitudes and timescales can influence turbulent flow fields. As a test case, highly vibrationally excited Benzene in a N2 bath was created after laser excitation at 193 nm. The time dependent increase in the temperature of the bath was experimentally probed using NO laser induced fluorescence. The experimental bath temperature rise was fit to simulations from the master equation program MultiWell as well as classical trajectory calculations. Multiple models of energy transfer were used to evaluate the effects of low probability super collisions as well as molecular internal energy dependent energy transfer on the overall time of relaxation of Benzene.

“Photodissociation of Acetaldehyde: Imaging the Methyl Radical”
Department of Chemistry, College of Science
By: Colin Wallace

Velocity map ion imaging (VELMI) has been employed to study the photodissociation of acetaldehyde in the wavelength range of 288 to 310 nm. These measurements have revealed the effects of both wavelength and concentration on the apparent clustering of acetaldehyde in our molecular beam. Images of the methyl radical have shown a bimodal energy distribution at shorter wavelengths. The low energy distribution has been attributed to the formation of methyl radical via a triple fragmentation pathway. The low energy distribution disappears at wavelengths longer than 293 nm which corresponds to the dissociation threshold for the triple fragmentation pathway. Images taken at varying concentrations have shown minimal clustering of acetaldehyde in the molecular beam.

“Quantitative surface-enhanced Raman spectroscopy using
a core-shell nanocube substrate for kinetic analysis”
Department of Chemical Engineering, College of Engineering
By: Joshua David Weatherston

Surface Enhanced Raman Scattering (SERS) spectroscopy is a highly sensitive analytical technique capable of identifying surface-adsorbed chemical species at extremely low concentrations. The low detection threshold and the “fingerprint” nature of this vibrational spectroscopic method make SERS an ideal candidate for multiplexed biomolecule detection. SERS is a consequence of the large electric field enhancement present near nanostructured probe surfaces; as such, its signal is dependent on the morphology and dielectric properties of the probe and the analyte's proximity to the probe. To create a suitable substrate for high-throughput SERS measurements, highly monodisperse plasmonic silver nanocubes were synthesized and coated with several atomic layers of gold in a large-scale batch synthesis. The theoretical SERS enhancement of silver nanocubes (AgNC) and silver-gold core-shell nanocubes (Ag@AuNC) were calculated using finite element method (FEM), which predicted large enhancement factors. The FEM computation was confirmed by acquiring Raman spectra of the nanocubes functionalized with Raman-active organic dyes. Compared with pure silver nanocubes, the gold coated substrate showed greater Raman enhancement, increased resistance to particle degradation, and better compatibility with biological analytes. SERS measurements are often subject to signal variability because the SERS enhancement factor varies substantially with local conditions, especially interparticle distance, which can change during the course of a kinetic assay. Quantification was achieved through co-adsorption of analyte with an inert internal standard. To demonstrate the quantitative capabilities of the Ag@AuNC SERS probe, the kinetics of a base-catalyzed crossed aldol condensation reaction were analyzed.

"Patterns of Parasitism: The Latitudinal Diversity Gradient of Parasitic Helminths"

Department of Wildlife & Fisheries Sciences, College of Agriculture and Life Sciences
By: Whitney Preisser

The tropics are host to the greatest diversity of animal fauna, with species diversity generally decreasing as latitude increases. Less attention has been given to parasite latitudinal diversity gradients (LDG). There is not a clear consensus on a general latitudinal pattern of parasite diversity and more studies investigating this topic are needed. It is important to note that latitude itself cannot explain parasite species distributions; rather, multiple abiotic and biotic factors vary with latitude, and the amount of pressure they exert on parasite species may vary across geography. My research seeks to investigate the parasite LDG through field sampling of rodents and their helminth parasites (flukes, tapeworms, and roundworms) across a latitudinal gradient and analyzing the influences of abiotic and biotic factors on helminth diversity and species distributions. Notably, this research will have important implications in determining the latitudinal patterns of helminth diversity, as this pattern in rodents has never been closely examined. Rodents were trapped and collected from specific sites along a latitudinal gradient across North and Central America. Captured rodents were dissected for internal parasite collection and collected helminths were identified to the species level using morphological methods and preserved using standard techniques. At each trapping locality, abiotic and biotic factors were measured. These factors were analyzed with helminth diversity and distributions to find significant correlates; analyses were performed both across localities and within host species. Results of the helminthic diversity of collected rodents will be discussed, as will preliminary results of correlations between various abiotic and biotic factors and diversity.

“Rapid interspecific evolution of sex chromosome amplicons suggests candidates for meiotic drive and hybrid sterility within Felidae”

Department of Genetics, College of Agriculture and Life Sciences
By: Wesley Brashear

The ampliconic regions of sex chromosomes are among the most rapidly evolving in the mammalian genome. The highly repetitive nature of these regions makes them exceedingly difficult to sequence using modern short-read WGS approaches, and, as a result, has led to their absence from all but a handful of current genome assemblies. This is unfortunate as these regions possess characteristics that potentially have major implications in biological pathways and phenomena such as meiotic drive systems, male fertility, and inter-specific hybridization. We have used an integrated approach combining chromosome-specific cDNA capture, RNA-Seq, FISH, BAC sequencing, and whole genome analyses to examine sex chromosome evolution within the cat family Felidae. Using transcriptome assemblies from mature domestic cat testis tissue, we have identified a large number of novel protein-coding genes located on the X chromosome. These genes often display testis-biased or testis-specific expression (a frequent hallmark of novel sex linked genes), and likely play a critical role in spermatogenesis. Furthermore, several of these genes are located in close proximity to mapped hybrid sterility loci, suggesting plausible candidate genes for further interrogation. We have developed a clone-by-clone sequencing approach that employs both pooled PacBio sequencing and optimized Illumina library preparations and bioinformatic pipelines in order to reconstruct the true architecture of the ampliconic regions of the domestic cat sex chromosomes. Using this approach, we have sequenced a large representative portion of the domestic cat ampliconic MSY, which has revealed a complex pattern of historic and lineage specific duplication events and structural rearrangements. Comparative fluorescent in-situ hybridization and WGS data reveal a high degree of conservation of genic content, but variable copy number and structural rearrangement, within the MSY across the cat family. We have also been able to sequence and accurately incorporate a large amount of ampliconic sequence of the domestic cat X chromosome that was missing in previous assemblies. These data, along with WGS Illumina data from across the felid phylogeny and a more extensive chromosome-wide annotation, have revealed rapid evolution and drastic changes in copy number between species along this chromosome. These results reveal promising avenues for investigating the role of sex chromosomes in various facets of felid biology, notably reproductive isolation.

“All-inorganic Perovskite Heterostructure Nanocrystals for Optoelectronic Applications”

Department of Chemistry, College of Science
By: Benjamin Roman

All-inorganic, $CsPbX_3$ (X=Cl, Br, I) quantum dot nanocrystals have been shown to have great promise for optical and optoelectronic applications due to excellent stability, high fluorescent quantum yields, and optical tunability via a facile halide exchange reaction. Recently, we have demonstrated that Au may be deposited onto the surface of $CsPbBr_3$ nanoparticles with controlled deposition domain size. Remarkably, these Au-$CsPbBr_3$ heterostructure nanocrystals maintain high fluorescence quantum yield, especially when compared with the complete quenching of photoluminescence in similar Au-chalcogenide nanocrystals. In this talk, I will discuss the synthesis and initial characterization of these perovskite heterostructure nanocrystals, as well as their potential future applications in optoelectronics, especially in regards to luminescence upconversion for improved photovoltaics.

"Geminivirus-encoded TrAP suppressor inhibits SUVH4/KYP activity to counter host defense"

Department of Biochemistry, College of Agriculture and Life Sciences
By: Claudia Marcela Castillo Gonzalez

Successful invasion of a host by a pathogen is a very complex process in which both organisms exhibit a splendid array of molecular weapons. RNA silencing is a potent defense mechanism for the host to combat invading nucleic acids and to prevent them from multiplication. RNA silencing includes Post-Transcriptional Gene Silencing (PTGS) and Transcriptional Gene Silencing (TGS). Because of the widespread presence of double-stranded RNA from intermediates in RNA virus replication, highly structured RNA virus genomes, or from viral transcripts, PTGS has evolved as a universal defense response toward all viruses. Virtually all plant viruses are known to encode suppressor proteins that are able to block different key steps of the PTGS pathway to counter host defense. While the host-virus battle at the PTGS level has been well appreciated, the relationship between TGS and viral suppression is still unexplored.

TGS is emerging as an innate immunity against invading DNA viruses. Geminivirus, a model DNA plant virus, forms a nuclear minichromosome and undergoes epigenetic regulation in the host. The Geminivirus-encoded TrAP protein has been known to suppress the TGS pathway, but its mechanism is unknown. We employed an unbiased biochemical screening to identify that the bone fide target of TrAP in the host is an Arabidopsis Su(var)3-9 homolog SUVH4/KYP, a histone methyltransferase responsible for depositing the repressive H3K9me2 mark in chromatin to silence gene expression. TrAP interacts with the catalytic domain of KYP and inhibits its trans-methylation activity in vitro. TrAP elicits developmental anomalies phenocopying several TGS mutants, reduces the repressive H3K9me2 mark, and correspondingly activates numerous endogenous KYP-repressed loci in vivo. Moreover, KYP binds to the viral chromatin, and controls its methylation. We conclude that TrAP attenuates the TGS of the viral chromatin by inhibiting KYP activity to evade host surveillance. These findings provide the first evidence of a viral suppressor targeting a histone modifier, and offer new insight on the molecular arms race between the host antiviral defense and virus counter defense at an epigenetic level.

"Enhanced Endosomal Escape of Cell-Penetrating Peptides: a Multivalent Approach"
Department of Biochemistry, College of Agriculture and Life Sciences
By: Dakota James Brock

Cell-penetrating peptides (CPPs) have been used as beneficial tools to mediate the delivery of biologically active, macromolecules into live cells. The usefulness of many existing CPPs, such as the prototypical CPP TAT, has been greatly depreciated due to the suboptimal release of CPPs and cargoes into the cytosolic space of cells. Recently, highly-efficient CPPs have been developed that seem to have a common trait: the peptides are multivalent, or display multiple copies of the CPP, within the same molecule. The focus of this project is to investigate the role that multivalency plays in cell-penetrating activity. To perform this study, a new generation of branched, multivalent CPPs (mCPPs), which differ only in CPP copy number, have been designed and synthesized. By gaining a fundamental understanding of the effect of multivalency on cell-penetration, next generation CPPs can be developed to more efficiently and successfully deliver molecular probes and drugs, thereby advancing the fields of cellular biology and therapeutics.

Aerospace Eng; Biomedical Eng; Chemical Eng; Civil Eng; Computer Sc & Eng; Electrical & Computer Eng; Engineering Tech. & Industrial Distribution; Industrial & Systems Eng; Materials Sc & Eng; Mechanical Eng; Nuclear Eng; Ocean Eng; Petroleum Eng

“Simultaneous Process Network Synthesis and Process Intensification Using Grid Superstructure”

Department of Chemical Engineering, College of Engineering
By: Jianping Li

Process synthesis is used in obtaining the best processing route among many alternatives by assembling units into a process network with the goal of optimizing either economic, environmental, and/or social objectives. Current optimization-based process synthesis methods are unable to automatically construct and identify novel intensified equipments as they require pre-specified equipment configurations. Furthermore, whenever a new problem is addressed, a different superstructure needs to be postulated. To address these challenges, we propose a new building-block based superstructure instead of classical unit-operation based one. Each block represents a unit use of materials with a specific function (reaction, separation, storage). An assembly of the same blocks results in a classical unit operation, while intensified units are realized with assembly of multiple different blocks. This allows a systematic identification, representation and generation of intensification alternatives at the flowsheet level without a priori postulation of their existence. The proposed approach not only identifies different process equipment, but also automatically generates the corresponding flowsheet. We pose the unified synthesis and intensification problem as a mixed-integer nonlinear optimization (MINLP) problem. The objective is to synthesize a process with intensified units by minimizing or maximizing a process metric given the feed and product specifications, feed and product prices, material properties and bounds on flow rates. We also demonstrate that the simultaneous synthesis and intensification approach leads to substantially smaller, cleaner, safer, and more energy-efficient designs.

“Condition-based maintenance for queues with degrading servers”

Department of Industrial Engineering, College of Engineering
By: Iqra Ejaz

We derive an analytical model for condition-based maintenance of a single server queue with Markovian degradation, Poisson arrivals, and general service and repair times. Stability conditions and performance measures (e.g., average queue length, average degradation.) are derived through steady state analysis. An optimal repair decision model is presented that minimizes an objective function with four costs: repair, catastrophic failure, quality and holding. We develop and verify a simulation model, perform a sensitivity analysis, and show insights learned from relaxing underlying assumptions.

“Electrochemical Synthesis and Hydrophilicity of Micro-pored Aluminum Foil”
Department of Materials Science and Engineering, College of Engineering
By: Yuan Yue

Materials with textured surfaces have attracted great interests due to the unique characteristics, such as high specific surface area, light weight, and excellent electronic or magnetic performances. Current approaches to manufacture porous materials have been limited by being complicated, costly, and time-consuming. Here we demonstrate a facile and cost-effective method to fabricate an unprecedented macropore-arrayed structure on an aluminum foil through electrochemical etching. The process was carried out at a galvanostatic mode of electrochemical reaction, in which the aluminum foil was the working electrode. The

electrolytic solution contained perchloric acid and ethanol. Pores were observed using various characterization techniques such as digital optical microscopy, scanning electron microscopy, and interferometer. With extended etching time, the pore density was increased while the pore size remained to be consistent (~15 Âµm in diameter). Further examination showed that the surface hydrophilicity was improved due to the existence of pores. The increased pore density is responsible for reduced contact angle. The new finding offers the potential economical and practical applications of the pored aluminum surface in designing novel hierarchical structures.

“A Gaze Gesture-Based User Authentication System to Counter Shoulder-Surfing Attacks”
Department of Computer Science, College of Engineering
By: Vijay Rajanna

Shoulder-surfing is the act of spying on an authorized user of a computer system with the malicious intent of gaining unauthorized access. Current solutions to address shoulder-surfing such as graphical passwords, gaze input, tactile interfaces, and so on are limited by low accuracy, lack of precise gaze-input, and susceptibility to video analysis attack. We present an intelligent gaze gesture-based system that authenticates users from their unique gaze patterns onto moving geometric shapes. The system authenticates the user by comparing their scan-path with each shapes' paths and recognizing the closest path. In a study with 15 users, authentication accuracy was found to be 99% with true calibration and 96% with disturbed calibration. Also, our system is 40% less susceptible and nearly nine times more time-consuming to video analysis attacks compared to a gaze- and PIN-based authentication system.

“Energy Audit and Indices in Water Distribution Systems”
Department of Civil Engineering, College of Engineering
By: Mohsen Aghashahi, Gabriella Morales, Ruoxi Wu

Water distribution systems (WDSs) consume approximately five percent of the total urban power consumption. To lessen this portion, optimizing the energy devouring components in a WDS is unprecedented. In this research, by applying an energy auditing method, we evaluated all components of two WDSs, regarding their energy demand and generation status. This method led to the identification of the major energy sinks and sources. Then, seven indices were computed to show the level of energy consumption in the networks. Based upon the energy audit, those most significant components were opted and some solutions were recommended to optimize them, in order to make the water networks the most energy efficient.

“A Multi-Pronged, Noninvasive Probing of Electrodeposition in Lithium Ion Batteries”
Department of Mechanical Engineering, College of Engineering
By: Michael Kalan

Lithium ion batteries hold the potential to play a key role in meeting our future, and increasing energy storage needs. Lithium ion batteries have the highest energy density of all battery systems currently available. Since their introduction in the mid 900’s they have evolved and become the choice system for meeting energy needs in portable electronic devices. However, lithium ion batteries still face many challenges preventing them from being utilized to their fullest potential. They suffer from self-discharge, degradation over repeated charging, do not operate well at extreme low or high temperatures, and can suffer from the deposition of metallic lithium during charging. This deposition leads to growth of lithium dendrites inside the cell, which can lead to a short circuit, ultimately resulting in the battery catching on fire. The focus of this work is to add to the understanding of the latter problem with lithium ion batteries: dendrite growth. Both computational modeling and experimental observations were used to study their growth. The computational model was developed in Python and provides a 1D approach to understanding dendrite growth and compares well to experimental data. The experimental results utilized electrochemical impedance spectroscopy in conjunction with equivalent circuit modeling to correlate the deposition of metallic lithium on graphite electrodes with changes in the impedance spectrum.

“Mixture Fraction Imaging Using Femtosecond TPLIF of Krypton”
Department of Mechanical Engineering, College of Engineering
By: Yejun Wang

Understanding of fuel-air mixing in combustors is a critical step towards the development of highly efficient, low-emission engines for transportation, power generation and propulsion applications. In a wide range of engines such as gas turbines, scramjets, diesel and gasoline engines, fuel and air mixing primarily controls engine efficiency, combustion emissions, and in extreme cases engine failure. The objective of this research is to investigate the fundamentals of fuel-air mixing using high-speed laser diagnostics that are capable of capturing spatio-temporal dynamics in mixing in the turbulent flows associated with these combustion devices. In particular, we use cutting-edge, ultrashort-pulse (femtosecond-duration) two-photon laser-induced fluorescence (TPLIF) imaging technique for high-speed imaging of characteristic turbulent jets. TPLIF technique, when employed with an inert gas tracer such as Kr can provide excellent images of mixing flow fields of gas jets. This scheme allows us to study in detail, two very different problems in fuel-air mixing; steady-state mixing as it applies to gas turbine combustors, and unsteady jet mixing as it applies to vaporized sprays in diesel or direct-injection gasoline engines. A key challenge in steady state mixing is mapping the mixture fraction and scalar dissipation at high-repetition rates in order to understand the dynamics of turbulent mixing, characteristic modes and frequencies. Such measurements reveal important flow physics associated with gas turbine flame ignition and extinction in ultra-lean combustion and high-altitude propulsion as well as fuel-flexible operation. In diesel and gasoline engines, the fuel injection never reaches steady state, and can several injections per cycle to reduce emissions and improve efficiency. While these advanced fuel-injection strategies are already used in production hardware, they are largely designed through a "guess and check" process. In-depth understanding of the fundamental mixing processes provides engine designers with better tools to design next generation engines.

"Risk based decision making methods for evaluating complex technologies, a comparative analysis on pipelines and railroad for crude oil transport"

Department of Chemical Engineering, College of Engineering
By: Pranav Kannan

Decision making for long term capital intensive projects involve large number of uncertainities. Traditional risk assessments are based on probabilities which are estimated from limited data sets and provide limited flexibility for complex technologies. Further, the environment and specific conditions under which the data is obtained may be unknown and yield to erroneous extrapolations. The method proposed in this work utilizes a novel method for estimation of the risk based on the net present value of technologies and provides the basis for a decision support tool based on the expected value theorem. This is demonstrated using the case of the safety and economic crisis in on shore crude oil transport in the continental united states. The exponential growth of crude oil production in the continental United States has led to crisis in the mid-stream industry with existing pipeline infrastructure under pressure to service the increased production. This fact is reflected in the 4000% increase in the carloads in a span of five years from 2009 to 2013. This has been compounded by the volatile fluctuation in crude oil price from $100 to $30 over the past few years. This has put enormous constraints on capital decision making. Since railroad infrastructure albeit aged, already exists in many regions, loading and unloading crude oil is relatively easy and their connection to the refining centers along the Gulf of Mexico apart from sites in the east and west coast make it an option to many producers. In this paper a novel decision making model is proposed using the concept of "Net present value" of a technology to evaluate the option between railroad and as suitable mid-stream alternatives for the transportation of crude oil. The model is built on using a prescriptive decision making technique for the quantification of factors affecting the decision, incorporating also the utility of wealth of the decision maker. Monte-carlo simulation is further used to obtain results and trends based on variation of initial parameters. This analysis can provide a basis in for making decisions given the complex environment of crude oil transport operations and can be extended to a variety of geographies given that they satisfy the requirements of the model. The method can also be further extended to other technology evaluation given appropriate factors can be identified to build the model.

"3D titanium carbide (MXene) particles crumpled using capillary forces"
Department of Chemical Engineering, College of Engineering
By: Smit Alkesh Shah

MXenes are a relatively new class of nanosheets and they have gained significant interest due to their unique chemical, dielectric and transport properties. Since their discovery in 2011, they have been shown to be promising in range of applications such as batteries, supercapacitors, electromagnetic shielding, and water desalination. There was a lack of research on changing the morphology of these nanosheets which might potentially open doors to many new fascinating applications. In this study, we have shown that Ti3C2 MXenes can be reversibly processed into a 3D crumpled structure. This was achieved by using capillary forces of a drying droplet in a commonly used industrial spray dryer. Without using any template, we were able to obtain scrolled, bent and folded 3D structures and the morphological change was found to be reversible upon rehydration. We also showed that the extent of crumpling can be controlled by adjusting the spray drying parameters.

"Development of Spectroscopic Characterization Tools for Reactions Involving Counter-WMD Simulants"
Department of Mechanical Engineering, College of Engineering
By: Nicholas Anthony Niemiec

Developing countermeasures for use against Weapons of Mass Destruction (WMD) such as sarin gas is important to both national and international security. A promising method of neutralization is to decompose the WMD agent via burning. To facilitate the creation of such countermeasures, the underlying combustion chemistry of WMD agents needs to be understood. In this study, the combustion chemistry of a sarin surrogate, triethyl phosphate (TEP), is investigated by experimentally measuring the spectral emission of TEP in a hydrogen-air mixture during combustion.

As molecules and atoms are excited during the combustion process, their electrons move to higher energy levels and then fall back down while producing a unique spectrum of light. By measuring the spectral emission of the combustion, information on the different molecules and elements that are present during combustion is obtained. Optical methods such as this are desirable because they provide a means to probe the combustion phenomena occurring without disturbing the system. The system used to provide a flame in this study was an existing laminar flame speed vessel at Texas A&M.

Hydrogen is an extremely well-studied fuel and thus it makes an ideal parent fuel to compare changes that TEP might have on the flames. In these experiments, TEP was added to a stoichiometric mixture of hydrogen-air as a percentage of the total pressure. In this way experiments with varying concentrations of TEP could be compared; however, it should be noted that the addition of TEP does alter the real equivalence ratio. The combustion of these mixtures was synchronized to a spectrometer to take time resolved measurements of the spectra.

The mixtures studied were pure hydrogen, and then three additional mixtures of hydrogen with TEP, namely 0.025% TEP, 0.075% TEP, and 0.138% TEP. The addition of TEP to the hydrogen fuel caused the overall intensity of the spectra observed in the pure hydrogen case to increase. Broadband emission due to the addition of TEP was the major characteristic observed; however, this broadband emission did not prevent slight detection of OH* chemiluminescence. This work shows the possibility of detecting chemical species through emission spectra during early stages of the ignition of TEP mixtures.

"Optimal design of an energy storage composite flywheel for uninterruptible power supply"

Department of Mechanical Engineering, College of Engineering
By: Dewashish Shah

The study to be presented is focused on the design aspects of a composite flywheel and optimization routine for the design.

"Improving the Robustness of Monocular Vision-Aided Navigation for Multirotors through Integrated Estimation and Guidance"

Department of Aerospace Engineering, College of Engineering
By: William Daniel Whitten

Multirotors could be used to autonomously perform tasks in search-and-rescue, reconnaissance, or infrastructure-monitoring applications. In these environments, the vehicle may have limited or degraded GPS access. Researchers have investigated methods for simultaneous localization and mapping (SLAM) using on-board vision sensors, allowing vehicles to navigate in GPS-denied environments. In particular, SLAM solutions based on a monocular camera offer low-cost, low-weight, and accurate navigation indoors and outdoors without explicit range limitations. However, a monocular camera is a bearing-only sensor. Additional sensors are required to achieve metric pose estimation and the structure of a scene can only be recovered through camera motion. Because of these challenges, the performance of monocular-based navigation solutions is typically very sensitive to the environment and the vehicle's trajectory. This work proposes an integrated estimation and guidance approach for improving the robustness of monocular SLAM to environmental uncertainty. It is specifically intended for a multirotor carrying a monocular camera, downward-facing rangefinder, and inertial measurement unit (IMU). A guidance maneuver is proposed that takes advantage of the metric rangefinder measurements. When the environmental uncertainty is high, the vehicle simply moves up and down, initializing features with a confident and accurate baseline. In order to demonstrate this technique, a vision-aided navigation solution is implemented which includes a unique consider least squares approach to feature covariance initialization. Features are only initialized if there is enough information to accurately triangulate their position, providing an indirect metric of environmental uncertainty that could be used to signal the guidance maneuver. The navigation filter is validated using hardware and simulated data. Finally, simulations show that the proposed initialization maneuver is a simple, practical, and effective way to improve the robustness of monocular-vision-aided-navigation and could increase the amount of autonomy that GPS-denied multirotors are capable of achieving.

“Quantifiable Fatigue Risk Assessment”
Department of Engineering Systems Management, College of Engineering
By: Karla Gonzalez Coronado

Every year fatigue causes thousands of road accidents, medical errors, and industrial disaster. It can also lead to the deterioration of health and cause chronic and acute illnesses. Therefore, it is imperative that proper fatigue management is implemented for individuals. I propose a smart-real time system that can use heart rate variability and accelerometer information to predict when a person is becoming fatigue. This system will be able to advise the person to stop an activity and when it is safe for them to return to the task. This has applications in many areas ranging from healthcare to oil & gas.

“Iterative Five-Element Lyapunov Control for Low Thrust Rendezvous with Modified Chebyshev Picard Iteration”
Department of Aerospace Engineering, College of Engineering
By: Nathan Isaac Budd

We present an iterative five-element Lyapunov control for low thrust rendezvous that uses Modified Chebyshev Picard Iteration (MCPI), an iterative solver of lin-ear and nonlinear ordinary differential equations (ODEs). MCPI uses Chebyshev polynomials to approximate the orbital trajectory and then uses Picard iteration to improve the approximation iteratively. We discuss simulations of two rendezvous test cases, which illustrate the effectiveness of this method as a computationally cheap alternative to relatively expensive optimal control solutions.

“Flexible Implementation of Smart Electricity Grid Technologies”
Department of Electrical Engineering, College of Engineering
By: Payman Dehghanian

Electricity fuels our existence. Living without electricity in nowadays technological world is hard to imagine. While it is essential to keep the lights on at all times, severe climate and adverse weather conditions are frequently experienced leading to frequent loss of electricity. With increasing dependence on electricity, an urgent need exists to enhance the resilience of power delivery infrastructure to reduce the impact and risk from natural disasters and climate change events. My research tries to offer a fast remedial decision making solution for forecasting such severe events in advance and efficiently re-routing the electricity by means of transmission topology control to recover from such disasters. Such considerations make it possible to have more efficient use of the existing network infrastructure with minimal additional costs. This research is groundbreaking as it aims to safeguard the electricity grid in face of adverse weather conditions, cyber-security attacks, component failures, and other grid disruptions. My research aligns with several identified graduate and professional student high impact learning outcomes: Interdisciplinary learning in all aspects of electricity grid operation and control, ranging from the application of optimizations (Industrial Engineering) to applications of mechanical infrastructure in energy research (Mechanical Engineering) as well as the new technologies of smart electricity grids (Electrical Engineering) is highlighted and actually implemented.

"Triage robotics"
Department of Computer Engineering, College of Engineering
By: Cassandra Oduola

An overview of ways medical robots can be used for search and rescue.

"An improved glycerol biosensor with an Au-FeS-NAD-glycerol-dehydrogenase bioanode"
Department of Biological & Agricultural Engineering, College of Agriculture and Life Sciences
By: Aishwarya Mahadevan

An improved glycerol biosensor was developed via direct attachment of NAD+-glycerol dehydrogenase coenzyme-apoenzyme complex onto supporting gold electrodes, using novel inorganic iron (II) sulfide (FeS)-based single molecular wires. Sensing performance factors, i.e., sensitivity, a detection limit and response time of the FeS and conventional pyrroloquinoline quinone (PQQ)-based biosensor were evaluated and compared by dynamic constant potential amperometry at 1.3V. For glycerol concentrations ranging from 1 to 25mM, a 77% increase in sensitivity and a 53% decrease in detection limit were observed for the FeS-based biosensor when compared to the conventional PQQ-based counterpart. Interference by glucose, fructose, ethanol, and acetic acid in glycerol detection was studied. The observations indicated a promising enhancement in glycerol detection using the novel FeS-based glycerol sensing electrode compared to the conventional PQQ-based one.

"Use of Waste Plastic in Flexible Pavement-Green Roads"
Department of Civil Engineering, College of Engineering
By: Yash Menaria

Wrappers of betel nuts, chocolates, chips, hand bags, cold drink bottles and all other forms of plastic create significant environmental and economic problem. They consume massive energy and other natural resources, depleting the environment in various ways. In manufacturing firms, construction industries and products delivery services, use of plastic is a priority to handle and pack things comfortably due to its light weight, cost effectiveness and strength. Plastics cannot be banned as it will result in usage of natural resources like paper, wood at a great extent. It is made up of various chemical elements and is regarded as a highly pestilent material which does not easily degrade in the natural environment after its usage. Waste plastics are made up of Polyethylene, Polystyrene and Polypropylene. Temperature varying between 120°C - 160°C gives the softening point of these plastics. They do not produce any toxic gases during heating but the softened plastics have tendency to form a lamination or coating over the aggregate, when it is sprayed over the hot aggregate at 160Â°C. The main objective of this paper is to discuss the significance of plastic in terms of cost reduction, increase in strength and durability when these plastic are heated and coated upon the aggregates (160°C) to compensate the air voids with plastic and binds with aggregate to provide stability.

“Computer Aided Feature Extraction for Modeling the Brain Surface”
Department of Biomedical Engineering, College of Engineering
By: Ana Cristina Chang Gonzalez

Classification of biological images based solely on their characteristic features is a common technique to allow for co-registration and comparison-based image analysis between dataset. There are many feature extraction methods based on varying feature levels. These include pixel-by-pixel comparisons, edge detection methods, and volume or mass-based features. However, when classifying images that have minimal features or contain much noise, available feature extraction methods are inadequate. We have developed the Computer Aided Feature Extraction (CAFE) program, a command-driven and programmable environment to process images and build corresponding physical models.

As an example of the capabilities of CAFE, we apply our software to analyze images of an embryonic zebrafish brain. During early-stage development, the most notable feature in a zebrafish brain is the curvature fold of the forming neuroepithelial tube; this fold is best described as an “edge.” However, several factors render detection of the fold challenging, including proximity to the external edge of the brain, the changing shape of the fold throughout development, and image noise. Â Utilizing CAFE, we input image slices and reconstruct the brain volume in surface patches; each patch is described by a polynomial equation and characterized according to surface curvature. This model is expected to aid in co-registration and classification of embryonic zebrafish brains at varying time points.

“The Effects of Heterogeneous Membranes on Lectin Mediated Cell Adhesion”
Department of Chemical Engineering, College of Engineering
By: Nolan Worstell

Bacteria recognize and attach to host cells by carbohydrate groups, glycans, on the cell surface. Carbohydrate binding proteins called lectins mediate this bacterial recognition. Traditionally, lectin binding affinity is assessed by studying the interaction between the lectin and a single potential glycan receptor. However, this ignores a defining characteristic of lectins: that they have multiple binding sites. Furthermore, a surface containing only a single type of glycan receptor is a poor mimic of the heterogeneous cell membrane that lectins experience in vivo. This inspired us to consider lectins interacting with idealized cell membranes containing multiple glycan receptors. In this study, we focused on Pseudomonas Aeruginosa lectin, divalent LecA, as well as a Vibrio Cholera lectin, pentameric Cholera toxin subunit B (CTB) binding to 1-5 glycan presenting lipids. We demonstrated that glycan receptors with minimal monovalent binding can exhibit relatively high binding affinity when mixed with strong glycan receptors. Further work showed lectins binding to high-affinity glycan receptors experience a reduction of dimensionality. This effectively enhances the rate of association with more abundant low-affinity glycan receptors resulting in improved overall lectin binding to the cell surface. The demonstration of this phenomenon in two different lectin systems highlights the importance of the mechanism in lectin-mediated host cell recognition.

“Hand Gesture Mouse Interface System”
Department of Business Administration, Mays School of Business
By: Shyam Sundar Esanaka Harikumar

The requirement of simple, yet sophisticated user interface has driven the IT professionals to develop enhanced devices ranging from the basic punch-card system which were used for the earliest computer devices, to the widely used keyboard, mouse and the latest touch screen technology which are emerging on today's computers. These improved gadgets and technology basically reduce the invisible barrier between the everyday user and the system. However, these devices have their limitations and inconvenient for the user to interact with the system. To simplify this, a new system is developed which takes human gestures into consideration to perform the corresponding operation on the computer device. Hand Gesture Mouse Interface is developed to capture the hand gesture from the user through web camera. The primitive hand movement for the respective gesture is used. The relative positioning of the hand is being used in the system to ensure that the gesture recognition is made accurately. The Hand Gesture Mouse Interface simplifies the procedure which outperforms the mouse operation that is in vogue and also provides a low cost and easy to use interfacing for the user.

“Versatile Thermochromic Supramolecular Materials based on Charge Transfer Interactions”
Department of Materials Science & Engineering, College of Engineering
By: Tianyu Yuan

Stimuli-responsive supramolecular materials are of paramount importance for a broad range of applications. It is essential to impart versatility, sustainability, and scalability into these materials. Herein we report the design and synthesis of a new class of thermochromic supramolecular materials, which can easily be processed from water via a reversible sol’ gel transition. The supramolecular materials are composed of a bis-bipyridinium acceptor, a p-electron-rich naphthalene derivative donor, and halogen counterions. Long helical nanofbers can be assembled in water, gelating at room temperature. Inked designs, thin films, and aerogels are solution-processed to exhibit thermochromic behavior based on competing p to p* and n to p* charge transfer interactions. By using different p-electron rich donors, and counterions, we demonstrate that both the color observed at room temperature and at high temperatures can be tailored. The results open up the door to develop novel amphiphile-based thermochromes with water processability and a large tunable color palette.

“Flying Animal Inspired Autonomous Flight with a Small Unmanned Rotorcraft in a Restricted Maneuverability Environment”
Department of Computer Science, College of Engineering
By: Traci Sarmiento

This research investigates the ability of a small unmanned rotorcraft system to autonomously fly collision-free through a restricted maneuverability environment with no a priori knowledge by using a gap-aiming behavior inspired by flying animals. Current approaches to autonomous flight with small unmanned aerial systems (SUAS) concentrate on detecting and explicitly avoiding obstacles. In contrast, biology indicates that birds, bats, and insects do the opposite; they react to open spaces, or gaps in the environment, with gap_aiming behavior. Using behavior-based robotics, the gap-aiming behavior observed in flying animals was designed with an artificial potential field implemented as the motor schema. Because biological studies were unclear whether the flying animals were reacting to the largest gap perceived, the closest gap perceived, or all of the gaps three approaches for the perceptual schema were explored in simulation: detect_closest_gap, detect_largest_gap, and detect_all_gaps. Results of these simulations will be used in a proof-of-concept implementation on a 3DRobotics Solo quadrotor platform in an indoor environment designed to represent the navigational difficulties found inside a restricted maneuverability environment. The successful transfer of the gap-aiming behavior observed in flying animals to small unmanned rotorcraft provides a way to autonomously fly collision-free without explicit obstacle detection and avoidance like current implementations. Additionally, the testing environment described by quantitative metrics could provide a benchmark for indoor SUAS autonomous flight testing. Finally, the success of the autonomous collision-free flight implementation on a small unmanned rotorcraft and tested in a restricted maneuverability environment would also have important societal impact in both the public and private sectors.

“Rapid Microwave-assisted Synthesis of Hybrid Zeolitic-Imidazolate Frameworks with Mixed Metals and Mixed Linkers”

Department of Chemical Engineering, College of Engineering

By: Febrian Hillman

Separating a crude component into a more valuable purer product is a major part of many industrial chemical plants. Typically these processes utilize distillation, which account to 10 â€“ 15 % of world’s energy consumption. One alternative solution that can reduce energy consumption is through membrane separation using porous solid material such as metal organic frameworks (MOFs). Zeolitic-imidazolate frameworks (ZIFs), a subclass of MOFs, in particular have attracted many attentions due to their chemical/thermal stabilities, their ultra-miroporosities, and high surface area when compared to other MOFs material. ZIFs are frameworks consisting transition metals bridged by imidazolate-derived ligands. A common drawback for membrane gas separation is the limited availability of pore size and functionalities. Studies have shown that through mixing metals and ligands, one can continuously tune the ZIFs (termed hybrid ZIFs) properties to match with the characteristic of specific gas mixture. However, The common synthesis of hybrid ZIFs has generally been through slow conventional solvothermal methods, requiring several hours up to days, which can be an economical issue for hybrid ZIFs to be used in a large industrial scale.

Herein we report a new microwave-assisted (MW) synthetic strategy to rapidly prepare hybrid ZIFs with mixed metal centers and/or linkers. The MW method significantly shortens synthesis time, produces higher yield, substantially reduces the amount of ligand, and eliminates the use of deprotonating agents. Several characterizations were performed to determine the structure and properties of the hybrid ZIFs. Furthermore, for the first time, a hybrid ZIF with both mixed metal centers and mixed linkers was prepared through one-step microwave synthesis. Finally, a mixed metal CoZn-ZIF-8 was grown as membranes, showing higher propylene/propane separation factor (~120) when compared to pure Zn-ZIF-8 membranes (~63) prepared with similar method.

"Guided Head Rotation and Amplified Head Rotation: Evaluating Semi-natural Travel and Viewing Techniques in Virtual Reality"

Department of Visualization, College of Architecture
By: Shyam Prathish Sargunam, Kasra Rahimi Moghadam, & Mohamed Suhail

Traditionally in virtual reality systems, head tracking is used in head-mounted displays (HMDs) to allow users to control viewing using 360-degree head and body rotations. Our research explores interaction considerations that enable semi-natural methods of view control that will work for seated use of virtual reality with HMDs when physically turning all the way around is not ideal, such as when sitting on a couch or at a desk. We investigate the use of amplified head rotations so physically turning in a comfortable range can allow viewing of a 360-degree virtual range. Additionally, to avoid situations where the user's neck is turned in an uncomfortable position for an extended period, we also use redirection during virtual movement to gradually realign the user's head position back to the neutral, straight-ahead position. We ran a controlled experiment to evaluate guided head rotation and amplified head rotation without realignment during movement, and we compared both to traditional one-to-one head-tracked viewing as a baseline for reference. After a navigation task, overall errors on spatial orientation tasks were relatively low with all techniques, but orientation effects, sickness, and preferences varied depending on participants' 3D gaming habits. Using the guided rotation technique, participants who played 3D games performed better, reported higher preference scores, and demonstrated significantly lower sickness results compared to non-gamers.

"Towards More Resilient Performance of Emergency Departments"

Department of Industrial Engineering, College of Engineering
By: Changwon Son

Today's emergency departments are at its brittle point due to increasing patients seeking urgent care and growing economic pressure. Hence, this imbalance threatens patients' safety and health and also 'dumping' or 'overcrowding' in EDs becomes normal. In order to enhance the overall performance of EDs and not to compromise the quality of the services provided, resilience engineering is suggested as an approach to achieve this seemingly opposing objectives. Resilience refers to a system's capability to respond to varying disruptions and quickly bounce back to its desired state. As resilience is a tacit, covert system property, different types of representations and their advantages and disadvantages are introduced. Then, strategies to enhance resilient performance of EDs are proposed in terms of staffing, facility and equipment design.

"Computational Algorithms for Oral Cancer Diagnosis Based on
In-Vivo Multispectral FLIM Data Processing"

Department of Biomedical Engineering, College of Engineering
By: Elvis Duran

The American Cancer Society estimates that the number of cases of oral cavity cancer in the US will rise to 49,670 in 2017. The 5-year survival rates for oral cavity cancer are ~80%, ~50% and ~25% for early, intermediate and advanced stages, respectively. Hence, early detection of oral cancer is crucial to improve survival rates. Unfortunately, only ~30% of patients are diagnosed at early stages since benign oral mucosa lesions are difficult to distinguish from early invasive cancer. Therefore, fast and noninvasive tools for oral cancer screening would significantly improve detection at early stages. Fluorescence lifetime imaging microscopy (FLIM) is a functional modality that provides information about the biochemical composition of a biological sample. Endogenous FLIM can noninvasively measure the complementary functional and biochemical changes accompanying tissue transition from benign to precancerous and cancerous. In this work, multispectral FLIM images from clinically suspicious lesions of the human gingiva (n=11) and tongue (n=18) were acquired in vivo at three spectral bands: 390Â±20nm, 452Â±22.5nm and >500nm. The normalized intensity, average lifetime, fast and slow lifetime components and their fractional amounts, were computed for each spectral channel. The redox ratio was also computed. Feature exhaustive search was performed on the statistical medians of these FLIM derived biomarkers. Support Vector Machine (SVM) classifiers were trained for binary classification (Benign vs. Mild Dysplasia/SCC) of gingiva and tongue lesions separately. Classification results using leave-one-out cross validation displayed an accuracy of 100% and 94.4% for gingiva and tongue lesions, respectively. These results indicate that computational algorithms based on FLIM data processing provide a robust clinical tool for oral cancer diagnosis. However, a larger and more complete FLIM image database will be needed for future validation.

"Did you Remember To Brush?: A Noninvasive Wearable Approach
to Recognizing Brushing Teeth for Elderly Care"

Department of Electrical Engineering, College of Engineering
By: Josh Cherian

Previous studies have shown that failing to regularly brush one's teeth can have a surprisingly serious health consequences, from periodontal disease to coronary heart disease to pancreatic cancer. This problem is especially worrying when caring for the elderly and/or individuals with dementia, as they often forget to or are unable to perform standard health activities such as brushing their teeth. To ensure that such individuals are correctly looked after they are placed under the supervision of caretakers or family members, simultaneously limiting their independence and placing an immense burden on their family members or caretakers. To address this problem we developed a non-invasive wearable system based on a single wrist-mounted accelerometer to accurately identify when a person brushed their teeth. We tested the efficacy of our system with a month-long in-the-wild study, and achieved an accuracy of 94\% and an F-measure of 0.82.

“Visual Navigation of USV from UAS to Save Drowning Victims”

Department of Computer Science, College of Engineering
By: Jan Dufek & Xuesu Xiao

This project uses the video from a small unmanned aerial system to improve the navigation of an unmanned surface vehicle (USV) covered in a flotation jacket to reach victims. The teleoperated EMILY USV has been used by the Hellenic Coast Guard since January of 2016 to allow lifeguards to rapidly deploy flotation to refugees attempting to cross the Mediterranean Sea. While EMILY has been credited with the successful rescue of at least one boat load of refugees, there are three problems. First, teleoperation takes lifeguard time and energy that would be better spent on directly rescuing high risk victims. Second, the lifeguards have trouble teleoperating the USV because their viewing angle of the USV heading away from them is unfavorable; as a result EMILY often fish-tails and takes a sub-optimal path. Third, the lifeguards quickly lose depth perception and may accidentally hit the victim with the USV. This project addresses these deficiencies by using the output from a small UAS to direct the USV; while this has been discussed in the literature, this work appears to be the first actual implementation.

The implementation relies on a robust vision-based algorithm for position and orientation estimation of EMILY based on the CamShift algorithm. The CamShift algorithm is applied to EMILY’s histogram backprojection to estimate the position and projection of EMILY’s trajectory filtered by Douglas-Peucker algorithm to estimate the orientation. Rudder and throttle control signals for EMILY to reach the target selected in the video are computed using the line-of-sight and PID control. Current work is enabling the operator to select victims in the video feed provided by a tethered UAS called a FotoKite. The Fotokite can operate from a shore or from a boat without the need to worry about the control. The UAS controlling the USV was tested during Summer Institute 2016 in Galveston, TX, and in Genoa, Italy, in cooperation with Italian Coast Guard. A tracking error, progression of error angle to the target, distance to the target, and cross track error were measured. The mean tracking error was 0.3%. The mean cross track error for the latest version was 1 m. The experimental results indicated feasibility of the system. The trials identified two major challenges that interfere with the visual navigation; these are i) the vibration and drifting of the UAS which adds noise to image processing and ii) changes in lightning which typically cause computer vision algorithms to fail. These challenges are the focus of current work. The results are expected to be made available to lifeguards in Greece and the FRONTEX agencies assisting with the rescues.

“H2 Optimal Sensing Architecture with Model Uncertainty”

Department of Electrical Engineering, College of Engineering
By: Radhika Saraf

In this work, I shall present an integrated approach to control and sensing design. The framework assumes sensor noise as design variables along with the controller and determines l1 regularized optimal sensing precision that satisfies a given closed-loop performance in the presence of model uncertainty.

The two step algorithm finds an appropriate scaling to bound the H2 norm of an uncertain controlled system. The sensor precision is found as the minimal solution to the optimization problem. This is a novel approach to reframe a non-convex problem as two separate convex problems and solved using linear matrix inequalities and integral quadratic constraints. The design is tested for stability and robustness on a tensegrity robot arm model.

“An Improved Approach for Robust Scheduling Under Uncertainty”

Department of Chemical Engineering, College of Engineering
By: Utkarsh Dinesh Shah

In practice, the uncertainty in processing time data frequently affects the feasibility of optimal solution of the nominal production scheduling problem. Using the unit-specific event-based continuous time model (Li and Floudas, Ind. Eng. Chem. Res., 2010, 49, 7446) for scheduling, we develop a novel multi-stage robust approach with corrective action to ensure robust feasibility of the worst case solution while reducing the conservatism arising from traditional robust optimization approaches. We quantify the probability of constraint satisfaction by using apriori and aposteriori probabilistic bounds for known and unknown uncertainty distributions, consequently, improving the objective value for a given risk scenario. Computational experiments on several examples were carried out to measure the effectiveness of the proposed method. For a given constraint satisfaction probability, the proposed method improves the objective value compared to the traditional robust optimization approaches.

Medicine; Surgery; Radiology; Pediatrics; Pathology; Obstetrics & Gynecology; Anesthesiology; Epidemology & Biostat; Env'tal & Occ Health; Health Policy & Mgmt; Health Promotion/Comm Health Sc; Public Health Studies; Pharm Sc; Pharm Practice; Nursing

“Early Exposure to Elevated IGF-1 Levels Increases Mammary Tumor Susceptibility through Expansion and Activation of the Mammary Stem Cell Compartment”

College of Medicine
By: Lindsey Luo

Breast cancer (BrCa) is the most common cancer in women. Despite substantial research, BrCa incidence continues to rise, and outcome disparities persist. African American (AA) women suffer higher mortality than White Caucasians. Assessment of this disparity reveals that AA women are more likely to develop the early onset, treatment refractory, triple negative BrCa subtype associated with worse prognosis. The mechanistic basis for the difference in development of BrCa subtypes remains unresolved, but it has been shown that young AA girls have significantly higher circulating levels of Insulin-like growth factor 1 (IGF-1) than their age-matched White counterparts, implicating early exposures to this mitogenic and pro-tumorigenic growth factor in mediating BrCa subtype. To investigate the role of IGF-1 in mammary tumorigenesis, we use the transgenic (Tg) BK5.IGF-1 model, which recapitulates the paracrine effects of IGF-1 exposure on the mammary epithelium. We previously showed that exposure to elevated levels of IGF-1 are strongly pro-tumorigenic in the mammary gland, and pre-pubertal Tg mice have an increased number of terminal end buds, which are known to be important stem cell niches. In this study, we found that the mammary stem cell (MaSC) pool was expanded in both pre- and post-pubertal Tg mice compared to age-matched WT animals. Flow cytometry and immunolocalization identified the expression of IGF-1R on both WT and Tg MaSCs. Single-cell transcriptomic analysis of MaSC compartment revealed that IGF-1 stimulated Cyclin D1 and Cyclin G2 gene expression and increased the proliferation of "activated" transient stem cells (T-MaSCs). Moreover, Gene Set Enrichment Analysis demonstrated that genes involved in stemness, proliferation, EMT, invasion and metastasis were highly upregulated in T-MaSCs from Tg mice compared to age-matched WT animals. Interestingly, GO enrichment analysis also showed downregulation of genes associated with cell polarity in T-MaSCs from Tg animals, suggesting an increased number of stem cells undergoing symmetric cell divisions. Overall, our results identify a novel tumorigenic mechanism, by which early exposure to IGF-1 expands the MaSC compartment and “primes” these cells for transformation, thereby increasing mammary tumor incidence and reducing latency.

“Marek’s disease virus encoded, Meq-vIL8, RLORF4-vIL8 and RLORF5-vIL8 splice variants are not essential for in vitro replication”

Department of Biomedical Sciences, College of Veterinary Medicine and Biomedical Sciences
By: Kanika Bajwa

Marek’s disease virus (MDV) is a highly contagious alphaherpesvirus that causes rapid onset of lymphoma and paralysis in chicken. The MDV genome encodes for an oncogene, meq, and a chemo-attractant of chicken peripheral blood mononuclear cells, vIL8. Chickens infected with a recombinant virus lacking the oncogene meq do not develop tumors, while chickens infected with a mutant virus lacking the vIL8 gene show impaired disease progression and or development. However, it is unclear whether these phenotypes are due to loss of meq and vIL8, individually, or because of splice variants that fuse vIL8 to certain upstream open reading frames including Meq, RLORF4 and RLORF5. To specifically examine the role of these splice variants

in MDV pathogenesis, recombinants viruses unable to express splice variants Meq-vIL8 or RLORF4-vIL8 and RLORF5-vIL8 were generated. In vitro growth kinetics showed that these splice variants are not essential for virus replication. Absence of expression of these splice transcripts was confirmed by RT-PCR. Future studies will examine the role of these splice variants in pathogenesis.

"The Ethics of Incentivizing: Methods for Dispelling Myths & Creating an Inclusive Organ Donation Culture in Texas"

College of Medicine
By: Virginia Beth Neese

Every year in the United States, 8,000 people die while waiting for an organ transplant. Despite medical and scientific progress, public policy change, and donor advocacy incentive programs, this number continues to grow. In Texas, minority groups, including Hispanics and the elderly, are disproportionately represented on the waitlist; yet rarely become donors themselves. This presents a unique opportunity to explore the motivations behind this phenomenon.

When Texas policy allowed citizens to register as a donor through the DMV, registration skyrocketed. Despite this success, this new policy also has certain limitations. For example, studies show that family decision-makers refuse donation on behalf of a loved one if they are unsure of his or her prior wishes. Additionally, families frequently cited fear of bodily disfigurement, perceived conflicts of interest or corruption by the medical team, and the legacy of exploiting vulnerable populations in procurement.

Therefore, this project will show that interventions must go beyond the registration process, and focus on demystifying the organ procurement process in a culturally competent way. Anything less will continue to cause demographic discrepancies and foster distrust.

Preliminary findings suggest the potential donor's care team, the Organ Procurement Organization's representative, and the recipient's care team must remain three separate entities. Culturally sensitive and narrowly-marketed public awareness campaigns should address entrenched barriers for donation head on.

"The Dynamic role of an ethnically disparate TP53 single nucleotide polymorphism at codon 72 on mammary tumorigenesis"

Department of Genetics, College of Agriculture and Life Sciences
By: Ramesh Tharindu Gunaratna

TP53 is one of the most mutated genes in breast cancer (BrCa), showing the importance of TP53-regulated biological processes in the development of the disease. Therefore, variants that alter the function of TP53 are of significance. We investigated the possible contribution of an ethnically disparate codon 72 variants of TP53 (P72: proline-coding, R72: arginine-coding) on mammary tumorigenesis using a humanized Trp53 mouse model. Comparatively, R72 mice showed significantly poor kinetics of mammary tumorigenesis induced by DMBA or MMTV-

Erbb2/Neu overexpression. The susceptible mammary glands of R72 mice had significantly elevated senescence and chronic inflammatory markers such as Tnfa and Il6, consistent with increased senescence-associated secretory phenotype (SASP), which has been shown to enhance tumorigenesis and resistance to treatment in several tissues, including breast. The findings of this study indicate that the R72 variant stimulates mammary tumorigenesis through an increased SASP-driven inflammation, potentially contributing to increased luminal BrCa seen in post-menopausal women of European decent.

"Versatile Retargeting Lentiviral System bearing the Isopeptide Bond Pair SpyTag-SpyCatcher"
College of Medicine
By: Nagarjun Kasaraneni

Introduction: Selectivity/specificity is a crucial factor for the safety and efficacy of gene therapy vectors. It remains a non-trivial task to produce gene therapy vectors programmed to deliver genetic payloads efficiently and specifically to disease cells of interest. We sought to develop a facile strategy to reprogram lentiviral vectors through in vitro covalent functionalization with cell-binding proteins (e.g. monoclonal antibodies).

Methods: An isopeptide bond-forming protein-protein pair is exploited to covalently functionalize a lentivirus with a cell-binding protein (CBP). This protein pair consists of the N-terminus (SpyCatcher) and C-terminus (SpyTag) of the collagen adhesion domain (CnaB2) from the fibronectin binding protein (FbaB) in Streptococcus pyogenes. SpyTag is genetically inserted into an exposed extracellular loop of the envelope protein of a binding-deficient fusion-competent Sindbis virus to form Sind-SpyTag, and the SpyCatcher protein is genetically or chemically linked to a CBP to form SpyCatcher-CBP. Coincubation of Sind-SpyTag-pseudotyped lentivirus (Sind-SpyTag-pp) with SpyCatcher-CBP triggers the covalent functionalization of the lentivirus with the CBP through an isopeptide bond and reprograms the lentivirus to cells displaying the binding partner of the CBP.

Results: A HER2-binding DARPin (H-DARPin) and a transtuzumab-derived Fab (T-Fab) were used as model CBPs. SpyCatcher was genetically and chemically linked to DARPin and Fab, respectively, and loaded onto Sind-SpyTag-pp. The resulting H-DARPin- or T-Fab-functionalized Sind-SpyTag-pp were able to efficiently transduce HER2+ cells with >106 IU/mL, while the naked Sind-SpyTag-pp exhibited minimum transduction in the same cells (<104 IU/mL). The association of CBP with Sind-SpyTag-pp was found to be irreversible due to the high stability of the isopeptide bond and the CBP-functionalized virions were able to selectively transduce HER2+ cells in mixed cell population. Finally, Sind-SpyTag-pp is able to efficiently transduce HER2+ cells in the presence of pooled human serum, suggesting a high potential for in vivo application in human gene therapy.

Conclusions: We developed an in vitro chemical biological approach for covalent conjugation of a cell-binding protein to lentiviruses, providing a convenient and effective new tool for reprogramming lentiviral vectors to deliver their genetic cargo to specific cell types. Ongoing work in the lab aims to extend this strategy to functionalize lentiviruses with additional Fabs and assess the ability of the reprogrammed lentiviral vectors to deliver functional genetic cargo to desired cell types in vivo.

“Impact of chronic EGFR inhibition on cardiotoxicity”

Department of Genetics, College of Agriculture and Life Sciences
By: Selene Howe

The prevalence of activating mutations in the epidermal growth factor receptor (EGFR) gene in lung cancer patients has made EGFR-targeted therapy a front line method for inhibiting tumor growth. Long-term effects due to chemotherapy drug toxicities has become a leading concern for the health of cancer survivors, with cardiotoxicity in particular leading to drastic increases in mortality rates. The long-term impact of therapeutic levels of EGFR inhibitors on human cardiac health is unknown, but exposure has been implicated in cardiotoxicity in C57BL/6J mice. This research aims to determine how an EGFR tyrosine kinase inhibitor (AG1478) impacts cardiac health in four genetically distinct mouse lines at various doses for a 16-month period, modeling the chronic nature of human chemotherapies. Cardiac health was monitored frequently through multiple echocardiography techniques, collection of serum for cholesterol quantification, and blood pressure measurements. These methods have shown the progression of cardiotoxicity in the various genetic backgrounds. Results reveal that different strains are at different risk levels of cardiotoxicity and that there is a non-linear drug response curve. These trends will be further investigated by analyzing histopathology and genetic expression of cardiotoxicity markers in study mice. This research will serve as a pivotal reference to the potential adverse side effects of chronic EGFR chemotherapy.

Veterinary Integrative Biosciences; Veterinary Large Animal Clinical Sciences; Veterinary Pathobiology; Veterinary Physiology & Pharmacology; Veterinary Small Animal Clinical Sciences

“Virulence of two plaque size variants of the DA strain in Theiler’s virus-induced epilepsy”

Department of Biomedical Sciences, College of Veterinary and Biomedical Sciences
By: Dr. Megha Bijalwan

Introduction- Epilepsy is one of the most common neurological diseases affecting 50 million people worldwide. It is defined as two or more unprovoked seizures that occur due to aberrant neuronal hyperexcitability. Detailed analysis of the mechanisms involved in epilepsy is needed since there is lack of adequate preventive therapy and one third of epileptic patients are pharmaco-resistant.

Viral infection of the Central Nervous System (CNS) is a common cause of epilepsy, and patients with viral encephalitis have a 16 fold-increased chance of developing epilepsy. Intracranial (IC) infection of Daniels (DA) strain of Theiler’s virus triggers an exacerbated immune response and neuronal degeneration, causing epileptic seizures in C57BL/6 mice. In our current study, we compared the in vivo neurovirulence of two variants of the DA strain, small (DA-DS) and large (DA-CL) plaque forming variants.

Methods- C57BL/6 mice were infected IC with either DA-DS or DA-CL, and monitored for seizures, weight loss, and cognitive and behavioral deficits during the course of infection. Brains from infected mice were collected to determine viral titer, histopathology, and characterization of cellular infiltration.

Results- 90% of the DA-DS infected mice developed behavioral seizures, compared to 14% of the DA-CL group, by day 7 p.i. DA-DS infected mice had significantly more neuroinflammation, neuronal damage, and weight loss than DA-CL infected mice. Additionally, the brains of DA-DS infected mice contained approximately twice as much virus as those of DA-CL infected mice.

Thus, DA-DS is more neurovirulent than DA-CL variant. Currently, we are comparing genetic differences between the two plaque size variants, to identify the basis for attenuation of the DA-CL variant.

“Role of Mechanical Loading During Mouse Digit Tip Regeneration”

Department of Biomedical Sciences, College of Veterinary and Biomedical Sciences
By: Connor Dolan

Interplanetary space travel is dependent on the ability to maintain astronaut health. However, prolonged mechanical unloading experienced by astronauts living in microgravity enhances degeneration of skeletal tissue, impairs wound healing, and disrupts stem cell proliferation and differentiation. Presently, it is unknown if mechanical unloading affects mammalian digit tip regeneration. Digit tip regeneration is a complex process both resembling and differing from development and occurs through sequential stages which includes inflammation, histolysis, epidermal closure, blastema formation, and redifferentiation into structures which were amputated.

To study the role of mechanical loading during mammalian digit tip regeneration, we utilized Hindlimb Unloading (HU), a well established model in which the hindlimbs of mice are no longer weight bearing. We find that at 26 days post amputation (DPA) amputated/ HU (AMP/HU) mice had significantly less bone volume relative to amputation and suspension controls. Further, using an in-vivo uCT we also show that the rate of degradation is slowed in AMP/HU mice.

Histological studies of AMP/HU digits reveal two dramatic differences in tissue architecture compared to control digits. First, epidermal wound closure was incomplete in 95% of the digits AMP/HU digits. Second, the degradation of stump bone is remarkable in that proximal bone is eroded and in some cases the proximal bone plate is degraded to the joint. Bone degradation is primarily endosteal, rather than periosteal, and associated with cathepsin K positive multinucleated osteoclasts littering the bone surface.

Overall, the inhibition of wound closure, decreased bone degradation rate, and lack of new bone formation demonstrate that HU treatment inhibits digit tip regeneration. These results are consistent with literature investigating physiological changes associated with space flight. Therefore, we have created a novel model to investigate how mechanical unloading alters regeneration.

“The Florida manatee (Trichechus manatus latirostris) immunoglobulin heavy chain suggests the importance of clan III variable segments in repertoire diversity”

Department of Veterinary Pathobiology, College of Veterinary and Biomedical Sciences
By: Breanna Breaux

Manatees are a vulnerable, charismatic sentinel species from the evolutionarily divergent Afrotheria that are used as a measure of ecological fitness in coastal ecosystems. Manatee health and resistance to infectious disease is of great concern to conservation groups, but little is known about their immune system. Immunoglobulins are the most common tool for monitoring the immune response. To develop manatee-specific tools for monitoring health and diagnostics, we first must have a general knowledge of how the immunoglobulin heavy (IgH) chain locus is organized and transcriptionally expressed. Using the genomic scaffolds of the Florida manatee (Trichechus manatus latirostris), we characterized the potential segmental diversity and constant region isotypic diversity of IgH and performed the first Afrotherian repertoire analysis. The Florida manatee has low potential V(D)J combinatorial diversity (3744 combinations) and fewer constant region isotypes compared to most mammalian species. They also are the first species identified outside of the ungulate lineage to have lost all clan III V segments, which may be the cause of reduced V segment numbers compared to other eutherian mammals. However, we found productive somatic hypermutation concentrated in the antigen binding complementarity determining regions, which increases affinity post-antigen exposure. In conclusion, manatees maintain a robust immune system despite having limited IGHV clan and combinatorial diversity in the IgH locus. This suggests that clan III V segments are essential for productive IgH locus evolution, but that combinatorial diversity may not be a reliable metric for immune strength.

"Maternal Vaccination with PNAG Protects Foals Against the Intracellular Pathogen Rhodococcus Equi and Enhances IFNÎ³ Production by Peripheral Blood Mononuclear Cells"
Department of Biomedical Sciences, College of Veterinary and Biomedical Sciences
By: Joana Rocha

Rhodococcus equi is a facultative intracellular pathogen that causes pneumonia in foals and for which no vaccine is available. A synthetic pentameric ÃŸ-(1?6)-linked glucosamine oligosaccharide was used to evaluate whether maternal vaccination could enhance cell-mediated immunity (CMI) in foals of vaccinated mares, and whether the CMI responses were associated with protection against disease.

The vaccine was administered to 12 pregnant mares 6 and 3 weeks before foaling; 7 control mares were sham vaccinated at the same times with saline. Foals were infected intrabronchially with 1 x 106 live, virulent R. equi at age 28 days and were monitored for pneumonia thereafter. To assess CMI, peripheral blood mononuclear cells (PBMCs) were isolated from foals at ages 2, 28, 56, and 84 days to assess interferon gamma (IFNg) production by ELISA when stimulated with a lysate of R. equi, concanavalin A (positive control), or media (negative control). For all foals, IFNg production at age 2 days was significantly ($P < 0.05$) lower than at all other ages. At each age, IFNg concentrations from R. equi-stimulated PBMCs were significantly higher ($P < 0.05$) in foals that remained healthy than from pneumonic foals. The proportion of pneumonic foals was significantly ($P < 0.05$) lower in foals born to vaccinated mares than to unvaccinated mares. Results suggest that maternal vaccination with this candidate vaccine enhances CMI in foals and protects against R. equi. The mechanism by which maternally-transferred antibodies help prime PBMCs to increase IFNg production before its exposure to R. equi needs further investigation.

"Identification and characterization of novel Brucella melitensis VirB/T4SS-Effector proteins"
Department of Biomedical Sciences, College of Veterinary and Biomedical Sciences
By: Ana Lucia Cabello Aguirre

Brucellosis is a global zoonotic disease of major importance. Approximately 500 thousand new cases per year are reported worldwide primarily in rural areas of Middle-Eastern and Mediterranean countries, Africa, and Central and South America. The main etiological agents of human brucellosis (also known as Malta fever, Mediterranean fever or undulant fever) are Brucella melitensis, B. abortus and B. suis. Routes of transmission involve 1) ingestion of unpasteurized dairy products, 2) direct contact with infected animals (i.e. cattle, goats, pigs, sheep, dogs) via skin abrasions or mucous membranes or 3) accidental exposure to bacterial cultures in clinical laboratories via inhalation of aerosols. In addition to wild type strains, currently available attenuated animal vaccine strains retain enough virulence and/or antibiotic resistance to cause considerable human morbidity. To treat human brucellosis, the World Health Organization (WHO) recommends a combination of antibiotics (doxycycline and rifampin) for a six-week course. However, disease relapses are observed suggesting an urgent need to develop effective and reliable strategies for prevention and infection treatment. To develop such strategies, it is crucial to understand the molecular mechanisms used by Brucella to manipulate the host cell in order to persist and sustain infection. The long-term goal of this project is to advance our knowledge of the survival and pathogenesis of Brucella. This proposal looks to identify novel VirB/T4SS effector proteins and to elucidate their biological function. This will contribute to the effort to identify targets for the development of better vaccines and therapies against brucellosis. Therefore, the central hypothesis of this project is that novel Brucella VirB/T4SS effector proteins modulate host cell mechanisms to promote bacterial proliferation and persistence. The purposed approach combines: 1) bioinformatics analyses to screen VirB/T4SS effector candidates, 2) a protein translocation reporter assay to elucidate VirB/T4SS secretion of effectors, 3) gene-knockout mutant strains to characterize VirB/T4SS effector phenotypes, 4) localization of pathogen effector proteins in host cells to provide insight regarding their biological role, 5) epistasis mini-array profiles to identify conserved eukaryotic pathways that are targets of VirB/T4SS effector proteins, and 6) the use of Brucella melitensis as experimental model to study intracellular bacterial infection.

"Population Variability and The Teratogenic Effects of Exposure to 2, 3, 7, 8-Tetrachlorodibenzo-p-dioxin During Pregnancy"

Department of Toxicology, College of Veterinary and Biomedical Sciences
By: Melanie Warren

2, 3, 7, 8-tetrachlorodibenzo-p-dioxin (TCDD, dioxin), is a toxicant that exhibits carcinogenic and deleterious effects on various tissues and organs. People are exposed to dioxin through everyday foods and by living in contaminated areas. Exposure during pregnancy is of particular concern as it interrupts fetal growth and development and may have long-term consequences for exposed offspring. While susceptibility to many toxicants often varies among individuals due to genetic differences, current studies of the teratogenic effects of dioxin do not account for inter-individual variability when evaluating exposure risks. Our study aims to evaluate the effects of dioxin exposure on pregnant females and fetal development in genetically diverse mice to determine how genetic background impacts susceptibility.

According to the National Research Council (NRC), dose-responses are anticipated to linearize with non-cancerous endpoints even when accounting for genetic variability among the population. To test this prediction, we developed an in vivo study with a panel of mice that collectively mimic a heterogeneous human population. In this study, pregnant female mice from 16 diverse mouse strains were exposed to one of three doses of TCDD (0 control, 1, 100 ng/kg/day) for a period of 10 days following mating. At day E10.5 (post mating) mice were euthanized and embryos dissected. To determine effects of dioxin at different doses, non-cancerous pregnancy-related endpoints were assessed, and expression of cardiogenic markers of development assayed by quantitative PCR.

Preliminary data shows inter-strain differences greatly impact the level of response and the overall outcome of pregnancy during exposure to TCDD. Several highly susceptible and resistant strains have been identified, thus proving that inter-individual genetic heterogeneity influences dose-response and exposure risks. Our objective is to determine whether dose responses are linear within individual genetic backgrounds, as they are when analyzed in genetically mixed populations. These findings will ultimately contribute to the development of knowledge needed to establish science-based responses to contaminated environments.

“SIM2s-Dependent Regulation of Metabolic Adaptation in Breast Cancer Progression”
Department of Biomedical Sciences, College of Veterinary and Biomedical Sciences
By: Steven Wall

Dysregulation of cellular metabolism is a defining hallmark of breast cancer progression and is associated with metastasis and therapeutic resistance; however, there is a gap in our understanding of the mechanisms by which cells undergo the switch from respiration to glycolysis and its impact on cancer progression. Here, we show that the short splice variant of the bHLH/PAS transcription factor Singleminded-2 (SIM2s), inhibits ductal carcinoma in situ (DCIS) to invasive ductal carcinoma (IDC) progression by regulating metabolic homeostasis. SIM2s promotes normal mitochondrial function and structure and oxygen consumption while decreasing extracellular acidification and glycolytic enzyme activity, whereas loss of SIM2s in breast cancer cells induces mitochondrial dysfunction, promoting glycolysis and increased tumor invasion and metastasis. SIM2s is stabilized by a reduction in metabolites including glucose and glutamine further implicating SIM2s as a mitochondrial activator in DCIS cells. Live-cell imaging showed that SIM2s does not colocalize to the mitochondria, suggesting SIM2s plays an upstream role in mitochondrial reactivation. Together, these findings suggest that SIM2s is a tumor suppressor that blocks DCIS progression by regulating metabolic equilibrium. Elucidating the mechanisms of SIM2s stabilization and mitochondrial activation will be critical steps in developing novel therapeutics for breast cancer treatment.

“Marek’s disease virus encoded US3 protein phosphorylates and stabilizes Meq oncoprotein”
Department of Veterinary Pathobiology, College of Veterinary and Biomedical Sciences
By: Yifei Liao

Marek’s disease (MD) is a highly contagious lymphoproliferative disease of chickens, which is of significant importance to the poultry industry. The causative agent has been identified as Marek’s disease virus (MDV), which is classified as an alpha-herpesvirus based on DNA sequence homology and genome organization. MDV oncogene, Meq, is a 339-amino-acid bZIP (basic region leucine zipper) protein, which can be phosphorylated by CDK2 at Serine 42 position and facilitate its nuclear export. But the function of phosphorylation of Meq still not fully understood. The MDV US3 encodes a serine/threonine protein kinase, which is highly conserved among all alpha-herpesviruses. Here, our immunofluorescence result shows US3 co-localize with Meq oncoprotein. And we could detect physically interact between US3 and Meq after performing co-immunoprecipitation (co-IP) for co-transfected 293T cells. Further, we demonstrate that US3 could stabilize Meq oncoprotein in co-transfected 293 and 293T cells.

“Somatic hypermutation of TCRÎ± contributes to thymic positive selection in sharks”
Department of Veterinary Pathobiology, College of Veterinary and Biomedical Sciences
By: Jeannine A Ott

In mammals and probably all vertebrates, immature T cell positive selection is enhanced by receptor editing of TCR alpha genes over a three-day interval in the thymic cortex. Surprisingly we also found extensive somatic hypermutation (SHM) operating at the TCRa locus in the nurse shark thymus, implying that SHM contributes to receptor modifications that enhance positive selection. We analyzed mutation in TCRa families of clones with the same VJ rearrangement. Additionally, in situ hybridization showed the strongest activation-induced cytidine deaminase (AID) expression in the central thymic cortex and bordering the cortico-medullary junction, with weaker expression in the medulla. The frequency of mutation at TCRa was as high as that seen at B cell receptor (BCR) loci in sharks and mammals. Complementarity determining regions (CDRs) accumulated significantly more mutations than framework regions (FWs), and significantly more of the CDR mutations resulted in amino acid replacement. Additionally, tandem mutations, a common feature of the shark BCR SHM machinery, occurred more often in CDRs than in FWs. We saw a preference for G:A and C:T transitions as well as a strong bias toward G:C substitutions within DGYW/WRCH SHM hotspots, especially within CDRs. We suggest that SHM is used by TCRa to boost positive selection, and perhaps to broaden diversification of the T cell repertoire in sharks, the first reported use of this process in thymic diversification in vertebrates. In addition, SHM of TCR? and d genes also occurs in shark thymus, implying that ?d TCR repertoire generation is also enhanced by this mechanism.

Atmospheric Sciences; Geography; Geology & Geophysics; Oceanography

“Framework geology as a driver of barrier island development: Implications for coastal management”

Department of Geology, College of Geosciences
By: Phillipe Alan Wernette

Barrier island development and patterns of resiliency can exhibit both free and forced behavior. The influence of framework geology on barrier island geomorphology and geomorphic change has previously been examined in areas where the framework geology is relatively simple or rhythmic. The purpose of this paper is to examine the influence of a spatially variable framework geology on beach and dune geomorphology. Beach and dune morphometrics were extracted from a topobathy digital elevation model (DEM) using an automated approach. Offshore bathymetric profiles were also extracted from the topobathy DEM. An electromagnetic induction (EMI) survey of PAIS was used to map the subsurface framework geology. Wavelet decomposition, peak spectral density (PSD), and bicoherence analyses were used to test for spatial relationships between and within the extracted alongshore metrics. Results demonstrate that the island morphometrics are structurally controlled. Statistically significant relationships between surface, subsurface, and offshore metrics indicate that the framework geology has influenced PAIS development, and that its influence is variable along the island. Further evidence from ARFIMA analysis indicates that paleochannels in the framework geology have a directional influence on beach and dune morphology. We propose that the accepted theory of development for PAIS should be re-examined to explicitly incorporate framework geology effects. Efficiently managing coastal resources requires that we understanding how the framework geology is influencing barrier island morphology and resiliency. It is essential to understand how the framework geology influences coastal change in order to predict how the coast is likely to change in response to continued sea level rise.

“Pushing the limit of Nitrogen isotopic measurements on a coupled Elemental Analyzer-GC-IRMS instrumental set-up”

Department of Geology, College of Geosciences
By: Divya Saxena

Nitrogen is critical to biomass and a major nutrient required by all living organisms for metabolic processes. Several studies have used Nitrogen isotopes (d15N) from modern skeletal organic material to study ecosystem structure, food-web interactions, anthropogenic nutrient loading, however complexities due to low-organic matter preservation in fossils limit the utility of this technique in studying nutrient cycling in deep time. Here we present the first set of comprehensive experimental data that attests fidelity of N-isotope analyses in low-organic bearing carbonate samples by simple bulk combustion. Results presented herein are integral for studies that investigate source and flux of nutrients to determine cause of biotic turnover during geological past. Surrogate samples resembling the chemical composition of fossils were prepared using varying proportions of reagent $CaCO_3$ (0, 2, 35 mg) and three organic standards (USGS40, USGS41, Rice). Our results indicate that the lower threshold for sample size in terms of N-content is 10 µg N on a coupled EA-GC-IRMS setup. In samples containing >10 ug N, those with more $CaCO_3$ (35 mg) show greater divergence from true d15N value than samples with less $CaCO_3$ (2 mg). $CaCO_3$ matrix thus affects d15N analysis due to energy consumption during thermal decomposition resulting in incomplete combustion of organic matter. Our results warrant pre-treatment protocols for low organic-bearing fossil carbonate material, and validate the utility of simple bulk combustion as a reliable method for d15N analysis for samples with >10 ug N-content. This result has important implications for studies wherein large sample acquisition, cost of retrieval, or access to collection sites is limited.

“Source to Sink Evolution of the Southern Delaware Basin, West Texas: Implications for Reconstructing Sediment Mixing During Subsidence”

Department of Geology, College of Geosciences
By: Zihui Gao

The Delaware Basin formed during the collision of the Gondwana and Laurentian plates during the Late Paleozoic. The basin is situated within the foreland of the Marathon-Ouachita thin-skinned fold-thrust belt, and west of the basement-involved Central Basin Platform, suggesting potentially complex interactions between possible subsidence drivers. This study addresses the protracted source to sink evolution of the southern Delaware Basin margin spanning pre- to post-Ouachita/Marathon deformation. Previous studies have alternatively suggested west-, south-, and north-directed Late Paleozoic sediment transport pathways, highlighting persistent questions regarding the basin history. Our study builds upon previous results to refine the long-lived basins linked to the transition from passive to active margins. We will integrate detrital zircon U-Pb geochronology, heavy mineral analyses, and thin section petrography as multi-proxy provenance techniques from fifteen samples spanning the pre-Cambrian to Cretaceous collected in the Marathon uplift and Guadalupe mountain areas. We will then reconstruct likely sediment transport pathways from these sources to the southern Delaware Basin margin, and provide additional constraints on the compositional history of the basin fill. The composition of sediment delivered into a basin has implications for diagenesis, reservoir properties, and geomechanics. Sediment routing systems may transport multiple sediment sources to basin sinks and are sensitive to tectonics, eustasy, topographic, and climatic gradients. The resulting basin fill records a diverse array of stratigraphic geometries of potentially variable composition. Better constraints on the origin and paleodispersal patterns of siliciclastic sediment have implications for improving long-lived basin models of geomechanics and reservoir composition.

“The Occurrence and Susceptibility to Mass Movement in the Western San Juan Mountains, Colorado: A 3-D Mapping Approach”

Department of Geology, College of Geosciences
By: Kaytan Kelkar

Mass movement is an integral part of the evolution of hillslope morphology, which poses a potential hazard to human activity in mountainous terrain. Hence, the identification and quantification of risk from mass movement is key to saving lives and safeguarding economic interests in mountainous environments. The complex geologic setting and rugged topography of the San Juan Mountains are prone to slope failure. Climate change and increased human development are modifying the equilibrium conditions of relatively steep ice-contact slope deposits potentially propagating greater frequencies of mass movement in the area.

The study area encompasses eight USGS quadrangles: Ridgway, Dallas, Mount Sneffels, Ouray, Telluride, Ironton, Ophir, and Silverton covering an area of ~1615 km2. We developed a GIS-based virtual 3-D approach to model susceptibility to mass movement for the area. To map the susceptibility to mass movement, we applied a weighted-overlay method integrating six terrain variables: slope angle and length, aspect, geology, vegetation, and soil drainage. We supplemented the 3-D model with a map of surficial landforms constructed at a scale of 1:3,000, which displays the occurrence of mass-movement features in the area. Our findings show that roads in the area are high susceptible to mass-movement and, unfortunately, the continued expansion of towns will create additional major concerns. Analysis of the susceptibility of mass movement using the 3-D model shows that aspect and slope have the greatest relative influence on slope failure. We think this research demonstrates the implementation of a combination of emerging geospatial and visualization techniques to facilitate improved landslide prediction in mountain area worldwide.

"Detecting Vegetation Disturbances using MODIS Imagery"

Department of Geography, College of Geosciences
By: Eric Guenther & Billy Hales

Catastrophic natural and anthropogenic events can drastically affect the vegetation of an area. Measuring the occurrence, duration, and location of these events is vital for geospatial and environmental theater assessment. Satellite based imagery products such as MODIS are typically used to detect and measure these events because their high temporal resolution allows investigators to measure the vegetation conditions before and after an event within a reasonable timeframe. However, identifying the occurrence and location of these events can be difficult using time-series data alone, as there are also seasonal and long-term vegetation trends that can obscure acute changes, anomalies, in vegetation. To detect these anomalies, we have created a time-series anomaly detection algorithm that is applied on each pixel of a small MODIS scene in the area of the Bastrop Complex Fire. The algorithm first applies a Fourier Transform to the time-series to account for seasonal variation, then finds the trend of the de-seasonal data. The residual of the trend shows when anomalies occur in the time-series. Initial results indicate that areas that have been affected by fire can accurately be identified.

"Glacial-interglacial changes in the position of the Intertropical Convergence Zone"

Department of Geology, College of Geosciences
By: Maria Alejandra Reimi Sipala

The Intertropical Convergence Zone (ITCZ) is a key component of tropical hydroclimate. It is associated with a zonally heterogeneous tropical precipitation maximum which affects the lives of billions. The Central Equatorial Pacific, near the Line Islands, is an ideal location to study ITCZ migration in response to global temperature fluctuations. Our study uses dust records recovered from five locations in the CEP. We address changes in dust provenance, and the response of the paleo-ITCZ to glacial-interglacial transitions around the penultimate termination (150 to 110 ka). Pb and Nd isotope ratios can be used as a dust provenance tool, and lead to accurate reconstructions of paleo- ITCZ position which are decoupled from rainfall intensity and dust flux.

Five cores, along a meridional transect at approximately 160Â° W, give us access to unprecedented high spatial resolution records with core samples at: 0.48Â° N (ML1208-17PC), 1.27Â° N (ML1208-20BB), 2.97Â° N (ML1208-28BB), 4.68Â° N (ML1208-31BB), and 7.04Â° N (ML1208-31BB). Our preliminary data suggests that equatorial (core 17PC) dust is predominantly sourced from South America (average eNd = -4.4), but during Heinrich Stadial 11 (~136-129 ka) there is a rapid isotopic excursion (3 eNd units). This suggests an abrupt change in dust provenance to the CEP potentially associated with an increased influence of northern hemisphere dust.

"Firsthand Learning of the Circulation and Stratification off Sabrina Coast, Antarctica"

Department of Oceanography, College of Geosciences
By: Ms Natalie Zielinski

Air-sea-ice interaction observed within the Sabrina Basin, East Antarctica are likely widespread along the Antarctica margins, therefore this study is relevant to explaining and predicting current mass loss trends in other Antarctic ice shelves and glaciers. Water mass structure, mixing history and flow patterns over the continental shelf off Sabrina Coast (115 Â°E - 122 Â°E) are described using the first observations made during the multi-disciplinary U.S. cruise of 2014 and the follow up Australian cruise of 2015 and based on property distributions on specific isopycnals and levels.

Two large cyclones are inferred over the shelf, an elongated one connecting slope waters to the eastern end of the escarpment, and a zonally-oriented cell connecting the westward boundary current along the northern escarpment to the interior of the Dalton Basin. Unlike the available Modified Circumpolar Deep Water near the shelf break, the lighter Thermocline Water is able to enter the shelf over the Dalton Basin sill (~450 m), progressively deepening within the bottom layer temperature maximum of an eastern boundary current found against the western flank of the Dalton Plateau (450 m â€“ 550 m). Near the southern end of the Plateau its densest remnant branches westward and further sinks to depths greater than 550 m supplying the warmest bottom layer within the southern limb of the Dalton Basin cyclone. Relatively lighter Thermocline Water (?n = 27.90 kg m3) lying at about 150 m near the shelf break extends to over the escarpment at 450 m, and supplies multiple trenches connected to Moscow University Ice Shelf with source water warmer than -1.7 Â°C at 560 m available for basal melt. Directly above this inflow, a prominent Meltwater-bearing outflow is observed at the Central Trench of this Ice Shelf over a 300-m thick layer with water colder than -1.8 Â°C and fresher than 34.22 (?n < 27.90 kg m3), whose downstream influence throughout the Sabrina Basin cyclonic flow is evident by a thickened thermostad layer and much deeper interior thermocline than over the eastern shelf. Ventilation of the oceanic Thermocline Water takes place along a tight anticyclonic loop west of the Dalton Iceberg Tongue. Here, a relatively warm (? > -1.83 Â°C) and saline (S > 34.30) southeastward inflow at 200 m (?n > 27.90 kg m3) impinges onto the northern Tongue, and emerges off its tip as a fresh (S < 34.22) and lighter (?n < 27.80 kg m3) plume injected northwestward into the Antarctic Slope Current.

“Classification of Ground Penetrating Radar Images using K-means Clustering of Structure Tensors”

Department of Geophysics, College of Science
By: Roy Bowling

Interpretation of ground penetrating radar (GPR) images can be a subjective, and in some cases, a time consuming process. We present here a method for facilitating GPR image interpretation through k-means clustering of image structure tensors. Structure tensors of image points have been described as matrices representing gradient information, and eigen-decomposition of these tensors gives eigenvectors representing directions of minimum and maximum image gradients (van Vliet and Verbeek, 1995; Fehmers and Höcker, 2003). For geophysical images created by reflection methods, the direction of the minimum image gradient will be parallel to reflectors in the image (Fehmers and Höcker, 2003; Hale, 2006). Using the methodology described by Hale (2006), computation of structure tensors and their eigenvectors is performed for 2D GPR reflection data. We then use the structure parallel eigenvectors as the vector space for performing a k-means image segmentation of the GPR images. The k-means clustering algorithm, adapted from MacQueen (1967), seeks to optimally assign each image point to a cluster based on the point’s closeness to the cluster’s mean. After initial image point assignment, new cluster means are computed and the process repeats until cluster means do not change significantly between iterations (MacKay, 2003). By using local neighborhoods of structure parallel vectors to compare GPR image points to cluster means, we are able to segment the 2D GPR image into regions of similar reflector patterns. Each cluster is defined by specific reflector geometries and therefore represents a category of subsurface features. This method has been applied here to facilitate interpretation of geologic structures and radar facies of carbonate terrace geology.

Education, Admin., & Human Resource Dev.; Educational Psychology; Health & Kinesiology; Teaching, Learning & Culture

“Self-Regulation in Predicting Problem Behaviors: A Twelveyear Longitudinal Study”

Department of Educational Psychology, College of Eduation and Human Development
By: Qinxin Shi, Marike Deutz & Jade Kestian

Background: Children’s behavior problems are increasingly characterized by co-occurring difficulties in internalizing and externalizing problem behaviors. This study sought to investigate what factors best predicted this set of co-occurring problem behaviors using data from a longitudinal study in Texas. Methods: Children (N = 784) were followed during four measurement waves covering distinct developmental periods (early childhood, late childhood, early adolescence, and late adolescence) during a 12-year longitudinal study. A bifactor model parsing out the contributions of domain (general problem behavior factor: GP-factor) and specific factors (internalizing and externalizing problems) of problem behaviors was used to evaluate predictors at various developmental measurement waves, such as socioeconomic status, ethnicity, gender, IQ, academic achievement, and self-regulation. Results: A questionnaire measure of self-regulation was identified as the strongest and most robust predictor of a GP factor and internalizing problems across all developmental spans. Conclusion: The findings suggest early self-regulation plays an important role in the future development of a profile of problem behaviors tapping into shared internalizing and externalizing problems.

“Influences of Parents’ Marital Conflict and Parent-child Relationship on the Children’s Self-esteem”

Department of Educational Psychology, College of Education and Human Development
By: Tingting Huang

Self-esteem has been found to be important for adolescents both physical and psychological health. Drawing on the data from the Flourishing Family Project, this study examined the influences of parents’ marital conflict and parent-child relationship on children’s self-esteem. A number of theories suggest that positive parent-child relationships can foster children’s health feelings of overall self-worth and support high self-esteem. The quality of the parents’ couple relationship is also an important element that may influence children’s self-esteem. Parents’ positive couple relationship may enhance children’s family life satisfaction and foster children’s positive feelings of self-worth while negative couple relationship may reflect or result in family conflict, which may negatively impact children’s emotional or psychological adjustment. Participants were 500 children (approximately 52% girls and 48% boys) and their parents from a large northwestern city in the USA. The data of parents; couple communication patterns regarding conflict and parent-child connectedness were collected in 2007 using the RELATE assessment battery and Social Connectedness Scale-Revised (reliabilities equal 0.78 for children’s scale and 0.94 for parent’s scale) . The average age of children in the first year was 11.82. Children’s global self-esteem was assessed in 2011 using the Rosenberg Self-Esteem Scale. The average age of children was 15.29. Results show across the five year, couple communication patterns regarding conflicts ($r = -.065$) and parents perceived parent-child connectedness ($r = -.004$) have little correlation with children’s self-esteem, while children perceived parent-child connectedness is positively correlated with children’s self-esteem ($p = .165^{**}$). In addition, result also shows that girls’ self-esteem is significantly lower than boys’ (p

< .05). This study supports the idea that good parent-child relationship may foster children's high self-esteem. However, the relationship of marital conflict and children's self-esteem still need to be examined.

"Metacognition in the classroom: The association between students' exam predictions and their desired grades"
Department of Psychology, College of Liberal Arts
By: Gabriel Diego Saenz

Students are overconfident when making grade predictions, and worse, the lowest-performing students are generally the most overconfident. Because metacognitive accuracy is associated with academic performance, multiple studies have attempted to improve metacognitive accuracy with mixed results. However, these studies may be of limited use because we do not understand the types of information university students use to make performance predictions. The current studies examined the possibility that university students' predictions are associated with their desires' the grade they want to receive. Studies 1 and 4 demonstrated that students' desired grades were strongly associated with their grade predictions across different courses, universities, and measurement strategies. Study 4 also showed that, if warned about the previous results, students could reduce their reliance on their desired grades and improve the accuracy of their predictions relative to control. Together, results demonstrated that students' exam predictions are associated with their desired grades.

"Diversity at the Bush School: A Program Evaluation"
Department of Public Service &Administration, Bush School of Government
By: Dianey Leal, Morgan Gray, & Heba Baig

"It has been proven that diversity and diversity experiences affect student learning and potential. Based on this empirical evidence, ensuring diversity and inclusion at the Bush School is a priority for the success of students during their academic tenure and their professional success afterwards. The Bush School of Government & Public Service identifies, as part of its mission, to be a leader in achieving equity in representation and building a culture of inclusion. As part of this mission, the Bush School constantly seeks resources, strategies, and tools to help achieve this mission. Evaluating the programs that aim to improve diversity and inclusion is the key challenge.

One of the continued flaws of programs in higher education, is a lack of a rigorous approach to evaluation of programs. Too often either anecdotal evidence or single measures are used to evaluate programs that are implemented in academic institutions. The Bush School utilized the DIVERSITY MATTERS Seed Grant Program to develop and implement a thorough, multi-method program evaluation of our pilot program to take a comprehensive approach to achieving equity in representation and to continue building a culture of inclusion. The program evaluation aims to answer the question: How effective was The Bush School of Government & Public Service's pilot program in helping to achieve equity in representation and in continuing to build a culture of inclusion? The results of this evaluation will provide insight into how other graduate programs might design comprehensive strategies to enhance diversity recruitment and encourage an inclusive culture.

"Numerical Cognition: A review"

Department of Curriculum & Instruction, College of Education and Human Development
By: Mahati Kopparla

In the recent years, the world has experienced a major growth in STEM (science, technology, engineering and mathematics) related fields, and numeracy is a critical component in the progress of these fields (President's Council of Advisors on Science and Technology, 2012). Numeracy is essential not only for success in college (Imran, Nasor & Hayati, 2015) or STEM related professions but also for non-STEM related jobs and everyday activities (Lacey and Wright, 2009). However, the cognitive processes underlying numeracy are not completely understood. The present proposal aims to investigate numerical cognition via a commonly observed phenomenon during mental arithmetic: the problem size effect.

The problem size effect refers to the direct relation between the magnitude of numbers in an arithmetic problem and the time taken to solve it, e.g., a problem with smaller numbers such as 3+4 is solved much faster and more accurately than a problem with larger numbers such as 23+76. Understanding the problem size effect helps in understanding the cognitive processes in action during mental arithmetic.

In an effort to justify the problem size effect, two types of theories, namely, procedural/calculation based, and retrieval/memory based theories have been proposed (Zbrodoff, 1995). Though these different theories explain certain behavioral observations of the problem size effect, there is no consensus about the mechanism underlying this effect (Zbrodoff & Logan, 2005). Relying on behavioral measures alone to explore the causes of this disparity has brought the debate "to a standstill" (Ashcraft & Guillaume, 2009, p.144). Neuroscientific evidence can play a vital role in clarifying the dilemma as the strategy used by the participants can be identified based on the region of brain activation. While activations in the fronto-parietal regions are associated with procedural strategies, activations in left angular gyrus are associated with retrieval strategies (Grabner et al., 2009).

The current study is a systematic review of behavioral and neuroscientific explanations of the problem size effect. For the purpose of this study, articles focusing on problem size effect in adults as well as children were used. The articles were categorized based on their approach toward studying the effect. Finally, various theories of mathematical cognition used to explain problem size effect were summarized.

This study could provide a better understanding of the problem size effect and give a deeper insight into the processes underlying mathematical cognition. The outcomes of this study contributes to the field of mathematics education. Gaining a deeper understanding of the cognitive processes underlying numeracy and can help in determining instruction strategies according to students' cognitive needs.

“Affective Engagement in STEM PBL Lessons”

Department of Curriculum & Instruction, College of Education and Human Development
By: Yujin Lee, Mario Itzel Suarez, Devyn Rice, & Cassidy Caldwell

Affective engagement of secondary students is very important in their learning to help ensure they remain interested in STEM learning as they transition to secondary education. Project-based learning (PBL) has been shown to be effective in engaging students in STEM content. Students in STEM PBL and non-STEM PBL classes participated in a survey measuring their affective engagement based on attitudes, cognition, emotions, and values. Correlations between eight sets of items related to those factors were analyzed to determine statistical significance and possible reasons behind those correlations. A negative, statistically significant correlations was found between “Stay out of Trouble” and “Check This Out!” (r = .288, p = .04). The eight sets of items were combined into the four factors for additional correlational analysis. Cognition and emotion were positively correlated (r = .238, p = .02) and cognition and values were negatively correlated (r = -.434, p < .001).

“Item Response Theory (IRT): AGQ-PE Gender Measurement Invariance”

Department of Kinesiology, College of Education and Human Development
By: Nasnoor Bin Mohd Nasiruddin

The Achievement Goal Questionnaire-Physical Education (AGQ-PE; Guan, McBride & Xiang, 2007) has demonstrated to be a reliable and valid measure when assessing students’ mastery-approach (MAp), mastery-avoidance (MAv), performance-approach (PAp), and performance-avoidance (PAv) goals in physical activity/physical education settings (e.g., Pieper, 2003; Agbuga, 2009). The validation of AGQ-PE involved Cronbach`s alpha, exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). More recently, through multigroup CFAs, Su, McBride, and Xiang (2015) reported that AGQ-PE was a gender invariant measure at factor-level measurement among college students in physical activity (PA) classes. However, this measure has never been validated using the differential item functioning (DIF) analysis in the item response theory (IRT). The IRT model is based on item response function specifying probabilities of achieving a particular score on a measured item given a person’s latent trait levels (Hambleton, Swaminathan, & Rogers, 1991). The presence of DIF on an item occurs if the probability of a correct item response differs across groups; despite differences in ability or proficiency is controlled (Hambleton et al., 1991). This study extends Su et al. (2015) work by using the IRT to examine gender measurement invariance of the AGQ-PE in a college PA setting.

As a part of a larger project, 307 undergraduates (152 male, M age = 20.19, SD=1.90; 155 female, M age =19.82, SD =1.53) enrolled in PA classes (e.g., swimming, weight lifting, volleyball) at a large university located in the Southwest U.S served as participants. Ethnicities included 74.5% Caucasians, 15.1 % Hispanics, 2.5% African Americans, and 7.9 % Asians. Responding to the stem, â€œIn my PA classesâ€¦,â€• all participants completed the AGQ-PE on a 7-point Likert scale ranging from 1 (not at all true of me) to 7 (very true of me). The AGQ-PE included MAp, MAv, PAp and PAv subscales with each subscale containing three items. Cronbach’s alphas for MAp, MAv, PAp, and PAv scores were .81, .82, .84, and .74, respectively

Data were analyzed using forward procedure and were fitted in the IRT`s graded response model (GRM; Samejima, 1972; Stark, Chernyshenko, & Drasgow, 2006). The DIF analysis detected a significant gender non-invariant on the item “My goal is to avoid performing poor” in PAv subscale, ?2/df = 244.4, p =. 0001, dDIF =.23. The presence of DIF on this item also indicated that the item was more difficult for female students to understand than male students, ?2/df = 146.1, p = .0001, dDIF =.16. Overall, each of the AGQ-PE items demonstrated to be a full gender invariant measure in three of the four subscales (i.e., MAp, MAv, PAp). However, “My goal is to avoid performing poorly” in PAv subscale was identified as a non-invariant measure; it was understood differently by female and male students. Given this finding, we recommend that future research should consider rephrasing this item, or removing it from the AGQ- PE in physical activity/physical education research settings. It is pinnacle, due to improve the construct validity; have an instrument that unbiased, and measuring the same construct across groups.

“Literature in High School: Eleven Teachers, Three Themes”

Department of Curriculum & Instruction, College of Education and Human Development
By: Kimbelry Ann Currens

High school students often struggle when reading the classical literature analyzed in their English courses, even though teachers devote considerable time to make certain they leave with a solid foundation. English teachers were recruited for this study through the snowball method. Eleven teachers completed semi-structured interviews regarding the pedagogical methods they used during literature instruction in their English classes. The resulting data were analyzed qualitatively for themes through an iterative coding process. Three major categories emerged: background that led to teaching, teaching literature philosophies, and reading technical text. The data also revealed information about how and why students study classical literature in their classes, from the teacher perspective.

“Questioning Privilege: Tools for Advocacy and Teaching”

Department of Education Human Resource Development,
College of Education and Human Development
By: Sarah Michele Ray

Privilege and oppression are valuable concepts to personally explore and teach in Adult Education. This presentation serves two primary purposes: a) to provide an overview of literature on privilege and oppression within a conceptual framework of experiential learning through critical and feminist pedagogies (b) to explore three learning activities adult educators, researchers, and learners can use to uncover personal privilege in various cultural contexts.

“Faculty Development: A Systematic Literature Review of Review Studies”
Department of Education Human Resource Development,
College of Education and Human Development
By: Tam Phuong & Margret Foster

In recent years, faculty development (FD) has progressed significantly and grown to become an emerging discipline (Steinert, 2014) with an extensive body of literature; the primary focus regards FD effectiveness across a wide variety of subject areas. A systematic literature review was conducted to synthesize the findings of 11 review studies on FD, published between 1990 and 2015. The main purpose of this review study was to investigate the current FD literature, concentrating on the identification of FD activities and categorization of FD outcomes. The findings indicate that the review studies mostly originated from North American universities, used a systematic literature review method, and applied Kirkpatrick’s evaluation model to evaluate FD outcomes. The most common FD activities included formal training programs, self-directed learning, and comprehensive curricula. The FD outcomes usually involved changes in faculty members’ knowledge, skills, and behavior. Based on this literature review, a conceptual FD framework, locating individual experience as the core category, was developed. These review findings and the newly-generated conceptual framework will contribute to serve as a foundation for faculty members, educational leaders, and faculty developers and highlight areas for future research hoping to further evolve their respective practices

“Cultural Values and Gender Equity on the National Olympic Committee Boards”
Department of Kinesiology, College of Education and Human Development
By: Na Young Ahn

Introduction: Around the world and across different occupational settings, women are under-represented in leadership positions. For example, according to the 2016 Fortune 500 list, women held 21 percent of the board seats and just 4.2 percent of Chief Executive Officer (CEO) positions in American corporations. Similar trends are apparent in European organizations, too (European Commission, 2015). These patterns are not limited to the corporate setting, as researchers have shown that women are under-represented in sport organizations, including as administrators and coaches in college athletics (Acosta & Carpenter, 2014), commissions for the Australian Sports Commission (Australian Sports Commission, 2014), and board members of Sport England (Sport England, 2014), among other settings (see also Burton, 2015). The lack of women in leadership roles is important for several reasons. From an ethical and social obligation perspective, sport organizations have a responsibility to be inclusive (Cunningham, 2015). Furthermore, top management teams with a gender balance signal inclusiveness to internal and external stakeholders, arrive at better decisions, and frequently outperform their peers (Eagly & Carli, 2003; Robinson & Dechant, 1997).

There are a bevy of multi-level reasons for the under-representation of women, including societal factors and gendered expectations for women and men, organizational cultures of similarity, biased decision making, prejudice, and discrimination (Burton, 2015). The purpose of the current study was to expand on this understanding in several ways. First, we investigate the representation of women in National Olympic Committees. Given that much of the gender

research is set in North America and Europe, considering the gender equity of sport organizations around the world adds a novel contribution. Second, we draw from Hofstede's theory on cultural values to empirically consider the role of macro-level factors on the representation of women in leadership positions.

Theoretical Framework and Literature Review: Hofstede (1991) defined culture as "the collective programming of the mind distinguishing the members of one group or category people from others" (p. 5). In his early work, Hofstede measured the nations' culture to explain the similarities and differences among human cultures and also concluded organizations are culturally tied (Hofstede, 1980, 1984). He later refined this thinking to suggest national culture exists along five dimensions (Hofstede, 1991). Power distance, refers to the degree to which resources and influence are concentrated around a select few; uncertainty avoidance pertains to the degree to which people view uncertainty as a threat and subsequently seek to eschew such situations; individualism versus collectivism refers to the strength of bonding, concern for others, and collaboration among people; femininity versus masculinity refers to the traditional role for women and men, with countries high in femininity valuing cooperation, modesty, and caring for others; and finally, long-term orientation refers to the degree to which people in a society value tradition, fulfilling social obligations, and the past.

Hofstede's theory of cultural values provides some explanatory value in understanding the representation of women on governing boards outside of sport. For example, Carrasco et al. (2015) found that women were under-represented on boards in countries marked by power imbalances (high in power distance) and a preference for traditional roles of men (high in masculinity). In a related study, Ng and Burke (2004) observed that cultural values were predictive of attitudes toward diversity. Finally, Ringov and Zollo (2007) observed that masculinity and power distance were associated with poorer social performance among firms in their study, and as social performance might be linked with inclusiveness, the findings inform the current research.

Building on Hofstede's theory and the subsequent empirical work outside of sport, our work was guided by the following research question: What is the relationship between a country's cultural values and gender equity on its National Olympic Committee?

Method and Results: We relied on archival sources for our data. The Rio 2016 Olympics website listed every country's National Olympic Committee website, and we consulted these sites to gather the number of board members and gender of each board member. We used Hofstede's site (https://geert-hofstede.com/national-culture.html) to collect data concerning the country's cultural values. Members of the research team independently collected data from 10 countries to examine consistency in coding. Agreement was reached, and the remaining data were collected from the lead author.

The average National Olympic Committee had 12 members, 19.7 percent of whom were women. Eight countries had a committee with no women, while one country had an equal proportion of women and men. This country also had the largest proportion of women. The mode representation of women on the committee was 25 percent. In terms of committee leadership, 94.2 percent of the committees had a man as president, and 85.3 percent had a man as secretary general.

We computed a multiple regression analysis to examine the research question. Given the small sample of complete data ($n = 64$ countries), we interpret alphas at the .10 level. We included the size of the board as a control variable, though the effects were not significant (beta = -.14, $p = .12$). The block of cultural values variables was entered in the second step. The total model accounted for 41.6 percent of the variance ($p < .001$). Three cultural values were significant at the .10 level: power distance (beta = -.24, $p = .09$), masculinity (beta = -.31, $p = .005$), and uncertainty avoidance (beta = -.31, $p = .006$). We examined eta-square values, which showed that power distance accounted for 4.8 percent unique variance, masculinity accounted for 12.9 percent unique variance, and uncertainty avoidance contributed 12.5 percent unique variance.

Discussion: Our study yielded several noteworthy results. First, gender equality on National Olympic Committees was the exception, not the rule. Almost all of the committees had a man as president, over 85 percent had a man as secretary general, and 6.6 percent had no women on the board. In fact, 67 percent National Olympic Committees with fewer than 25 percent women. These results suggest administrative work at elite, international levels is largely reserved for men.

Second, three cultural values significantly predicted the representation of women on the National Olympic Committee. Lower power distance, aversion from the traditional male values, and a comfort with uncertainty and ambiguity were all associated with a higher proportion of women on the board. While national cultural values might be difficult to change, it is possible to embrace such positions in organizations (Hofstede et al., 2010). As gender diversity on boards is associated with multiple valued outcomes, sport managers should embrace such values and promote them in the workplace.

"SketchTivity: Learning How to Sketch with an Intelligent Tutoring System"

Department of Computer Science, College of Engineering
By: Blake Williford

Sketching is a powerful tool for expressing creative ideas and becoming a more well-rounded communicator. Sketching instructors conventionally employ pen and paper in their classrooms to convey these fundamentals to students. However this traditional approach limits the bandwidth and capability of instructors to give timely and individualized feedback. Intelligent tutoring systems can leverage the knowledge of domain expert design sketching instruction to give students personalized feedback outside of classroom hours, which can potentially improve self-efficacy, motivation, and engagement in the students. Additionally, the inclusion of games and gamified lessons can offer a more engaging and motivating experience for students.

This research is aimed at developing intelligent interactive lessons, challenges, and games that teach sketching fundamentals while evaluating their effectiveness in terms of improved sketching ability in the students, increased self-efficacy with respect to sketching, and motivation to practice sketching. The system utilizes sketch recognition to give timely feedback that both mirrors human instruction and goes beyond human instruction. Initial results have been promising, as we have shown students can improve their accuracy, line quality, and speed by using the system while also learning fundamentals of sketching.

“Transcranial direct current stimulation effect on motor skill learning”

Department of Kinesiology, College of Education and Human Development
By: Jing Chen

Primary motor cortex (M1) is a key neural participant during motor sequence learning. Tecchio et al. (2010) revealed that the application of anodal transcranial direct current stimulation (tDCS) at contralateral M1 immediately following training facilitated subsequent test performance compared to a sham control. It was argued that tDCS supported important consolidation processes critical to offline improvement of the practiced sequence. However because the test phase was administered only 15-min after tDCS application, one cannot rule out the possibility that performance facilitation was a result of known tDCS after-effects rather than on consolidation. The present experiment addressed this issue by extending the work of Tecchio et al. by utilizing a 2-hr delayed retention test following the administration of anodal, cathodal, or sham stimulation. If consolidation is influenced by this non-invasive stimulation protocol then test performance should be superior for the anodal compared to other stimulation conditions. Thirty-six right handed young adults experienced two sets of five blocks with the same finger tapping series (3-1-4-2-4-1-3-2) using their left hand. During each block, subjects are required to repeat the finger tapping series as accurately as possible and as fast as possible in 30 seconds. Following training, participants were exposed to 15-min of 1.0 mA anodal or a sham protocol. Approximately two hours later, participants return to the lab and completed a retention test. Initial assessment of the data revealed the novel finding that anodal stimulation boost retention test performance in anodal group compared to those in sham group. The results suggest that important offline processes occur in a brief temporal window following practice and this cognitive activity can be influenced by exogenous non-invasive brain stimulation.

“Distributed Leadership: A model for equity”

Department of Curriculum & Instruction, College of Education and Human Development
By: Matthew James Etchells

The concept of distributed leadership (DL) has developed in function, as it has in name. From its basic restricted conception as â€˜leadership from a remote (physical) location, using only technological means of communication’ (Kayworth and Leidner, 2000, cited in Bennett et al, p. 47) to much more developed functions which will be discussed further. Many names have and are being placed under the umbrella of distributed leadership. Delegated, devolved, democratic, dispersed, team and shared leadership are all closely related to the idea with subtle differentiation. This research explores how one school in the Middle East employs DL to develop an environment of equity for teachers and students.

Architecture; Construction Science; Landscape Architecture & Urban Planning; Visualization

“Contextualizing Construction Incident Reports in a Virtual Environment”
Department of Visualization, College of Architecture
By: Alyssa Pena

Safety education is important in the construction industry. While research has been done on virtual environments for construction safety education, there is no set method for effectively contextualizing safety information and engaging students. In this research we developed a virtual environment to represent a construction accident report provided by the Occupational Health and Safety Administration (OSHA). Along the way we looked at different designs to contextualize the report data through space, visuals, and text. Users can explore the environment and interact with it in VR to learn more about the particular accident.

“An Artisan Heritage Crafts Village: Indigenous Sustainability of Raghurajpur”
Department of Architecture, College of Architecture
By: Rohit Kumar

The research concerns Raghurajpur, a heritage crafts village in Puri in India. This village is recognized for its folk art called Pattachitra, an art form which dates back to 5th Century B.C. and Gotipua dance which existed as a predecessor before the emergence of Odissi dance. Hence it is the home of a prominent visual art as well as a performing art. The artisans of this village are also engaged in making craft objects like wooden toys and masks, palm leaf engravings, wood carvings, etc. These activities have provided them income opportunities outside their state and even in foreign lands. The village was designated as a heritage village in the year 2000 by the efforts of the federal and state government. Though the state government has attempted to improve the physical conditions so as to make them tourist friendly but the impacts of these interventions have been questionable. The purpose of the research is to show how the practices and traditions of the residents make it an open air museum for the outsiders but a home for the residents. Sustainability being the watch word of the present, is evident here as seen from the raw materials used in the painting process, in the colors, canvases, etc. and the manner in which the painting is done. This is an example of the complex relationship which the village shares with the environment and is exclusive to the place, making it an important focus of rural tourism of the state.

“An Exploration of the relationship between architecture and nature in Tadao Ando’s projects”
Department of Archtirecture, College of Architecture
By: Hao Huang

I. Introduction: The topic of my research is An Exploration of the relationship between architecture and nature in Tadao Ando’s projects. Tadao Ando is a Japanese self-taught architect. He visited buildings designed by famous architects before he founded his own design studio, Tadao Ando Architects and Associates in 1969. In 1995, Ando won the Pritzker Prize for architecture, considered the highest distinction in the field. When asked why he want to be an architect, he replied, “As it happens work was carried on where I lived when I was 15, and I got to know some of the carpenters. About the same time, in a used bookstore, I saw a book on the complete work of Le Corbusier. I recopied some of his drawings, and I would say that that is how I began to be interested in architecture."

II. Background and Significance: According to Kenneth Frampton, nature in the form of water, light, and sky restores architecture from a metaphysical to an earthly plane and gives life to architecture. In Tadao Andoâ€™s earliest works, the element reinforced-concrete wall under certain conditions is susceptible to dematerialization through the impact of light.

III. Literature Review: According to Jin Baek, the self-taught architect Tadao Ando was good at using natural light in innovative way. Instead of destroy the environments around, Ando always try to fit into the nature of the landscape. Chichu Art Museum was designed by Ando in 2004. The position of the museum buried underground, making the building disappear from the landscape. Ando has also designed Christian churches, such as the Church of the Light (1989). The church is a simple concrete box consisting of a rectangular form and a free standing wall at a 15 degree angle relative to the east side wall. Andrew Kroll said that for Ando, the Church of Light is an architecture of duality "the dual nature of existence" solid/void, light/dark, stark/serene. The Church of the Light embraces Ando's philosophical framework between nature and architecture through the way in which light can define and create new spatial perceptions equally.

IV. Research Design and Methods: The research approachs I will use are case studies and combined strategies. I expect to articulate the relationship between architecture and nature in Tadao Ando's projects and develop my ability to solve the problem in the design process. I will study the projects of Tadao Ando in their real-life context. For instance, the Azuma Row House (Sumiyoshi, Osaka, Japan) was built in an old post WWII neighborhood of wooden row houses. Ando used a modern language to interpret the urban context. In addition, I will use different sources of evidence. The data sources include archives, oral history, spatial analyses etc.

V. Preliminary Suppositions and Conclusion: Jay A. Pritzker, who established the Pritzker Architecture Prize in 1979, commented on Ando's architecture ""Ando conceives his projects as places of habitation not as abstract designs in a landscape. He considers craftsmanship important in accomplishing his designs.

"Availability of Parks to Races and Ethnicities"

Department of Urban & Regional Planning, College of Architecture
By: Kaveh Forghanparast

No abstract provided.

"A policy based analysis to determine the underlying causal nature of ethics in the history of Housing Discrimination"

Department of Urban & Regional Planning, College of Architecture
By: Gulafshan Ghori

Three main learning objectives:

1. How is discrimination in housing still prevalent even after 49 years of the enactment of the Fair Housing Act, the consecutive amendments with various policies and subsidies?

2. What are the types and the probable causes to Disparate Impact?

3. Is prevalence of discrimination in housing an ethical issue at the fundamental level?

This research demonstrates analytical studies pertaining to Housing Discrimination through policy studies and literature review of Ethics based on various references. An overview of seven landmark disparate impact cases has been applied for providing evidence for the objectives. When evaluating public policy questions most people ask selfishly, "How does this affect me?" Planners, in contrast, should ask selflessly, "How does this affect the community, particularly disadvantaged and underrepresented groups?" Some people assume that planning is a zero-sum game of interest groups fighting for special policies and projects. However, good planners generally want something quite different: policies and projects that benefit the greatest number of people including many who are unaware of their gains. It is about public interest.

"Towards Integrating a Non-Quantifiable Objective into Architectural Optimization: A Prototype for Design Process"

Department of Architecture, College of Architecture
By: Shermeen Yousif

Recently, architectural design has been considered as a Multi-Objective Optimization (MOO) problem of which quantifiable objectives of building performance requirements are sought to be satisfied. In traditional design activity, often, other non-quantifiable criteria such building form aesthetics, are also considered of great importance. As a major shortcoming in current architectural optimization platforms, there is a lack of explicit consideration of architectural aesthetics where the focus is more on quantifiable objectives. Consequently, there is a lack of methods that interpret and insert aesthetic principles as an objective into architectural design optimization.

This work investigates a new architectural design system that accommodates aesthetics into standardized building performance optimization of building energy use and daylight performance. The proposal of introducing aesthetics is done in two ways: 1) rationalist: in which an aesthetic principle is converted into an objective for form evolution, done through computation, and 2) subjective: in which an aesthetic judgment is done by the designer through interaction with the system. The system enables designers to incorporate aesthetic principles into the optimization process, and explore diverse design alternatives while assessing aesthetics, energy and daylight performance. In addition, the system allows for designer's interaction and decision making, based on their expertise, to best automate the process.

The methods used in this work are prototyping and experimenting. A prototype is being developed to illustrate how to use the suggested optimization system. Experiments are done at different progress levels of the optimization tasks to test the feasibility of the method framework. The system is developed in four processes: 1) Building form generation, 2) Performance Evaluation, 3) Optimization and search mechanism, 4) Decision making. The prototype is being implemented in the conceptual design stage, although the system can also be used for later design phases. For the prototype tasks, parametric modeling is used in Grasshopper®, an algorithmic tool to initiate the building form. Honeybee® and Ladybug® plugins are utilized for conducting performance evaluation, mainly, energy and daylight simulations. Optimization is done inside the Multi-Objective Genetic Algorithm tool (Octopus®), a plugin for Grasshopper®. A case study of a small size office building is selected to showcase the prototype workflow, using proportion as an example of design principles, indicative of aesthetic building form. The quantifiable objectives sought for optimization are to minimize building energy use and maximize the appropriate daylight level. The initial results demonstrate that the system has the potential to successfully work as desired; however, the work is still in progress.

"Disputes in construction: An evaluation of contractual effects"

Department of Construction Management, College of Architecture
By: Anusree Saseendran

Construction disputes are on the rise globally. Every year, there is a marked increase in the resolution time and cost involved in dispute resolution. They adversely affect the progress and quality of a construction project by resulting in cost overruns and delays. Very often, disputes are a direct result of improper administration of contracts or failure to understand contractual obligations. In this regard, it is valuable to analyze the standard form contacts being used today for their effectiveness. This study was an attempt to identify the most disputed clauses in construction in the US and the UK, and to evaluate the wording used by ConsensusDOCS in addressing these issues in the US. There exists several studies that either deal with comparison of one provision only or the entire general conditions of two contracts. Unlike what has been already done, this study attempts to perform seminal research in the area by first identifying the most disputed clauses and then determining the cause through a survey of industry professionals. Furthermore, due to its novelty, very little research exists on ConsensusDOCS. The four most disputed areas in the US and the UK are delay, defects, changes and payment. The fifth most disputed area in the US is design defects, while that in the UK is termination. Further interviews of construction industry professionals suggested that the relation between contractual language and the number of disputes is not very significant.

Anthropology; Communication; Economics; English; Hispanic Studies; History; International Studies; Performance Studies; Political Science; Psychology; Sociology

“Constraints to Pickup Basketball Participation among Chinese American Women”
Department of Recreation, Park & Tourism Science, College of Agriculture and Life Sciences
By: Suiwen Zou

This study examined Chinese American women’s leisure experience within the context of male- and African/White American-dominated pickup basketball. A qualitative approach was utilized in this study. Participants, who were serious basketball players, encountered numerous constraints unique to their identities as Asian females, and these were inexorably linked to how pickup basketball is organized in the United States. While some informants stopped playing basketball because of constraints, others developed ingenious negotiation strategies to combat constraints and to maintain participation.

“U.S.-Mexico Water Cooperation and Conflict”
Department of Ecosystem Science and Management, College of Agriculture and Life Sciences
By: Lindsay Sansom

The history and experiences of water management along the U.S.-Mexico border are characterized by periods of relative cooperation, tension, and conflict. In the face of different water management and governance regimes, water rights, water uses, and formal agreements, efforts at water cooperation have experienced considerable ebbs and flows, periods of relative cooperation and periods of enhanced tension. Within this type of polycentric governance, achieving persistent cooperation becomes an enormous challenge. On the U.S.-Mexico border, the result has been unilateral takings of groundwater and severe aquifer degradation on both sides of the border. This paper is motivated by the expectation that, in the face of surface water scarcity and increased reliance on groundwater resources, improved water security requires stakeholders and managers to behave in cooperative ways. On both sides of the border, from international NGOs, to nations, states, local municipalities, and unincorporated communities, effective communication, cooperation, and agreement over water issues is highly desirable.

The broader water security literature on conflict and cooperation often places country-level interactions on a single linear scale, with conflict and cooperation on opposite ends of the spectrum. Alternatively, Zeitoun and Mirumachi (2008) propose that, in practice, conflict and cooperation often co-exist in cross country-level water interactions. This means two things. First, it means that the water relations between two countries might reflect cooperation and conflict at different points in time. Second, it means that aspects of cooperation and conflict or tension might, in fact, co-exist at the same time but at different levels. This paper analyzes the historical progression of conflict and cooperation between the U.S. and Mexico over the Rio Grande Basin by utilizing Mirumachi’s Transboundary Water Interaction NexuS (TWINS) matrix. The TWINS matrix places cooperation and conflict on a two-dimensional scale and tracks changes over time. This is a particularly useful tool for understanding the dynamic influences on cooperation or conflict. Emphasis will be placed on understanding the ways in which the TWINS approach provides a more complete and accurate picture of U.S.-Mexico transboundary water governance. The hope is that this picture will provide new insights into how greater cooperation can be achieved in the management of shared water resources.

"Politeness Theory and Communication Privacy Management: How Young Adults Communicate About Sexually Transmitted Infections with Romantic Partners"
Department of Communication, College of Liberal Arts
By: Grace Ellen Brannon

Sexually transmitted infections (STIs) are among the most common infectious diseases in the United States with nearly 20 million new cases of sexually transmitted infections occurring each year and disproportionately affect young adults (age 15-24) (Katz, 2014). Communicating with romantic partners about STIs can positively influence health outcomes, as treatment can then be sought, yet the discussions themselves can pose several risks to both the requestor and the receiver (Xiao et al., 2015). This proposal examines how young adults enact and manage positive and negative face threats in STI-related conversations with romantic partners, using politeness theory and communication privacy management theory as the theoretical frameworks. Specifically, this study seeks to understand a) whose face is protected during conversations about STIs between romantic partners; b) how facework strategies are performed when romantic partners discuss STI-related issues (e.g., diagnosis and testing); and c) how privacy orientations affect the choice of facework strategies selected. Currently, data is still being collected, but will end on March 6th. (Results will be ready to present for SRW.)

"Setting up smARt weight loss goals"
Department of Agricultural Economics, College of Agriculture and Life Sciences
By: Michelle Segovia

The present paper proposes the creation of customized programs and policy interventions that target individuals with specific health characteristics in order to set Achievable and Realistic goals. Using economic and biometric tools, we investigate whether inducing health-related thoughts influences the behavior of normal weight, overweight, and obese individuals. Specifically, we analyze the effects of inducing thoughts about the benefits of dieting and exercising along with the effects from exposing individuals to different self-images in food choices, time preferences, and cognitive ability. The results show that the provision of information about the benefits of eating healthy and exercising had a positive impact on overweight and obese individuals. However, when the obese became more self-conscious about their image, the opposite effect was found. This effect is attributed to the possibility that obese individuals look at the reward of becoming healthier as somewhat farfetched or difficult to achieve.

"Taking another perspective on overconfidence in cognitive ability: A comparison of self and informant metacognitive judgments"
Department of Psychology, College of Liberal Arts
By: Robert Tirso

People provide overconfident metacognitive judgments in a variety of domains. However, there is evidence to suggest that judgments from others may be less overconfident and more accurate than self-judgments. We investigated whether selves and informants differed in their metacognitive judgments in the classroom, the laboratory, and online. Across four studies, results showed that people were more confident in others' cognitive abilities than in their own. This pattern of results occurred in the classroom for grade predictions (Study 1), in the laboratory and online for standard cognitive test predictions (Studies 2 and 3), and when people knew others well or had just met (Study 4). These findings are inconsistent with prior work showing people often believe their abilities are better than others' abilities, and suggest that we may be underconfident in our abilities relative to how others view us.

"Arrow of God: Ouobna Ottobah Cuagano's Deconstruction of Euro-Centric Law"

Department of Philosophy, College of Liberal Arts
By: Dalitso Ruwe

Critical Race theorist Jerome McCristar Jr, in his essay "Toward a Black Legal Scholarship: Race and Original Understandings," argues that while we have a Black Jurisprudence we have yet to create a Black Legal Studies Program. Building on McCristar's essay, this essays advances the case for the inclusion of a Black Philosophy of Law in Africana Philosophy. This presentation asses the work of Quobna Ottobah Cugoanoâ's titled Thoughts and Sentiments on the Evil and Wicked Traffic of the Slavery and Commerce of the Human Species as being the progenitor of a Black Philosophy of Law.

"Location, location, location! The impact of venue selection on the results of valuation experiments"

Department of Agribusiness & Managerial Economics, College of Agriculture and Life Sciences
By: Daniel Eduardo Chavez

The use of experiments in different fields has grown considerably over the years. In the last decade several improvements methodology and design of valuation experiments has been improved. Choosing which location to conduct the experiments has been decision left to convenience in most cases. This paper studies the effect on willingness to pay of using different locations for the same valuation experiment. Mean willingness to pay was found to be impacted by selection of venue, implying this is not a choice that should be taken lightly by experimenters. Which location to choose, it depends on the objectives of the study and how much a priori the experimenter believes the demand effects could potentially drive the results away from the objectives of the study.

"Origin and Development of the Lying-In Hospitals: A Comparative View of Göttingen Accouchierhaus & Queen Charlotte's"

College of Medicine
By: Kendall Turner

Medical men assisting in labor and delivery was very rare at the beginning of the 18th century. However, by the end it was the norm for women to be attended by a male physician practicing obstetrics rather than a midwife during childbirth (Loudon, 1997). Beginning in the mid-18th century, lying-in hospitals were constructed in Europe including the first university funded teaching hospital established in 1751 (Göttingen University's Accouchierhaus) and one of the United Kingdom's first charity lying in hospitals founded in 1752 (Queen Charlotte's). The origins and development of these prominent institutions has not yet been adequately explored. An analysis of the similarities and differences regarding architecture of the facilities, education and training of obstetricians and midwives, as well as attitudes towards the patient populations provides an improved understanding of the goals of each hospital and how they relate to their various functions. Drawing primarily from historical documents, the study will review Gottingen director Friedrich Osiander's (1759-1822) writings and obstetrics handbooks and Christian Andreas Besemann's artwork of the Accouchierhaus dating to the 1790s. Additionally, the unpublished 1770 student lecture notes of Dr. Colin Mackenzie's (estimated 1705-1775) courses a physician and student of William Smellie (1697-1763) will provide important insight into the operations at Queen Charlotte's. This study seeks to understand key factors that have allowed Queen Charlotte's Lying-In Hospital ¬ to continue to thrive in modern times while Göttingen Accouchierhaus ceased functions in the mid-19th century.

"Policy Review: An Emerging Workforce To Reclaim Abandoned Mine Lands"
Department of Ecosystem Science and Management, College of Agriculture and Life Sciences
By: Gabriela Sosa

The United States has a vast legacy of economic prosperity and innovative technological development stemming from historic mining activities. The minerals recovered from our federal and public lands have been used to improve many facets of American life. These minerals provide vital ingredients in a wide range of everyday products that provide economic and national security. Unfortunately, another legacy associated with historical mining lies in its significant degradation of the environment. Over a century of mining has created thousands of Abandoned Mine Lands (AML) sites with hundreds of millions of tons of solid wastes. Current estimates of abandoned mines near 500,000 in the United States. In 2015, Congressman Raul Grijalva from Arizona introduced legislation that would increase the funding to reclaim these inactive mines and reform the General Mining Law of 1872. The proposed Hardrock Mining Reform and Reclamation Act of 2015 (H.R. 963, 114th Congress) requires industry to purchase reclamation bonds as liability for environmental damages. However, this legislation could be improved if it took into account the need for a qualified and trained workforce in environmental and geosciences to reclaim abandoned mines. This paper identifies initiatives and programs to prepare the next generation of environmental scientists and geoscientists, while increasing the participation of underrepresented groups in earth science, particularly women and minorities. The policy recommendations will focus on providing academic access to these professions to Hispanics in the U.S. Southwest region, where a critical need exists to restore AML sites through reclamation.

"Self-Serving Deviations from Standard Behavior: Investigating Income and Relative Return Differentials in Voluntary Contributions Mechanisms"
Department of Agricultural Economics, College of Agriculture and Life Sciences
By: Bachir Kassa

The sizeable positive contributions observed in voluntary contributions mechanisms (VCMs) despite the weakly dominant Nash equilibrium free-riding strategy have stimulated interest in uncovering the main motivations that drive this cooperative behavior. Using a between-subjects design with heterogeneous income and marginal per capita returns (MPCR), this paper reports on the main drivers of behavior for high- and low-income individuals playing separately and in mixed groups. The data can be well explained by a finite mixture model, which splits individuals in each income class into two categories. While about a third of low-income individuals were estimated as free-riders, the dominant portion was classified as opportunists, who try to benefit from the presence of high-income individuals by encouraging higher contributions through cooperation. On the other hand, free-riders were far less among high-income individuals, where the overruling majority fell under the category of selfists who are more reserved with their contributions in the presence of low-income individuals due mainly to self-interest and caution. Finally, there is evidence of a decaying randomness in the behavior of both income types as captured by the tremble parameters.

"Low Carbon Fuel Standards Can Mark a New Era in
Energy Regulation: The Case of California"

Department of Agricultural Economics, College of Agriculture and Life Sciences
By: Samir Huseynov

"Finding an effective economic policy tool to curb greenhouse gas (GHG) emissions becomes more crucial amid exacerbating environmental issues. An increasing share of GHG in the atmosphere has already generated measurable climate changes (Farrell and Sperling, 2007) and impacts of climate changes to water resources, agriculture, public health and the economy can be particularly damaging in California (Roos, 2003; Hayhoe et al. 2004; Farrell and Sperling, 2007). For example, continued sea level rising and significant temperature warming can cause serious issues in the long-run for California (Tanaka et al., 2006). Furthermore, California has diverse climate zones, but having limited water supplies and dependence on climate sensitive industries such as agriculture and recreational industries make California vulnerable to climate change issues (Hayhoe et al. 2004). Schlenker et al. (2007) estimate that surface water availability is strongly capitalized in farmland values in California and that is why, climate changes have significant negative impacts on farm businesses. Zivin and Neidell (2012) show that a 10 parts per billion (ppb) change in average ozone exposure reduces worker's productivity in the agricultural sector in California 5.5% through affecting their respiratory health.

The transportation sector is the largest GHGs producer in California accounting for nearly 37% of the total GHG inventory in 2014. "Bottom-up" sector-specific GHG mitigation policies, such as setting emission standards that cover all stages of production, have been recently recommended as an alternative policy approach. On January 18, 2007 California launched the Low Carbon Fuel Standards (LCFS) program to reduce the carbon intensity of motor fuels for on-road light-duty vehicles (Holland et al., 2009). Light duty vehicles accounted for nearly 70% of transportation emissions in 2014. In this article we analyze whether the LCFS has indeed reduced the carbon emissions in the transportation sector of California. In order to assess casualty, we apply different identification strategies and focus on recent econometric techniques and machine learning. We start our analysis using the synthetic control method (SCM) (Abadie and Gardeazabal, 2003; Abadie et al., 2012). Furthermore, we conduct two robustness checking analyses using Difference In Differences (DID) (Montalvo, 2011) and Lasso, which is a machine learning approach (Belloni et al., 2014). All three methods confirm that LCFS had a significant impact on GHGs inventory in California and has reduced CO2 emissions in transportation around 10%.

Three main instances motivate our study: First, some papers have assessed the outcomes of the LCFS, but mainly focused on the carbon intensity of motor fuels in California as the outcome variable. For example, Yeh et al. (2015) find that since the implementation of the law, the LCFS has decreased the carbon intensity of alternative fuels around 15%. As the LCFSâ€™s major goal is decreasing the carbon emissions in the transportation sector of California, this paper directly focuses on the carbon emissions of the Californian transportation sector and estimates the direct effect of the policy. Second, from the first day of its implementation the LCFS has been challenged by various stakeholders due to its life-cycle accounting methods (Lade and Lawell, 2015). There are some claims that the LCFS protects ethanol producers from interstate competition, since the standards apply to all transportation fuel providers (from refiners/blenders to ethanol importers [Sperling and Yeh, 2010]) and assigned different pollution scores to different ethanol producers. Out of state producers claimed that this procedure had harmed their businesses and resulted in the exclusion of their products from the California market. The LCFS initially targeted to reduce carbon intensity of transportation fuels 10% by 2020, by gradually increasing the compliance threshold. However, due to legal challenges the compliance rate was frozen at 1% during 2013 and 2014. Later the U.S. 9th Circuit Court ruled that the LCFS would slow down the rise of carbon emissions and would benefit California residents. The initial outcomes of the LCFS will be an important factor for the determination whether this policy has met the expectations. Moreover, the analysis of the outcomes of the LCFS is also crucial for the continuation of its implementation in the long-run. Furthermore, it is also an important test for well-to-wheel type policies. Third, California pioneers several environmental initiatives and the results of this policy will provide useful insights for federal policy making. The performance of LCFS in California has a strong information value to other states and its success can generate a new federal policy wave (Goulder and Stavins, 2011). For example, Oregon is considering to reinstate the LCFS and to some extent the regulation hinges on the LCFS’s performance in California. Therefore, studying the performance and consequences of Californian LCFS has importance for many interest groups. By applying clean identification strategy this paper estimates the actual outcomes of the LCFS and can be a good reference point for federal policy makers as well.

International Affairs; Public Service & Administration; Accounting; Finance; Information and Operations Management; Management; Marketing; Business Administration; Business

“The Kingdom and the Republic: In the Quest for Defeating the Islamic State. A Temporary Saudi-Iranian Partnership and the Role of the United States”

Department of International Affairs, Bush School of Government
By: Maria Florencia Tinnirello

The rising of the IS in June 2014 has altered the rules by which the Islamic Republic of Iran Iran and The Kingdom of Saudi Arabia have been playing the game of balancing each other’s power in pursuit of their respective foreign policy interests in the Middle East. Although the competition between these two states continues to be the most salient feature of the regional system, the assumption that they are each other’s number one enemy has slightly changed in response to the threat that the IS represents and the greater need to contain and defeat it. The political elites in Tehran and Riyadh need to shift (temporarily) their priorities form each other to defeating the IS, an entity that is perpetuating a menace that cannot longer be considered of secondary importance. Thus, any past efforts that have been conducted in this sense must be reinforced which entails a greater involvement of the United States as the foreign power with more leverage and influence in the region. Therefore, the next step that Washington should take is to put in place a strategy aiming to coordinate these efforts by engaging in bilateral and separated negotiations with Iran and Saudi Arabia that would result in a plan with which the IS will be definitely defeated.

In other words, this paper argues that in spite of the fact that the IS represents a threat to both Iran and Saudi Arabia, the nature of the threat as well as the implications it entails is different in each case. Whereas in the case of the Islamic Republic the IS is further destabilizing the domestic politics of its two major allies, Iraq and Syria, in the case of the Kingdom the entity embodies an ideological menace that not only affects the regime security but that also has extensive ramifications within Saudi borders. Regardless this differentiation, the paper addresses the fact that the IS is a shared threat between both states and thereby they should conduct serious efforts to contain and defeat it. The paper is structured in three sections: the first section frames a set of considerations worth highlighting when analyzing not only the dynamics of the enmity between the two regional powers but also the rising of the IS and its most prominent features. The

second section assesses the type of menace that the IS represents for Iran and Saudi Arabia separately and identifies the main strategies each state has developed so far with the purpose of confronting the threat. And the third section explains why the IS should be perceived by Tehran and Riyadh as a common and shared threat and thereby how the United States should engage in bilateral and separated negotiations with each nation with the sole mission of coordinating efforts in the quest for containing and eventually defeating of the IS.

“Operation Just Cause and Beyond: A Study of U.S.-Panama Relations”

Department of International Affairs, George Bush School of Government
By: Ashley Ruiz. Maribel McMillian, Christopher Van Dam, Cheyney Allen, Emma Parma, Matthew Acosta, & Sumer Wachtendorf

Our research examines the bilateral relationship between Panama and the United States prior to, during, and the years following Operation Just Cause to the present. Our analysis will begin by examining the origins of the relationship between Panama and the U.S. with the planning and building of the Panama Canal. We will then explore the events leading up to the ouster of Manuel Noreiga's dictatorship and subsequent U.S. intervention in 1989. We will analyze how the short and long term implications of the operation have impacted and shaped the bilateral relationship to date. Using this analysis, our research aims to offer policy recommendations for the new administration.

“Responding to the Hepatitis C Epidemic in Romania:
Recommendations for a National Viral Hepatitis Strategy”

Department of International Affairs, George Bush School of Government
By: Joshua Boatright, Samantha Ra, Greg Klein, Elaine French, Nimrah Riaz, & Valdemar Martinez

In April 2001, the Baylor Black Sea Foundation’s Centre of Excellence in Constanta, Romania opened their doors to fill a gap in the needs of the community’s health by serving children infected with HIV. The services which the Baylor Black Sea Foundation provide are critical for the local community, due to the high cost of drugs and inadequate national health care system in Romania. We analyze which aspects of the organization are most impactful, as well as cost effective with the intent of formulating a blueprint for handling Hepatitis C and other infectious diseases in Romania and other developing nations.

We have four main research objectives. First, we determine whether the introduction of Baylor Black Sea Foundation’s HCV program had an impact to evaluate the effectiveness of free public treatment within the Romanian context. Second, we evaluate whether the current health policies in Romania minimize, maximize, or have no effect on the national HCV epidemic. Third, we assess the value of a community-based advocacy approach to better enable access to integrated Find-test-Link Refer services for patients. Finally, we draft a document to serve as a consultative reference paper for authorities to use in drafting a national viral hepatitis strategy, as well as, to serve as a model for future advocacy strategies for other diseases.

“Effects of a Workplace Environment of Racial Microaggressions for Bystanders”

Department of Industrial/Organizational Psychology, College of Liberal Arts
By: Jessica Walker

Previous research has focused more attention on the targets of racial microaggressions, however, much less research has examined how racial microaggressions affect bystanders. The present study examined how a workplace’s environment exposed to racial microaggressions affected

Black and White non-targets. Additionally, the present study examined the mediating effects of negative emotional appraisals on the relationship between experiences of ambient workplace racial microaggressions and occupational outcomes (i.e., job satisfaction, affective organizational commitment, turnover intentions, workplace deviance, and job stress). We also examined the race of the observer as a moderator on the indirect relationship of the mediator. Utilizing online survey data from 446 employed adults (92% White; 8% Black) from the restaurant industry, results indicated that specific emotional appraisals mediated the relationship between observed racial microaggressions and occupational outcomes. Specifically, when Blacks had emotional appraisals of demoralization, they experienced more negative occupational outcomes when they observed racial incivility. Additionally, when Whites had emotional appraisals of anger, they experienced more negative occupational outcomes when they were witnesses to racial incivility. The overall results from this study demonstrated that subtle racism continues to be pervasive in the workplace and is detrimental to employee and organizational well-being.

“Elevator Impact on Egress of Heterogeneous Populations”

Department of Business Administration, Mays Business School
By: Haoping Tan, Kaitlin Wallace, Spencer Sullivan, & Arijan Horvat

The continuance of both naturally occurring and human caused disasters emphasize the importance of evacuation planning for all people including individuals with disabilities. Though elevators are traditionally grounded during a disaster, the possibility of using them to speed up evacuations is gaining considerable attention. We use an agent-based simulation model to evaluate the impact of elevator use on evacuation times for heterogeneous populations, including individuals with disabilities, from large, critical infrastructure assets like airports. The results of these experiments can be used to inform policy makers of more effective, evidence-based evacuation procedures based on a better understanding of how elevator technology can influence evacuation performance from these structures.

Graduate Student Poster Presentations

Anthropology; Communication; Economics; English; Hispanic Studies; History; International Studies; Performance Studies; Political Science; Psychology; Sociology

"Tourism Impacts of Shijia Hutong Museum"
Department of History, College of Liberal Arts
By: Mingqian Liu

The preservation of traditional alleyways (hutongs) of residential neighborhoods in Beijing has been facing significant challenges brought by contemporary urban regeneration and real estate development. Hutong tourism, and the establishment of community museum as both a tourist site for visitors and a civic center for the community, are still new concepts for the 21st century China. Shijia Hutong Museum was the first of its kind in Beijing, built as part of the neighborhood conservation-planning project to promote community culture and heritage protection. This study examines the various aspects of impact, including socio-cultural, political, economic and environmental impacts brought by the museum and tourist-related industries and activities. It also aims to analyze the impacts on different stakeholders, including local residents, tourists, government, NGOs and other parties who were involved in the founding and operation of the community museum. Based on literature and exhibition reviews, scholarly research, publicity materials, and stakeholder interviews, the study provides recommendations for the future development of Shijia Hutong Museum, on how it could improve in terms of public involvement and heritage education.

"Associations between sleep, napping behaviors, and anxiety"
Department of Educational Psychology, College of Education and Human Development
By: Yajun Jia

This MTurk study explores sleeping and napping behaviors and investigates the connection between anxiety and sleep or napping quality. We track the elements of anxiety and see how they are related with sleeping and napping. The study examines a) how sleeping and napping interact with life over time; b) how anxiety relates to sleeping quality, in particular, we hypothesize that insufficient sleep or bad sleep quality may relate to high anxiety level; c) how anxiety is connected to napping capacity and quality, specifically, we predict people with high anxiety level to be high frequent nappers, and with low napping efficiency; d) what implications suggestions might have for future polysomnography (PSG) study on sleep, napping, and general well-being.

"A Fire to be Lighted: The Training of American Astronauts From 1959 to the Present"
Department of History, College of Liberal Arts
By: Mr Tyler Peterson

This study examines the training of American astronauts from the selection of the original Mercury astronauts in 1959 to the present, as crews of six work aboard the International Space Station. It makes the primary argument that through all of those years, the training sequence has been a remarkable success in making possible the spectacular feats that astronauts could not have otherwise achieved. It will examine in more detail than any previous publication how training devices for the Mercury, Gemini, Apollo, Skylab, Space Shuttle, and International Space Station programs helped astronauts to make this statement true. This study will also make the argument that the successful training of astronauts helped prove the value of sending them into space. Sessions at a variety of locales, from electronic flight simulators, to neutral buoyancy pools, to virtual reality laboratories have given astronauts the mental and physical flexibility in space missions that only they possess. In other words, they are not automatons, but rather people who can develop their skills through training.

This study will demonstrate that when their missions began, those skills contributed to spectacular successes in space. Astronauts have returned a bevy of scientific data from their scientific experiments in Earth orbit and from their walks on the Moon during Apollo thanks to their trained eyes and minds. They have also serviced the Hubble Space Telescope and constructed an International Space Station that is longer than a football field thanks to their training. As the 21st century continues, astronauts will journey on bolder missions to near Earth asteroids, back to the Moon, and onto Mars. The instructors who train them for those missions, whether belonging to a government or a company, will benefit from reading this study because they will gain a sense of what training methods have worked historically and understand the tremendously strong track record of human accomplishments in space given adequate training.

“Can Women Have It All? Wait! What Does It Mean To “Have It All?”

Department of Industrial/Organizational Psychology, College of Liberal Arts
By: Jamara Parnell & Anjelica Mendoza

In 2002, Sylvia Ann Hewlett published a highly cited article in Harvard Business Review claiming it was a myth that executive women could “have it all.” The article summarized a study conducted by Hewlett (2001) and published in her new book at the time entitled “Creating a Life: Professional Women and the Quest for Children.” In 2012, Anne-Marie Slaughter published an article in The Atlantic explaining why women “still can’t have it all.” In an effort to further explore the boundaries and hindrances for women to have it all, we must first define both conceptually and operationally exactly it means to “have it all.” Recognizing the meaning of this phrase may vary based on an individual’s age and education, among other variables, we examine how college students define this phrase for individuals between the ages of 25 and 45. Our survey included 209 student participants who responded to 16 multiple choice and open-ended questions. Respondents were asked to describe in their own words what it means (or looks like) to them to “have it all,” if they thought men, as well as women, could have it all, and how likely it is they will have it all. The results of the survey revealed undergraduate students perceived the meaning of “having it all” to include family, job/work, and financial resources. Ratings of the perceived likelihood for women and for the individual themselves to have it all did not differ significantly among men and women. However, male responders were significantly more likely to report that men are more likely to have it all.

"AgAR - How AR system affects users experience while exploring their surroundings"
Biological & Agricultural Engineering, College of Engineering
By: Sikai Zhang, Larry Powell, & Nahum Villanueva Luna

We present findings from field trials of AgAR about how Augmented Reality can affects the way people observe their surroundings. AgAR, an augmented reality mobile application, as a solution for unfamiliar situations caused by the lack of knowledge about the environment. AgAR uses geo located objects to store relevant information about the user's environment and renders it overlapping camera information while the users get close to it. The main finding is that Augmented Reality can affects user's experience by 1. Providing better mapping between information and the object. 2. Making people better informed by providing the information and location at the same time. 3. Reducing cognitive load by making information context situated.The main potential of AgAR lies in multiple fields including touring, new environment exploration and social media.

"The forest, a nursery of ships"
Department of Anthropology, College of Liberal Arts
By: Marijo Gauthier-Berube

Ships are born in the forest... That is how Jean Marie Ballu (2008) titles his book describing forestry and its relation to the shipbuilding industry in France throughout history. He argues that a ship is the result of a long and complex material history and, in order to understand the irrevocability of that process, one must understand its roots. Up to the 19th century and the development of iron vessels, wood was the core of shipbuilding industry, which affected political and military decisions, social relations and economic trade. The analysis of a shpiwreck can be used to further understand the forestry practices but also the relationship between architectural conception and innovation of the shipbuilding industry.

"Trait Self-Control and Visceral States"
Department of Psychology, College of Liberal Arts
By: Cassandra Baldwin

Previous research has found self-control to be related to positive outcomes such as psychological well-being and greater academic achievement. Self-control has also been found to facilitate the formation of good habits. Other research has observed that visceral factors influence behavior, such that more intense visceral states (e.g., higher levels of stress, hunger, and fatigue) undermine success at self-control. Research has not, however, investigated the relationship between trait self-control and visceral states. The current study examined the relationship between trait self-control and self-reported levels of stress, hunger, fatigue, and experiencing the common cold. We predicted a negative relationship between trait self-control and the presence of these visceral states. We also predicted that individuals with high trait self-control would be less likely to report having experienced extreme stress or having a cold. We conducted secondary analyses on existing data collected in our laboratory over the past 5 years ($N > 5000$). We also conducted exploratory analyses to assess relationships among responses to the visceral states

questions and approach and avoidance motivation. We also explored the possible moderation of the link between trait self-control and visceral states by demographic variables. This research illuminates everyday consequences of trait self-control and suggests new ways to understand how and why self-control contributes to positive outcomes in life.

"Pronominal Asymmetries in Insult Perception among Spanish-English Bilinguals"

Department of Psychology, College of Liberal Arts
By: Omar Garcia

Whereas English only has a single second person pronoun form (you) and does not linguistically mark politeness through pronoun use, Spanish, like many other languages, distinguishes between an informal and a formal second person pronoun: the informal tÃº (T) marks intimacy and the formal or deferential usted (V) marks distance, at least in monolingual Spanish users. Less is known about how Spanish-English bilinguals, particularly those who identify culturally as Mexican-American, use and interpret forms of address in different contexts. The present research explores how the pairing of a formal vs. informal second person pronoun in Spanish with a taboo expression may moderate the perceived insult of the utterance, and how this may, in turn, be influenced by the bilingual's relative dominance in English vs. Spanish. Thirty Mexican-American Spanish-English bilinguals from Texas A&M International University will be tested. They will complete a 20-item survey in which they will rate, on a 10-point scale, the relative offensiveness of a phrase presented in the T vs. the V form (e.g, TÃº chingas mucho vs. Usted chinga mucho: You bother a lot). In addition, participants will complete a language use questionnaire in which their frequency of code-switching and preferred use of Spanish and English in different social domains will be assessed. It is hypothesized that use of the usted (formal) form in the context of a taboo expression will be perceived as less insulting than use of the tu (informal) form, all other things being equal. Additionally, it is expected that expressions will be perceived as more offensive the greater the dominance in Spanish of the participants. This study will be discussed in the context of sociopragmatic factors influencing perceptions of (im)politeness. Results' generalizability will be assessed by comparing the present study to other bilingual group's responses.

International Affairs; Public Service & Administration; Accounting; Finance; Information and Operations Management; Management; Marketing; Business Administration; Business

"Improving Workplace Safety by Thinking About What Might Have Been: To What Extent Does Counterfactual Thinking Influence Workplace Safety Behavior?"

Department of Industrial/Organizational Psychology, College of Liberal Arts
By: Yimin He

Human factors information processing theories of workplace safety suggest that cognition is an antecedent of safety behavior. However, little research has directly tested cognitive variables as predictors of workplace safety within the industrial/organizational (I/O) psychology research domain. Counterfactual thinking is defined as cognitions about what might have been. Social psychologists propose that counterfactual thinking can be functional as it alters future behavior in a manner that is consistent with better (e.g., safer) outcomes. The purpose of the current study was to examine the influence of counterfactual thinking on safety behavior, as well as two mechanisms (safety knowledge and motivation) and individual differences (safety locus of control) that are proposed to explain and facilitate this relationship. A sample of 240 medical providers from a hospital in Guizhou Province of China responded to three surveys over a four-month time frame. Results showed that overall and upward counterfactual thinking (reflecting on how past events could have been better) were positively related to safety compliance and participation, which were mediated by safety knowledge, but not by safety motivation. Furthermore, upward counterfactuals were found to be more strongly related to safety compliance and participation and safety knowledge than downward counterfactuals (reflecting on how past events could have been worse). Contrary to our hypotheses, these relationships were not dependent on safety locus of control. In sum, the findings demonstrated that counterfactual thinking has functional effects on safety behavior and safety knowledge expanding the variables related to workplace safety and laying the groundwork for new safety interventions.

"Examining Financial Exploitation of the Alzheimer's Affected Population in Texas"

Department of Public Service & Administration, Bush School of Government
By: Nicole Gabler, Sydney Thomas, Sarayu Sankar, Dianey Leal,
Christina Harrison, & Elizabeth McCrory

The Alzheimer's Association of Houston and Southeast Texas is committed to expanding the care and services for individuals with Alzheimer's disease and their caregivers through research, legislation, and awareness. The narrow scope of protection currently afforded under Texas statutory law regarding financial exploitation of the elderly often leaves many individuals with Alzheimer's and dementia-related diseases with little to no recourse. The Alzheimer's Association of Houston and Southeast Texas has asked the Bush School to examine the prevalence of financial exploitation among those with Alzheimer's and dementia-related diseases in the state of Texas. Our findings and recommendations will serve as the basis for policy change during the 2019 Texas Legislative Session.

Elder financial exploitation is the second most common form of elder abuse, resulting in a projected financial loss of over $2.9 billion a year (MetLife 2011). As the number of Americans over the age of 65 is expected to grow, adequately addressing this issue becomes increasingly important in order to protect the financial stability of the nation's wealthiest population (Hansen et al 2016). However, navigating this emerging issue is a course riddled with problems like inconsistent state laws, minimal research, and a general lack of awareness among the throng of stakeholders potentially affected. The legal definitions of cognitive impairment, consent, and guardianship further complicate the policy environment surrounding elder financial exploitation. This growing problem is exemplified in the state of Texas, home to the nation's fourth largest elderly population. The state's existing set of elder abuse laws and penalties are vaguely defined, neglecting to address the complexities and losses associated with elder financial exploitation. The state has not considered this issue a policy priority, presenting an opportunity for examination of the problem in an effort to present appropriate and objective solutions based on research.

The purpose of this capstone project is to examine the complexities of elder abuse through a discussion of financial exploitation, a survey of Texas' elder financial exploitation law, and an overview of nationwide overview of policy initiatives addressing this issue at the state and federal level. This interim report will update the Alzheimer's Association of Houston and Southeast Texas on all deliverables to date and the team's scope of work, research design, and review of relevant literature. The report will also include the team's next steps, including the perceived challenges and limitations.

"Conceptualizing Human Trafficking: A Family of Viruses"

Department of Public Service Administration, George Bush School of Government
By: Katherine Watson

Previous research has delineated the human trafficking network as a single chain, starting with the traffickers and ending with the victims. In reality, the network represents three strains of a virus: the international, regional, and local strains. A variety of players allow the different strains either to thrive or cease to exist. These include the actors, such as the buyers, sellers, enablers, and profiteers of human trafficking; the platforms by which the virus can thrive, such as the delivery and logistic systems; the target, which is the profit gained; and the victims, including the trafficked individuals, the community, and the families of the players involved. Another set of players is the interceptors. In the virus analogy, the interceptors serve as antibodies. Antibodies exist in the body, but they must be trained to recognize and attack a virus. Similarly, in the civil body, or the community as a whole, the interceptors must be trained to prevent and destroy the reproduction of the virus of human trafficking. Each strain "international, regional, and local" consists of different players and therefore each has a different set of antibodies, or interceptors, that can serve in eliminating the virus. The purpose of this research is to identify the interceptors on all three strains and give them the appropriate training and capability to identify and attack the virus of human trafficking.

“Military Effectiveness of the Gulf Cooperation Council (GCC)”

Department of International Affairs, Bush School of Government
By: Sean Danielson, Kaity Duffy, Jane Edwards, Steven Horowitz, Kasey Hudson, Jala Naguib, Olivia Ronna, & Sarah Warmbein

The militaries of the Gulf Cooperation Council (GCC) states face numerous defense challenges. These include internal domestic threats as well as external threats in the Persian Gulf and the greater Middle East. The U.S. Department of Defense (DoD) has a vested interest in ensuring that the member states of the GCC are capable of defending themselves and of projecting military power abroad. For this reason, it is important to have a transparent and replicable method of measuring each individual GCC state’s current military capabilities. This project addresses the central question: why do GCC members vary in their military effectiveness?

To this end, our project adapts the internal DoD metrics of DOTMLPF-P (doctrine, organization, training, materiel, leadership and education, personnel, facilities, and policy), used to assess capability gaps and to drive acquisitions within the U.S. military, to apply to foreign militaries. This adaptation of DOTMLPF-P produces a tool for assessing a military’s core competencies in the fighting domains of land, air, and sea. Such analysis allows specialists and non-specialists in either a classified or open-source environment to determine a state’s military effectiveness. We validated the method by analyzing the Iraqi military in 2014 and assessing why the Iraqi military was ineffective in countering the Islamic State of Iraq and Syria (ISIS) and subsequently applied the tool to each of the GCC member states in order to inform policymakers on how best to allocate limited resources, with the aim of more efficiently building partnership capacity (BPC).

Atmospheric Sciences; Geography; Geology & Geophysics; Oceanography

“Geomorphometric Characterization of Topographic and Lithological Variations in the Karakoram, Himalaya”

Department of Geography, College of Geosciences
By: Brennan W Young

Understanding, characterizing, and mapping the complexities of mountain geodynamics in the Karakoram Himalaya is notoriously difficult. Complex interactions involving feedback mechanisms and system couplings generate complex spatial variations in topography that are governed by climate, surface processes, and tectonic processes. Isolating and mapping topographic structure controlled by lithology and tectonism may provide significant insights into the nature of dynamic coupling of erosion and uplift. Consequently, our objective is to evaluate advanced geomorphometric approaches for characterizing scale-dependent topographic structure governed by lithology and erosion-uplift dynamics. Specifically, we utilize a Shuttle Radar Topographic Mission (SRTM) digital elevation model (Version 3) and new geomorphometric parameters to generate topographic information and terrain objects that characterize process-form relationships. We then use graph theory and network analysis to characterize and map lithological conditions and uplift and deformation zones. Preliminary results indicate that slope azimuth orientation information and terrain objects can be used to characterize and map topographic structure that defines variations in lithology as well as locations of fault and tectonic uplift zones. Furthermore, network analysis provides the basis for characterizing the scale-dependent operational scale over which erosion-uplift dynamics occur. Distinguishing features of the network are the density of network nodes, the directionality of node connections, the relief expressed by the network, and adjacency of selected terrain features. This research also presents the use of semantic modeling to formalize the definitions of terrain features and characterization of process-form relationships that are required to assess complex mountain geodynamics.

“Rock Glacier characterization using Controlled-Source Electromagnetic Induction in the Western San Juan Mountains of Colorado”

Department of Geology, College of Geosciences
By: Raquel Granados Aguilar

Global change includes the variations in the environmental conditions that produce significant impacts in the Earth system. Climate change, land-use changes, sea level rise, and changes on the atmospheric composition are the most recognized environmental global changes. Although all environments are susceptible to the impact of climate change, alpine environments are especially so. Impacts of climate change in periglacial environments include less rainfall, reduced snowpack, and shorter snow seasons. Thus, there will be less available recharge for the limited sources of water in alpine environments: glaciers, rock glaciers and groundwater. Rock glaciers (mixture of rock fragments, fine sediments and ice) are considered alpine aquifers because they can store water for long periods of time, have recharge, flow of water and discharge. The internal structure of rock glaciers can consist of a matrix (pore-ice or ice lenses) or a core of ice, covered by angular rocks. The overlying mantle of rubble serves as insulation for the internal ice allowing a slower response to temperature increases. The proposed research will provide a characterization of the internal structure, a groundwater resource evaluation, and estimate the potential of selected rock glaciers for water supply in the Western San Juan Mountains of

Colorado. The G-TEM by Geonics Ltd., a non-invasive controlled-source time-domain electromagnetic induction system, will be used to map the distribution of electrical conductivity in the subsurface. Geological interpretations of the geophysical data will reflect the internal structure of the rock glacier and detect the presence of water within the rock glaciers.

"Controlled-Source Electromagnetic Monitoring of Fluids-Introduction and Model Robustness"
Department of Geophysics. College of Geosciences
By: Matthew Couchman

Controlled-Source Electromagnetics (CSEM) have been used as a direct hydrocarbon indicator since the 1960s, with a resurgence in marine conventional settings in the new millennium, with many studies revolving around detecting a thin resistive layer buried at 1km depth with water depths of 1m-2km. The presence of the resistive layer is characterized by a jump in electric field amplitude recorded at the boundary between the layer and host sediments. Here the lessons learned from these studies are applied to terrestrial unconventional settings. Here we can apply the lessons learned from hydrocarbon studies to other scenarios including; groundwater, geothermal and nuclear issues. CSEM may be used to detect fluids in terrestrial environments as long as a conductivity contrast between the fluid and host sediment exists. The work shown here is a means to develop methods to enable more reliable terrestrial CSEM monitoring of fluid flow and to detect subsurface fluids based on their CSEM signature therefore inferring the subsurface flow of groundwater, geothermal fluids or conductive fluids from hydraulic fracturing. The predictive model developed focuses on the mapping of fluid flow in a uniform halfspace using an in-line Horizontal Electric Dipole (HED) with electric field amplitude recorded by an array of electric field sensors. Here the predictive model, originally developed for conventional marine settings is converted for use in terrestrial settings whilst also testing the robustness of the code for various marine and terrestrial scenarios.

"Geomorphometric Characterization of Debris Covered Glaciers in the Karakoram, Himalaya"
Department of Geography, College of Geosciences
By: Da Huo

Assessing climate-glacier dynamics in high mountains such as in the Karakoram Himalaya is notoriously difficult due to a paucity of data for characterizing debris cover, ablation and precipitation. Sediment fluxes, melt water production, and orographic mass loading regulate ice flow velocity, glacier downwasting and termini fluctuations. Consequently, it is important to be able to map and assess the morphological variations of debris-covered glaciers and be able to identify downwasting zones and evidence of surging. Our research objective was to evaluate advanced geomorphometric approaches for characterizing debris-covered glaciers in the Karakoram Mountains of Pakistan. Specifically, we utilize a Shuttle Radar Topographic Mission (SRTM) digital elevation model (Version 3, 30 m) and new first- and second-order geomorphometric parameters to characterize glacier-surface topographic structure that is governed by sediment, ice flow, and meltwater flow dynamics. We then used graph theory and network analysis to characterize and map glacier boundaries and morphological conditions. Preliminary results indicate that slope azimuth and curvature information can be useful for differentiating glacier surfaces from non-glacier surfaces. Network analysis produces unique spatial patterns that permit the identification of downwasting zones and unique morphological conditions that can be used to identify surging glaciers. Furthermore, our methodological approach can be used for accurate mapping of the terminus region of debris-covered glaciers. Finally, we note that our approach identifies the inherent scale at which high-magnitude ablation and erosion-uplift dynamics operate.

"Development of a New Predictive Tool for Tornadoes Downwind of the Appalachian Mountains Using AO and NAO Indices"

Department of Atmospheric Sciences, College of Geosciences
By: Matthew Brown

The majority of current severe storm focuses on the Midwest, leaving a gap in our understanding of severe convective activity throughout the eastern and southeastern United States. In order to help bridge this gap, the influence of the Artic Oscillation (AO) and North Atlantic Oscillation (NAO) on the prevalence of storm events downstream of the Appalachian Mountains was analyzed in an effort to develop an innovative forecasting tool. This was performed using tornado reports on the lee side of the Appalachians from 1950-2015, for the months of March through August. These reports were consolidated into unique events, each assigned a count indicating the number of tornadoes associated with that particular event. Daily AO and NAO index values were acquired for the two weeks preceding each event. Results show that, on average, AO and NAO indices reach a maximum roughly four and seven days before downstream tornado events, respectively, before decreasing rapidly up through the events themselves. Furthermore, the magnitude of both the maximum indices and their subsequent drop-off increases with the number of tornadoes associated with the events, and is maximized for the categories of events with 10-15 tornadoes. Self-organizing map (SOM) techniques were then applied to AO and NAO time series in order to group these patterns into characteristic nodes, with statistics computed regarding the storm events associated with each characteristic pattern. Additionally, composite maps of relevant thermodynamic and dynamic variables were also generated for the days grouped into each node. These findings suggest that the synoptic setup associated with the maximized AO and NAO teleconnections creates an environment downstream of the Appalachian Mountains that is particularly conducive to the convective activity, potentially through regional tropospheric destabilization via moisture and warm air advection. The sudden decrease in the AO and NAO indices corresponds to a significant shift in the given synoptic pattern, which combined with local mesoscale features, provides sufficient forcing for the initiation of lee side convection. AO and NAO indices can be accurately predicted out to at least a week, so the identification of an index pattern similar to one described above could signal an increased likelihood of favorable storm environment downstream of the Appalachian Mountains, and therefore be used as a diagnostic tool for operational forecasters.

"Fractal Models Simulating Non-Fickian Behavior in Three-Phase Single-Well Push-Pull Tests"

Department of Geology, College of Geosciences
By: Kewei Chen

Single-Well Push-Pull (SWPP) tracer test with three phases of injection, resting and pumping was conducted to estimate the hydraulic and transport properties in a fractured aquifer at Newark basin. An anomalous transport phenomenon observed in the SWPP test is the heavy tailing of breakthrough curves (BTCs) in the pumping phase of the test. A novel model with coupled fractional derivative of time and space was developed to interpret the anomalous behavior in the SWPP test. The fractal models, including fractional-in-time (FT), fractional-in-space (FS) and fractional-in-time-and-space (FTS), were solved in a radial coordinate system using implicit Euler method. A semi-analytical solution of the mobile-immobile model with a first-order mass transfer rate (FOR) was derived for comparison purpose. It is found that the FS and FTS models match the experimental data well. The FT model poorly matches the experimental data, as predicted concentrations by this model are much higher than the experimental data over the entire pumping phase. The BTCs of the FOR model drops exponentially, which is much faster than the linear drop obtained from the FS and FTS models, particularly during the later pumping phase. The best match of the FS model with the experimental data demonstrates that non-local transport in space plays an important role for the SWPP test conducted in the fractured aquifer.

"Isostasy and Flexure of the Delaware Basin: Potential Field Modelling & Interpretation"

Department of Geophysics, College of Geosciences
By: Samuel M. Price

The Delaware Basin is a well-studied region in terms of basin architecture and stratigraphic history. There are however numerous questions to be answered in terms of the origination of the basin geometry as determined by the Ouachita-Marathon Orogeny and subsequent subsidence of the lithosphere due to loading. Additionally, a large gravitational ""low"" is centered of the Delaware Basin which cannot be explained by the known densities and thicknesses of sedimentary strata.

Some key questions that will be address throughout this project: Is the Delaware Basin current in isostatic equilibrium? Are there lateral changes in flexural rigidity of the lithosphere across the Delaware Basin? Are topographic loads (e.g. the Central Basin Platform) sufficient to explain subsidence in the Delaware Basin? Do gravity models suggest evidence for subsurface (additional) loads?

"Hydrodynamic modeling of hydrologic surface connectivity within a coastal river-floodplain system"

Department of Geography, College of Geosciences
By: Cesar R. Castillo

Hydrologic surface connectivity (HSC) within river-floodplain environments is a useful indicator of the overall health of riparian habitats because it allows connections amongst components/landforms of the riverine landscape system to be quantified. Overbank flows have traditionally been the focus for analyses concerned with river-floodplain connectivity, but recent works have identified the large significance from sub-bankfull streamflows. Through the use of morphometric analysis and a digital elevation model that is relative to the river water surface, we previously determined that >50% of the floodplain for Mission River on the Coastal Bend of Texas becomes connected to the river at streamflows well-below bankfull conditions. Guided by streamflow records, field-based inundation data, and morphometric analysis; we develop a two-dimensional hydrodynamic model for lower portions of Mission River Floodplain system. This model not only allows us to analyze connections induced by surface water inundation, but also other aspects of the hydrologic connectivity concept such as exchanges of sediment and energy between the river and its floodplain. We also aggregate hydrodynamic model outputs to an object/landform level in order to analyze HSC and associated attributes using measures from graph/network theory. Combining physically-based hydrodynamic models with object-based and graph theoretical analyses allow river-floodplain connectivity to be quantified in a consistent manner with measures/indicators commonly used in landscape analysis. Analyzes similar to ours build towards the establishment of a formal framework for analyzing river-floodplain interaction that will ultimately serve to inform the management of riverine/floodplain environments.

"Variation of the impact of Pacific Decadal Oscillation on extreme streamflow regimes in Texas"

Department of Water Management & Hydrological Science, Department of Geosciences
By: Nikhil Bhatia

Texas has been severely impacted by extreme flood events in the past, which significantly damaged infrastructure, communication systems, agriculture, and livestock. The damages are expected to increase in upstream areas with higher flood plain population densities and limited number of instream hydraulic structures. Recent studies show that the sea surface temperature and pressure anomalies, caused by Atlantic and Pacific Ocean based climate teleconnections, result in abruptly high precipitation intensities, and eventually trigger extreme flood events across the state. Bhatia et al. (2016) found that these extreme flood events in Texas are affected by the variations in Pacific Decadal Oscillation (PDO). This teleconnection pattern characterizes the Pacific decadal variability in the Northern Hemisphere climate, with temperature anomalies in the central North Pacific zone surrounded by anomalies of opposite sign in the Alaska gyre, off California, and toward the Tropics. In this study, a weighted correlation approach incorporating Leave One Out Test (LOOT) is employed to determine the influence of PDO on 10â€"year or greater recurrence interval flood events in upstream river basins. The study also investigates the influence of regional precipitation and reference evapotranspiration on the respective relationship of extreme streamflow regimes and the climate teleconnection pattern.

Results of this study will aid regional water boards in planning, designing, and managing the respective hydrologic systems with reliable long term predictions of PDO states.

“Engaging undergraduates in the geosciences research: A high impact learning experience”
Department of Geography, College of Geosciences
By: Parveen Kumar Chhetri

Undergraduate research is an important component of undergraduate science education which can enhance their learning by promoting critical thinking skills and spatial understanding. To understand and assess the impact and benefits of undergraduate research experiences on personnel and professional carrier we developed two research projects and recruited sixteen students. We recruited students based on their interest in research, and not on the basis of their academic performances. The first project was utilized geographic information systems (GIS) and remote sensing (RS) to map and analyze spatial patterns in treeline data, and second project was dendrochronology focused, using tree-rings to assess climate response of sub-alpine tree species from the Nepal Himalaya and Alaska. Undergraduate students were diverse in academic major (Bioenvironmental Science, Geography, Geology, GIST, Environmental Geosciences, and Environmental Studies) and education level (U1, U2, U3, U4). Ninety percent of students had no previous experience with the research. Observations and conversations with undergraduate students suggest that students were more interested in science, had improved communication and reasoning skills, and were more comfortable working in a group following involvement in undergraduate research.

“Reactive solute transport in a filled single fracture-matrix system under unilateral and radial flows”
Department of Geology, College of Geosciences
By: Renjie Zhou

The study of transport processes in a single fracture is the basis of understanding transport in complex fractured networks. Many single fractures in the field are filled with sediments, and the transport in such filled single fractures has received much less attention up to present. When the fracture is partially filled with sediments, a mobile-immobile approach is considered necessary. This study deals with a coupled three-domain transport problem using mobile and immobile domains to characterize a filled single fracture and a matrix domain to characterize the rock body. Mathematical models are developed for such a coupled three-domain transport problem with new semi-analytical solutions to analyze the spatial-temporal concentration and mass distributions in the fracture and rock matrix with the help of Laplace transforms. This study addresses transport in a filled fracture-matrix system under two different flow conditions: unilateral flow, and radial flow. The new solutions have been tested extensively against previous solutions under various special settings and are proven to be robust and accurate.

“Origins of Microbes in Iron Oxide-rich Mats at Lō̧’ihi Seamount and Seamounts Along the Southern Marianas Trough”

Department of Oceanography, College of Geosciences
By: Kecen Zhou

Lō̧’ihi Seamount and the Southern Marianas Trough are two sites with active volcanic activity and numerous hydrothermal vent sites. Low oxygen and high Fe2+ concentrations in the vent fluid of these environments allows for the growth of iron oxide-rich microbial mats, which potentially play a major role in iron cycling in the ocean. A consortium of microbes that includes Zetaproteobacteria and Epsilonproteobacteria, make up the community of these mats and are responsible for the bulk of biological production. Epsilonproteobacteria and iron-oxidizing Zetaproteobacteria show a trend of being highly unique to each site, posing the question of where these microbes originate from and which factors select for what species are present. The proposed study will look at the microbial community makeup of Hiolo North and South and Pohaku at Lō̧’ihi, and Northwest Eifuku, Northwest Rota-1, and Urashima in the Marianas Trough. Using alpha, beta, and network analysis of environmental 16s rRNA sequences, this study intends to shed light on the origins and diversity of mat microbes at these locations; whether mat microbes originate from vent fluids or background seawater can be determined by comparing samples form different locations. Initial analyses of samples from Lō̧’ihi Seamount suggest bacteria originate mainly from fluids and archaea originating mainly from background seawater, and I hypothesize these trends will be confirmed in future analyses.

Agric Econ; Agric Leadshp, Edu & Comm; Animal Sc; Biochem & Biophy; Bio & Agric Engr; Ecosys Sc & Mgmt; Entomology; Horticulture Sc; Nutrition & Food Sc; Plant Pathology & Microbio; Poultry Sc; Recreatn, Park & Tour Sc; Soil & Crop Sc; Wildlife & Fishrs

“Metabolic pathway for utilization of kojibiose in Escherichia coli”

Department of Biochemistry, College of Agriculture and Life Sciences
By: Keya Mukherjee

Kojibiose (2-O-a-D-glucopyranosyl-D-glucose) is a component of lipoteichoic acids which are found in the cell wall of Gram-positive bacteria. A previously unknown metabolic pathway for the breakdown of kojibiose has been found in Escherichia coli. This pathway consists of six uncharacterized enzymes. YcjT is a kojibiose phosphorylase that converts kojibiose to D-glucose and ÃŸ-D-glucose-1-phosphate with a kcat and kcat/ Km of 1 s-1 and 1.2 x 103 M-1s-1 respectively. The products of this enzymatic reaction are substrates for two enzymes: YcjU, a ÃŸ-phosphoglucomutase that converts ÃŸ-D-glucose-1-phosphate to ÃŸ-D-glucose-6-phosphate, and YcjS, that oxidizes D-glucose to 3-keto-D-glucose. There are three other enzymes that also belong to this pathway: YcjR, a putative sugar isomerase/ epimerase; YcjQ, a dehydrogenase that oxidizes D-gulose with a kcat of 0.6 s-1 and kcat/ Km of 1.7 x 102 M-1s-1; and YcjM, a putative polysaccharide hydrolase/ phosphorylase.

“Stage-structured matrix analyses evaluating the post-2010 population trend of Kemp’s ridley sea turtles in the Gulf of Mexico: Four processes of investigation”

Department of Wildlife & Fisheries Sciences, College of Agriculture and Life Sciences
By: Amanda Kocmoud

Sea turtles are one of Earth’s most ancient species. Six of the seven species of sea turtles, including green (Chelonia mydas), loggerhead (Caretta caretta), hawksbill (Eretmochelys imbricate), leatherback (Dermochelys coriacea), olive ridley (Lepidochelys olivacea), and Kemp’s ridley (Lepidochelys kempii) are threatened or endangered due to anthropogenic effects. Among them, the Kemp’s ridley is a critically endangered sea turtle that breeds and spends the majority of its life cycle in the Gulf of Mexico. Prior to 2010, the population appeared to be recovering; however, coincidental with the deep water horizon oil spill, there was an unprecedented increase in turtle strandings in the northern Gulf of Mexico and also a 35% decline in nesting success on the principal nesting area in Mexico. Reduced per capita availability of blue crabs and shrimp trawl by-catch in the northern Gulf of Mexico may have also contributed to the Kemp’s ridley decline. Currently, I am conducting a stage-structured matrix model and thorough elasticity and sensitivity analyses to simulate and quantitatively evaluate various versions of four general processes that have been hypothesized to be driving the post-2010 population trend in the Gulf of Mexico. The four general processes I investigate here include: (1) single-year (“pulse”) reductions in survivorship, (2) multi-year (“press”) reductions in survivorship, (3) stock-recruitment relationships, and (4) density-dependent effects on the remigration interval. Although various versions of these hypotheses have been represented in previous models, they have not been represented, analyzed, and compared within a single modeling framework. I will demonstrate the different magnitudes of effects of the four hypotheses and provide the management implications and manuscript for publication in a peer-reviewed journal.

"Mechanisms of Membrane Fission"
Department of Biochemistry, College of Agriculture and Life Sciences
By: Lauren Kustigian

Membrane fission, or the controlled pinching off of vesicles and tubules from intracellular organelles and the plasma membrane, is utilized for vesicle trafficking between distinct compartments in all eukaryotic cells. Yet our understanding of membrane fission is limited primarily to endocytosis at the synapse (Cocucci 2014). While these studies have provided valuable insight into the mechanism of fission, they may fail to accurately describe the regulation of fission elsewhere in the cell, especially where the key neuronal fission protein, dynamin, appears to be absent. In order to address whether the membrane fission mechanism is conserved throughout the cell, we have focused our research on the membrane fission events at the recycling endosome of C. elegans. Fission at the recycling endosome returns proteins back to the plasma membrane and requires the activities of two interacting proteins, amphiphysin 1 (AMPH-1), and receptor mediated endocytosis-1 (RME-1; Pant 2009). Here we employ a single-particle fluorescence technique known as Burst Analysis Spectroscopy (BAS) to observe real time changes in the size and number of labeled liposomes during fission (Brooks 2015). We first validated BAS as a method for the quantitative study of membrane fission using an established potent fission agent, the ENTH domain from Epsin. However, the technical limits of those studies motivated us to extend the capabilities of BAS by introducing multicolor BAS (MC-BAS). This new technique allows us to measure the "leakiness" of fission reactions in real time, using fluorescently labeled liposomes and a soluble, fluorescent luminal tracker. Experiments using MC-BAS demonstrate a "leakiness" of membrane fission with the ENTH domain, suggesting that the ENTH domain represents unregulated fission activity that most likely requires additional factors for conservative fission, which preserves the integrity of lumenal contents.

In addition to tracking conservative versus leaky fission, MC-BAS is also useful for measuring protein liposome interactions, using fluorescently tagged proteins and liposomes. Using this approach, we have initiated our studies of the interactions of AMPH-1 and RME-1 with liposomes, using order-of-addition experiments. In this way, we can determine the number of RME-1 and AMPH-1 bound to a single liposome. These advancements in BAS and MC-BAS now allow more quantitative analysis of fission and its regulation. Future work will use these techniques to focus on the roles of AMPH-1 and RME-1 in regulated membrane fission and allow us to compare the fission mechanism at the recycling endosome to the well-studied dynamin-1 fission activity at the neuronal synapse.

"Analysis of QTL associated with yield and yield components in TAM111 and TAM112 and their interactions with environments"
Department of Plant Breeding, College of Agriculture and Life Sciences
By: Yan Yang

A population of 124 recombinant inbred lines (RILs) was developed from two popular hard red winter wheat (HHRW) cultivars TAM 111 and TAM 112 to identify and characterize QTLs for yield and yield components. A high-density genetic map was constructed by genotyping with the wheat 90K iSelect array and genotype-by-sequence (GBS). A set of 9928 markers forming 80 chromosome fragments and covering all 21 chromosomes, including 19 SSR and STS, 5094 GBS, 4815 SNPs from 90K were used for QTL analyses. Data for yield and yield components were obtained from 8 environments (locations x year x irrigation). A total of 193 putative QTLs were identified associated with yield and yield components through composite interval mapping (CIM) analysis. These QTLs that explained phenotypic variance ranged 8.9 to 18.4 %. Genome-wide scan for single trait with multiple environments showed 2, 2, 2, 1, 1, 3, and 2 QTLs for grain yield (GY), thousand kernal weight (TKW), seeds per head (SPH), Single head grain weight (SHGW), Harvest index (HI), yield from combine (Comyld), and AG score, respectively have significant additive by environment effects. 24 pairs of epistatic QTL were detected for different yield components, including four pairs for GY, one for SPH, six for heads per square meter (HSM). A major QTL Qyld.tamu-7D, positioned at 56 cM on chromosome 7D, with marker interval SNP50-SNP51, associated with GY, HI, and SPH. Results from this study provide a benchmark for future efforts on QTL analysis for wheat yield.

"Consumers willingness to pay for GMO products"

Department of Agribusiness & Managerial Economics, College of Agriculture and Life Sciences
By: Xiaotong Yuan

Since the first genetically modified food product was approved for commercial release in 1994, genetic engineering has been widely applied to multiple species of crops. According to USDA report, more than 90% of corn, soybean, and cotton planted in the U.S. are genetically modified. However, one interesting phenomena is that even though scientists keep claiming that GMO has no negative effect on human beings, consumers still carry their suspicion on GMO. Thus, clarifying what factors dominate consumers' purchasing decisions on GMO products could help the society have an objective perception on GMO and could have implications on policy making.

To test whether people truly prefer Non-GMO products to GMO products or not and to reveal the reason behind this behavior, we conducted our study on 6 common products: beef, canola oil, cotton ball, milk, plain yogurt. We recruited 174 grocery shoppers from Bryan and College Station ages 18 to 73. The experiment was conducted over a 2 day-period in a conference room in Hyatt Place, a hotel in College Station.

The study consists of two parts. The first part is the survey, it helps us get all the information that potentially dominate consumers' behavior of purchasing. The second part is bidding. In our study, we used Vickrey second price auctions (SPAs) to reveal consumers' willingness to pay (WTP). Consumers submit their bidding price and the price remain confidential until everyone finish the bid. The one who bid highest get the product and pay for the second price.

By analyzing the bidding price, we would be able to observe the difference between Non-GMO and GMO products and find the reason why people would like to pay more for Non-GMO products.

“Synergistic activity of Mutacin 1140 with Kanamycin against Staphylococcus aureus”

Department of Biology, College of Science
By: Steven Lai Hing

Streptococcus mutans JH1140 is a strain of bacteria which produces a lantibiotic product, named mutacin 1140. Mutacin 1140 has been shown to be effective at inhibiting Gram-positive bacterial infections caused by Staphylococcus aureus and Streptococcus pneumoniae. Mutacin 1140 is a ribosomally synthesized peptide antibiotic that undergoes extensive posttranslational modifications (PTM).

We have found that Mutacin 1140 and an aminoglycoside, Kanamycin, when combined together, acts synergistically against Staphylococcus aureus. This was determined by performing serial kill curve dilution overlays on solid media, followed up with kill curve by microdilution plate, and most recently confirmed with kill curve CFU count plates on Thyex media over time points in a 24 hour period. All three methods are independently consistent with their results: in combination with Kanamycin, Mutacin 1140 kills at an improved rate than either compound individually. Synergistic behavior opens many interesting opportunities for altered treatment strategies (lowered doses necessary for efficacy) and decreases the risk of developed resistance by Staphylococcus aureus against either 1140 or Kanamycin by providing multiple effective drug targets to account for.

“The Utilization of Tannase as a Processing Aid to Improve Quality of Mango Juice and Increase Bioaccessibility of Gallic Acid”

Department of Food Science & Technology, College of Agriculture and Life Sciences
By: Maritza Ashton Sirven

Mangos are one of the most popular fruits in the world and are nutritionally attractive because of their phytochemical composition. Gallotannins are the most abundant class of polyphenolics present in mango, but lack bioavailability due to their large size. Conversely, gallic acid is the monomeric constituent of gallotannins and it along with its colonic and phase II metabolites have been shown to be both bioavailable and bioactive. The objective of this study was to improve gallic acid bioaccessibility and quality of mango juice by hydrolyzing gallotannins using tannase as a processing aid. Mango juice was prepared from homogenized pulp of Ataulfo mangos and divided into four different treatments that included no treatment, juice with 167 U/100 mL tannase, juice fortified with L-ascorbic acid, and juice fortified with L-ascorbic acid and treated with tannase. Changes in color and concentration of gallic acid for all juices were evaluated over a 6-week shelf life study. The juices were also subjected to in vitro digestion. After 6 weeks of storage, no differences ($P<0.05$) occurred between treatments in juice browning measured at 420 nm. Tannase treated juice had a higher concentration of gallic acid ($P<0.05$) with 376 Â± 7.5 mg/L gallic acid compared to the non-treated juice at 138 Â± 9.3 mg/L gallic acid. Tannase treated juices also had higher ($P<0.05$) concentrations of gallic acid after simulated digestion. Results demonstrate that tannase can be used as a processing aid to increase bioavailability of gallic acid from tannins without detriment to the quality of mango juice.

“Phylogeographic Assessment of the Heermann’s Kangaroo Rat (Dipodomys Heermanni)”
Department of Wildlife & Fisheries Sciences, College of Agriculture and Life Science
By: Bridgett Downs

Heermann’s kangaroo rat (Dipodomys heermanni; Rodentia: Heteromyidae) is endemic to California and primarily found in the dry, gravelly grassland and open chaparral habitats of the San Joaquin Valley. Current taxonomy (based on morphology and habitat use) recognizes nine subspecies within this kangaroo rat. Current management practices of D. heermanni are based on these historical classifications; however, these classifications may not accurately reflect the unique lineages in need of conservation. This study aims to assess the phylogeography of D. heermanni across its geographic range. In doing so, we will gain insight into the diversification of D. heermanni, determine what, if any, barriers to gene flow exist among unique lineages, revise subspecific taxonomy (if necessary), create predictive models for the geographic ranges of each unique evolutionary unit, and make recommendations for conservation and management. We present a preliminary mitochondrial dataset that indicate recognition of all nine subspecies is likely unwarranted. Further molecular work will add additional markers and samples, including analysis of museum specimens in a dedicated ancient laboratory. Morphological analyses of 12 cranial measurements from museum specimens from across the species range representing all subspecies also will be performed. Lastly, distribution records from GBIF and VertNet will be analyzed using MaxEnt to predictively model the geographic range of D. heermanni.

“Utilization of genotyping platforms for introgression of A2 and D1 Germplasm into Upland Cotton Gossypium hirsutum (L.)”
Department of Plant Breeding, College of Agriculture and Life Science
By: Ammani Naidu Kyanam

Genetic improvement efforts in Upland cotton (Gossypium hirsutum L.) must contend with relatively low levels of diversity due to reasons such as the self-fertilizing reproductive biology, low mutation rate and recent polyploidization. Cotton has abundant naturally occurring diversity that can be introgressed into the elite cultivars. However, introgression breeding into Upland cotton is challenged by the reproductive physiology, differences in ploidy and meiotic affinity of genomes, F1 sterility, and other deleterious genetic interactions. We aim to study and facilitate diploid germplasm introgression breeding using a marker-assisted approach. A semi-fertile synthetic tetraploid 2[A2D1] developed by hybridization of G. arboreum (A2 genome, n=13) and G. thurberi (D1 genome, n=13) was crossed to the inbred Upland line TM-1 and then backcrossed the F1 to TM-1 to develop a mapping population of 73 BC1F1 individuals. To develop SNP resources, we developed a diploid cluster file for the CottonSNP63K Array. Using the Array and cluster file, we auto-genotyped 16,612 SNPs across all 73 BC1F1 hybrids. We then constructed a high-density genetic linkage map of SNP markers using the JoinMap 4.0 software. We grouped loci according to the maximum likelihood algorithm, and selected linkage groups (LGs) with LOD scores over 10, resulting in 26 linkage groups and a total of 5797 mapped loci. We analyzed map order by constructing and visually examining 2D Matrix Plots of the linkage groups constructed with CheckMatrix software. This information, along with comparisons to another recently published map of SNP markers based on the CottonSNP63K Array, was used to validate the map order. This linkage map provides us with positional information and a facile source of KASP markers for newly reported methods of cost-effective MAS of cotton seed or seedlings, e.g., for introgression and analysis of A2 and D1 germplasm via chromosome segment substitution line (CSSL) or “introgression line” (â€œILâ€•) development.

“Muscle metabolic effects of whole-body vibration in yearling horses”

Department of Animal Science, College of Agriculture and Life Science
By: Caitlyn Hyatt

The objective of this study was to determine the effects of whole-body vibration (WBV) on select muscle metabolites in yearling horses on stall rest. Twenty yearling horses (17Â±2 months) were randomly and evenly divided into a split plot design consisting of treatment (n=10) and control (n=10) groups.

Horses were assigned uniform stalls at the Texas A&M University Horse Center and given ad libitum access to water and trace mineral salt blocks. Horses were fed a diet for 100% of DE and 110% of protein, calcium, and phosphorus based on NRC recommendations using coastal grass hay and pelleted concentrate.

The treatment group completed WBV on a vibration plate at 50 Hz 30 minutes per day 5 days per week for 120 days. Serum was collected via jugular venipuncture in 6-mL lithium heparin tubes on days 0, 30, 60, and 120 before a 30-minute turnout, and after turnout (control group only) or vibration (treatment group only). Only an initial blood draw was collected on Day 0 as a baseline value to serve as a covariant to which all means were adjusted. Samples were analyzed by Texas A&M University Veterinary Medical Teaching Hospital Clinical Pathology Lab for blood urea nitrogen, aspartate aminotransferase, gamma-glutamyltransferase, creatine kinase, and lactic acid within 24 hours of collection. Statistical analysis was completed using the PROC MIXED procedure of SAS 9.4, and significance was set to P=0.05.

AST had a significant (P<0.05) reduction across all collections from a group average of 301.27 U/L (standard deviation= 11.42 U/L) before treatment to 287.73 U/L (standard deviation= 11.42 U/L) post-treatment in control horses. GGT values for both groups experienced a significant (P<0.05) regression between collections with the control group having a greater reduction than the vibration group. CK values showed a significant (P<0.05) treatment-day interaction with the control group showing reduced values and the treatment group showing increased values for CK.

Elevated CK and AST values are indicative of muscle degradation; LA presence in blood is an indicator of anaerobic conditions during high intensity physical exertion. GGT is a biomarker used to exclude liver disease as a reason for elevated CK. WBV of young horses on stall rest does not provide significant sustained muscular benefits. Further studies using uniform muscle biopsies and hourly blood collections post-vibration are recommended for further understanding of the potential therapeutic applications of WBV.

"In vitro bile acid binding capacity of kale with contribution of bioactive compounds"
Department of Animal Science, College of Agriculture and Life Science
By: Isabelle Yang

Foods with bile acid binding capacity can provide multiple benefits to human health, including reducing plasma cholesterol content, controlling blood sugar level in type-2 diabetic patients, preventing colon cancers and lowering the risk of cardiovascular diseases. Binding bile acids lowers the bile acid reabsorption rate in the enterohepatic circulation and promotes the utilization of cholesterol to synthesize new bile acids, thus to reduce the risk of cardiovascular diseases related to high cholesterol level. Secondary bile acids are associated with colon cancer, by reducing the free secondary bile acids in colon can reduce the risk of developing cancer. Kale's bile acid binding capacity was investigated by incubating with the mixture of bile acids through the in vitro digestion, simulating human digestion process. Phenolic compounds of kale were separated by Soxhlet extraction with hexane, acetone and 80% methanol with 1% formic acid, and the extraction fractions were tentatively identified by LC-MS. The Soxhlet extraction fractions and Soxhlet extraction residue of kale were used to test in vitro bile acid binding capacity. The bioaccessibility of polyphenols from kale was examined through two different in vitro digestion experiments, one experiment was with bile acid incubation involved in, the other in vitro digestion experiment was without bile acids involved in. The results shows that kale has good in vitro bile acid binding capacity. The bile acids are mainly bound by dietary fibers, especially soluble dietary fibers in kale. But polyphenols contribute to kale's bile acid binding capacity, as well. In addition, bile acids react with phenolic compounds in kale through the in vitro digestion and affect their bioaccessibilities.

"Cellular and antibody mediated immune responses are influenced by
sex and pregnancy status in mature Brahman cattle"
Department of Physiology and Reproduction, College of Agriculture and Life Sciences
By: Christian Cook

Measures of immune responsiveness are under evaluation as criteria to select breeding bulls and cows. The objective of this experiment was to determine whether cell-mediated immune response (CMIR) and antibody-mediated immune response (AMIR) varied according to sex and pregnancy status in mature Brahman cattle. We hypothesized that sex and pregnancy status would influence CMIR and AMIR. Status groups included 84 sexually mature, non-pregnant Brahman cows, 163 pregnant Brahman cows, and 25 fertile Brahman bulls in the Texas A&M AgriLife Research herd. For CMIR determination cattle were administered a 25x103 protein nitrogen units (PNU)/mL subcutaneous (neck) sensitization dose of Candida albicans (CA; Greer Labs, Lenoir, NC) with 750 Âµg of Quil-A (InvivoGen, San Diego, California) adjuvant in 2.5 mL buffer on d0. On d14 after sensitization, tail skin fold thickness (SFT) was measured using a Harpenden caliper prior to intradermal injection of 5x103 PNU/mL of CA in 0.5 mL in the skin fold. On d15 the injection site SFT was measured. Response was determined by the difference of SFT from d15 (post-injection) and d14 (pre-injection). For AMIR determination cattle were administered Salmonella Newport Extract vaccine (2 mL subcutaneous; Zoetis, Florham Park, NJ) on d0. Blood samples were collected by jugular venipuncture on d0 and d15. Serum samples were stored at -20C until analyzed for vaccine specific IgG by a double sandwich, enzyme linked immunosorbent assay. Data were analyzed using mixed model procedures of JMP (Cary, NC). Table 1 contains the mean CMIR and AMIR for bulls and non-pregnant and pregnant cows. Mean CMIR was greater ($P<0.05$) in pregnant cows and bulls than non-pregnant cows. Fertile bulls and pregnant cows did not differ in CMIR ($P>0.05$). With AMIR, fertile bulls and non-pregnant cows did not differ from each other; however the AMIR of these 2 groups exceeded ($P<0.05$) that of pregnant cows. A statistical relationship between CMIR and AMIR was not detected as correlation coefficients were near zero. The hypotheses that sex and pregnancy status affect CMIR and AMIR in cattle were accepted. Therefore, physiological status and sex should be considered when evaluating either cellular or antibody mediated immune response in mature Brahman cattle.

Biology; Chemistry; Mathematics; Physics & Astronomy; Statistics

How Far Can We See Supernovae?"
Department of Physics, College of Science
By: Peter J. Brown, Britton Beeny, Ethan Viera, Leslie Lagunas, Javier Romero, & Cooper Dix

The expansion of the universe causes light from distant objects to be redshifted to longer wavelengths. For optical observations, the observed photons were actually emitted in the ultraviolet. In our project, we find or develop spectroscopic models of different supernova types covering ultraviolet and optical energies and correct them for the effects of distance and redshift to determine how bright they would be as a function of distance. Our findings can improve the estimates of how bright and how many supernovae might be discovered by current and future ground and space-based telescopes such as the Dark Energy Survey, Large Synoptic Survey Telescope, the James Webb Space Telescope, and the Wide-Field Infrared Space Telescope.

"Understanding the regulation of inl gene expression in response to inositol"
Department of Biology, College of Science
By: Ananya Dasgupta

Inositol is important for different cellular processes but its role is highly pronounced in signal transduction pathways in the form of inositol phosphates. Inositol biosynthesis occurs by a well documented pathway which involves inl gene encoding inositol-3-phosphate synthase as the first enzyme in the pathway. It catalyzes the rate limiting step of converting D glucose-6-phosphate to 1D myo-inositol-3-phosphate. Interestingly, in 1983 Zsindely et al. published a study in Neurospora crassa indicating a feedback inhibition on this enzyme in presence of increasing concentrations of inositol in the media. This fuelled further research and it was found that the inl mRNA contains an upstream open reading frame (uORF) which starts with a non-cognate codon and is translated to form a 26-37 amino acid peptide in different fungal species. uORF containing transcripts have been reported to be under the control of nonsense-mediated mRNA decay (NMD) pathway. Therefore studying the mRNA expression in wild type and NMD deficient cells, both in presence and absence of inositol will help us to understand the regulation of this gene. The preliminary data from RT qPCR experiments show a highly significant result of about 2 fold change in inl gene levels compared to a housekeeping control gene in wild type N. crassa in presence of inositol. Hence it needs to be validated with the above-mentioned strains and conditions and can also be investigated more deeply using a whole genome transcriptomic approach to fully elucidate the overall effect of inositol.

"Role of NLRC5 and IRF1 in the induction of MHC class I"
College of Medicine
By: Saptha Vijayan

MHC class I and MHC class II plays a major role in adaptive immune responses through activation of CD8 T cells by presenting intracellular antigens such as virus or cancer antigen. NLRC5 or CITA is a critical transcriptional activator of MHC class I and related genes. Although NLRC5 lacks DNA binding domain, they interact with other DNA binding proteins such as RFX family members and are recruited to the proximal promoters of MHC class I genes to form CITA enhanceosome. However the factor essential for determining the specificity of NLRC5 to MHC class I gene transactivation is unknown. In the current study we show that there is a synergistic trans-activation of MHC class I and MHC class I related genes by IRF1 and NLCR5. We further show that the DNA binding domain and the transactivation domain of IRF1 is critical for the IRF1-NLRC5 interaction.

"Circadian clock regulation of translation initiation through eIF2a phosphorylation"

Department of Biology, College of Science
By: Shanta Karki

Roughly half of eukaryotic mRNAs accumulate with a circadian rhythm, demonstrating the profound impact of the clock on gene expression. In addition, mounting evidence supports a role for the circadian clock in controlling mRNA translation, extending the influence of the clock on gene expression beyond its role in rhythmic transcription control. However, the mechanisms and extent of translational regulation by the clock are largely unknown. Previous studies in our lab revealed that the clock, through rhythmic activation of the stress-associated p38 MAPK pathway, regulates the activity of translation elongation factor eEF-2 in Neurospora crassa. This discovery prompted us to also examine if the clock controls translation initiation, where we first focused on determining if the activity of eIF2a, a conserved component of the translation initiation machinery, is clock-controlled. In fungi, phosphorylation of eIF2a is accomplished by GCN2 kinase, which is activated in response to nutrient starvation. While phosphorylation of eIF2a blocks translation initiation of most mRNAs, some mRNAs are actively translated, including mRNAs encoding proteins involved in adaptation to stress. We discovered that phosphorylation of eIF2a is clock-controlled, peaking during the subjective day, and that the Neurospora eIF2a kinase CPC-3, a homolog of GCN2, is necessary for phosphorylation of eIF2a. In addition, we showed that the levels of cpc-3 mRNA and CPC-3 protein accumulate rhythmically. Consistent with these data, we found using in vitro translation assays that mRNA translation is reduced using cell-free translation extracts made from WT cells harvested at the peak of phospho-eIF2a levels, as compared the trough. As predicted, this translation rhythm was abolished in clock mutant and ?cpc-3 cells. Experiments are in progress to determine the impact of rhythmic phospho-eIF2a levels on mRNA translation and rhythmic protein accumulation using ribosome profiling, coupled with RNA-seq, in wild type versus ?cpc-3 cells.

"Control of circadian output by a transcription factor network"

Department of Genetics, College of Agriculture and Life Sciences
By: Jennifer Jung

Roughly half of the eukaryotic genome is expressed with a circadian rhythm, and circadian clock-controlled transcripts peak at all possible times of the day. However, the underlying mechanism controlling phase is unknown. To determine how the clock regulates phase in Neurospora crassa, the targets of the morning-active clock transcription factor (TF), the White Collar Complex (WCC), were determined by ChIP-seq (Smith, K. M. et al., 2010). TFs were enriched among the WCC targets. ChIP-seq data from these first tier TFs suggested the possibility that phase is controlled through a TF network consisting of multiple network motifs, including feedforward loops. To understand phase regulation of downstream clock controlled genes (ccgs), we first need to understand how rhythms in a first tier TF, like ADV-1, are regulated. To this end, a predicted network was generated using ChIP-seq data of the WCC and TF targets that form a network regulating the first tier TF ADV-1. Using this network as a guide, we are experimentally testing: 1) how upstream transcription factors affect ADV-1 rhythms, 2) how upstream TFs feed back to the core oscillator (and indirectly affect ADV-1 rhythms), and 3) if breaking down the network into different motifs can allow for easier or finer tuned manipulation of ADV-1 rhythms. This analysis will provide a foundation to construct a comprehensive model of transcriptionally controlled circadian output.

“Nuclear Trafficking of the Coxiella burnetii Type IV Secretion Effector Protein CBU0388”
College of Medicine
By: Sara Talmage

Coxiella burnetii is a Gram negative, obligate intracellular pathogen and the etiological agent of Q Fever. This organism utilizes an essential type IVB secretion system (T4BSS) to promote its intracellular survival and replication in a lysosome-like Coxiella-containing vacuole (CCV). To date, at least 143 potential effector proteins have been identified but very few have been assigned a function or a defined contribution to virulence. A Himar1-transposon mutant in CBU0388 is incapable of replicating in a wide range of cell types or in a SCID mouse model of C. burnetii infection, indicating that it is essential for CCV development and pathogenesis. Ectopic expression of CBU0388 in mammalian cells results in cell death by caspase-dependent apoptosis. Here we show that this toxicity is dependent on complete trafficking through the host cell nucleus. Using bioinformatic analysis, we identified a nuclear localization signal (NLS) as well as a nuclear export signal (NES). Targeted deletion of the NLS or NES results in an elimination of CBU0388-dependent toxicity. Application of the pharmacological inhibitors importazole or leptomycin b, which inhibit nuclear import or export, respectively, to CBU0388-expressing cells phenocopy the NLS or NES deletions. Ongoing studies are focused on identification of specific interacting partners of CBU0388 during its nuclear trafficking cycle to develop a mechanistic model for virulence related effector function.

“Daily Mango (Mangifera Indica L.) Consumption for 42 Days Differentially Modulates Metabolism and Inflammation in Lean and Obese Individuals”
Department of Nutrition, College of Agriculture and Life Sciences
By: Chuo Fang

Excess weight and body fat increase the risk of developing multiple medical conditions, including Type 2 Diabetes, cardiovascular diseases, and cancer, which pose major threats to public health. Diets rich in fruits and vegetables have been recommended for preventing metabolic disorder and cardiovascular disease. Mangoes are reported to have high concentrations of polyphenols that exert potent anti-inflammatory activities relevant to the treatment of chronic diseases and cancer, as demonstrated in preclinical studies. However, the number of human clinical trials examining the metabolic effects of mango polyphenols is limited. This study was carried out to investigate the effects of daily mango consumption for 42 days in lean and obese individuals. In this study, 21 healthy lean (BMI 18-25kg/m2) and obese (BMI>30kg/m2) subjects aged 18-55, were continuously provided with 400g of mango pulp for 42 days. Inflammatory cytokines, metabolic hormones, and lipid profiles were examined in plasma at a baseline and after 42 days of treatment. A three-day food record was filled out for dietary assessment prior to each clinical visit. Results revealed that 42 days of mango consumption decreased systolic blood pressure (mean Â± SD: 119.83Â±13.16 vs. 115.42Â±12.33; $p<0.05$) in lean subjects, but had no significant effect in obese subjects. The level of hemoglobin A1c was improved significantly in obese but not lean subjects. Reduced expression of PAI-1, associated with reduced risk of atherosclerosis and thrombosis, was observed in both groups (In lean group, mean Â± SD: 30.93Â±18.12 vs. 23.69Â±17.58; $p<0.1$; In obese group, mean Â± SD: 31.34Â±8.09 vs. 24.93Â±12.20; $p<0.05$). There was a non-significant trend towards lowered levels of C-reactive protein, and elevated levels of IL-10 in both groups. No significant changes were observed in lipid profiles for either group. The consumption of mango did not improve the plasma levels of adipokines. In conclusion, daily mango consumption lowers blood pressure in lean individuals, and benefits obese individuals by maintaining long-term glucose homeostasis. Galloyl-derivatives from mango may possess therapeutic potential in the prevention and treatment of obesity and metabolic disorders, which remain to be confirmed in a larger-size human clinical trial.

“Multi-resolution approximations of Gaussian processes for big spatial data”

Department of Statistics, College of Science
By: Wenlong Gong

Remote-sensing instruments have enabled the collection of big spatial data over large domains such as entire continents or the globe. Basis-function representations are well suited to big spatial data, as they can enable fast computations for large datasets and they provide flexibility to deal with the complicated dependence structures often encountered over large domains. We discuss a multi-resolution approximation (MRA) that uses basis functions at multiple resolutions to achieve fast inference and that can (approximately) represent any covariance structure. We present two versions of the MRA: The first version results in a multi-resolution taper that can deal with large datasets. The second version is based on a multi-resolution partitioning of the spatial domain and can deal with truly massive datasets, as it is highly scalable and amenable to parallel computations on modern distributed computing systems.

“Assessing the impact of anthropogenic activities on high altitude biodiversity in Huascaran National Park, Peru”

Department of Wildlife & Fisheries Sciences, College of Agriculture and Life Sciences
By: Jessica Gilbert

Global environmental change and the intensification of human activities are threatening the ecological integrity of alpine ecosystems, the biodiversity that depends on them, and the human uses they support. The compounded effects of global climate change (GCC) and anthropogenic intensification is threatening the sustainability of alpine socio-ecological systems. In response to GCC, species range distributions are shifting in relation to their environmental tolerances, with cold adapted species moving to higher elevations. Agricultural intensification at low elevations is pushing species to higher elevations, leading to reduced ecological connectivity and population isolation. For large carnivores, the retreat to high elevation habitat patches results in fragmented species distributions. In addition to changes for wildlife, livestock are moving to higher elevation, alpine grasslands in response to resource scarcity and pasture degradation caused by overgrazing. Although alpine ecosystems provide a wide range of cultural and biological resources, they are severely understudied. The following research is a preliminary assessment of the impact of human activities on high altitude biodiversity in alpine ecosystems in Huascaran National Park, Peru. From May-September 2016 mammal presence was determined using camera trap surveys, hair snares, and DNA analysis of scat samples. Species occupancy (?) was modeled using Program PRESENCE to determine species detection probability and proportion of sites occupied by species. Diel activity patterns for each species were calculated using kernel density estimation. Occupancy and activity patterns for each species were compared between pristine sites and sites with livestock grazing activity. We found that occupancy and diel activity patterns were affected by the presence of livestock activity, particularly for carnivore species (n=8). We found the first record of the IUCN endangered Andean mountain cat (Leopardus jacobita) in the region, representing a range expansion for this species. Understanding the shifting dynamics within these fragile systems is crucial to biodiversity conservation and management.

“Molecular Tagging Velocimetry (MTV) Measurements of Supersonic Flow Containing Seeded NO”

Department of Chemistry, College of Science
By: Zachary Buen

Describing how a gaseous supersonic flow traverses is necessary when designing and optimizing the performance of vehicles that travel at extremely high velocities. At supersonic speeds, the gas in which a vehicle travels through can be described as being laminar relative to the surface meaning the gas is moving in a streamline direction alongside of it. In certain instances, disrupting the laminar flow is desired to introduce a turbulent flow which increases the random motion of the individual molecules within or surrounding the vehicle. To induce a transition from a laminar to turbulent flow, the motion of the gas at these high velocities must be well characterized. Molecular Tagging Velocimetry (MTV) is a technique to describe the speed and direction of gas molecules comprising the supersonic flow. To measure the velocity of a molecule the total amount of displacement is divided by the total amount of time elapsed during the displacement. It is done by tagging select molecules in a two-line grid, in our project NO, with a “write” laser and taking an initial image of the tagged flow. After an elapsed time period, a second laser is fired at the flow and this is known as the “read” laser. A second image is then taken and the two images are analyzed relative to one another to determine the velocity from the spatial displacement. The two-line grid allows for the distinction of which direction the flow is traveling in.

“Fluoride Anion Complexation by a Triptycene-Based Distiborane: Taking Advantage of a Weak but Observable C−H···F Interaction”
Department of Chemistry, College of Science
By: Chang-Hong Chen

Fluoride anion complexation impacts a number of areas ranging from sensing to nucleophilic fluorination chemistry. Described here is a new bidentate Lewis acid consisting of two stiborane units connected by a 1,8-triptycenediyl backbone. This neutral derivative captures fluoride with an unprecedented affinity for a neutral, water-compatible Lewis acid. Structural, spectroscopic and computational studies demonstrate that fluoride anion binding is assisted by the formation of a C C−H···F hydrogen bond which involves a methine group of the 1,8-triptycenediyl backbone.

“Morphological variation of Gerbillurus in southern Africa”
Department of Wildlife & Fisheries Sciences, College of Agriculture and Life Sciences
By: Adrian Castellanos

The genus Gerbillurus is restricted to arid regions in southern Africa, and is composed of four species. Although these species are sympatric in several areas, they are clearly phenotypically divergent from one another, with the widest ranging species, Gerbillurus paeba, also showing intriguing intraspecific variation. Despite this, few studies have examined this genus comprehensively across its full distribution. We took 21 craniodental measurements from over 500 specimens of G. paeba, 50 of Gerbillurus setzeri, 59 of Gerbillurus tytonis, and 43 of Gerbillurus vallinus. These specimens represent the majority of the distribution of each of these species and together represent one of the most comprehensively sampled morphological datasets for this genus to date. We used these data to examine morphological variation within Gerbillurus to test current species and subspecies designations. To visualize and diagnose distinct groups, we used a variety of ordination and clustering methods. Analyses focused on differences among species, subspecies, and unique localities. Gerbillurus paeba is shown to be morphologically divergent from the other three species. Additionally, morphological variation exists within G. paeba, but not all current subspecies consistently exhibit this variation. Elucidating a more complete view of the morphological variation seen in Gerbillurus will help inform future biogeographic and systematic studies of this genus.

“Comparative variant analysis on diverse breeds of chickens”
Department of Biotechnology, College of Engineering
By: Rohit Rohra

Next generation sequencing has significantly advanced our ability to detect millions of genetic variants on different vertebrate populations. Shortly after human genome sequencing project, chickens became the first livestock’s to be completely sequenced. According to the U.S. Department of Agriculture, chickens supply 67% of our daily protein supplements; however, domestic chicken health and production is negatively impacted by multiple genetic, immune and metabolic disorders. For example, reduced genetic variation at immune loci is blamed for susceptibility to diseases like Avian Influenza. There are a number of indigenous domesticated chickens well known for disease resistance, tropical adaptation and survival, which suggest underlying genetic variation among different breeds. It is important that we characterize and understand the adaptive genetic variation associated with functional and phenotypical traits between various domesticated chicken breeds. In this study, we applied comparative genomic analyses on 14 domesticated and commercial chicken breeds to characterize and identify unique and shared genetic variation among them. The study detected about 8 million SNPs across all chicken breeds in the analysis and revealed that several high impact variant genes were involved in immunological and cell regulation pathways that influence each breed differently. The data from such analyses will be crucial in the management and development of chicken varieties with improved health and production traits.

Medicine; Surgery; Radiology; Pediatrics; Pathology; Obstetrics & Gynecology; Anesthesiology; Epidemology & Biostat; Env'tal & Occ Health; Health Policy & Mgmt; Health Promotion/Comm Health Sc; Public Health Studies; Pharm Sc; Pharm Practice; Nursing

“Noncanonical NF-kappaB signaling enhances invasion, pseudopodia formation and ITGA11 expression in glioma”

Department of Genetics, College of Agriculture and Life Sciences
By: Camille L Duran

High grade glioma are the most common primary brain tumor and the leading cause of cancer death in children. A hallmark of these tumors is highly aggressive invasion into normal brain tissue, contributing to a 100% recurrence rate and resistance to current therapies. Recent efforts to determine molecular differences in high grade glioma and define tumor subtypes have revealed that the noncanonical NF-kappaB transcription factor RelB is upregulated in the highly aggressive mesenchymal subtype, as well as in recurrent tumors. We have found noncanonical NF-kappaB signaling drives glioma invasion into 3D collagen matrices. Stabilization of NF-kappaB-inducing kinase (NIK), a critical driver of noncanonical NF-kappaB signaling, promoted glioma cell adhesion, spreading, and pseudopodia formation on collagen substrates. While normal brain tissue expresses low levels of collagen, collagen type I is upregulated within the stroma and surrounding tissue of glioma. Because NIK expression appeared to regulate glioma cell behavior on collagen, we investigated whether NIK controls the expression of collagen-binding and other integrins. We found NIK expression upregulated the integrin alpha 11 subunit (ITGA11), while it did not significantly affect the expression of ITGA1, ITGA2, or ITGA10. Further NIK expression did not significantly regulate ITGA3, ITGA6, or ITGAV subunit expression. Analysis of human tumor samples revealed that ITGA11 expression was increased in glioma tissue compared to normal brain tissue. Furthermore, when testing multiple glioma lines, ITGA11 expression positively correlated with invasiveness into 3D collagen matrices. Investigation of a key transmembrane metalloproteinase revealed that NIK expression enhanced the localization of phosphorylated membrane-type 1 matrix metalloproteinase (MT1-MMP) to pseudopodial structures. In a heterologous system, ITGA11 and MT1-MMP formed a complex, suggesting these transmembrane proteins could interact in glioma cells to facilitate coordinated recognition and degradation of collagen during invasion. Finally, silencing of ITGA11 in an invasive glioma line attenuated invasion into 3D collagen matrices. Collectively, these data reveal an ability of NIK to promote glioma cell invasion, pseudopodia formation, ITGA11 expression, and activated MT1-MMP localization to pseudopodia. These data suggest ITGA11 could serve as a novel marker for more invasive glioma and a potential therapeutic target in glioma.

“Functional Analysis of Age-Regulated MicroRNA-20a-3p on Barrier Function of Endothelial Cells”

College of Medicine
By: Marcus Wong

Stroke is a leading cause of death and disability in the United States. Blood brain barrier (BBB) permeability increases after an acute stroke and is thought to worsen stroke outcomes. In particular, older females have a higher morbidity and mortality than other groups. Further, compared to other groups, young females present with smaller infarct volumes. Astrocytes from young females also present greater expression of growth factors and better capacity for glutamate clearance. Upon analysis, microRNA-20a-p3 was expressed significantly higher in the astrocytes of these young female rats. MicroRNAs are small non-coding endogenous RNA's target mRNAs for degradation or translation, and through this mechanism, miR-20a may confer neuroprotection from stroke in young females.

Here, we investigate the role of miR-20a-3p on BBB permeability by characterizing its effects on a critical BBB component, endothelial cells. To assess miR-20â€™s effects on BBB integrity, we grew cultures of rat brain microvascular endothelial cells transfected with miR-20-FITC mimetics. First, we indirectly studied endothelial permeability through functional analysis of secreted matrix metalloproteinases via zymograph assay. MMP9 and MMP2 activity was significantly decreased in miR-20 transfected endothelial cells compared to scramble controls p=<0.05. Cell lysates used for RT-PCR and immunohistochemistry suggest that miR-20a regulates key surrogate permeability markers TGBFR and SPARC. Interestingly, direct study of permeability through a bovine serum albumin transfer assay using a micropore transwell apparatus showed no significant difference in BSA permeability between miR-20 transfectants and scramble controls.

These results suggest that there is some BBB integrity regulation by miR-20a-3p through modulation of matrix metalloproteinase activity and regulation of upstream effectors of BBB permeability like TGFBR and SPARC. However in light of the transfer assay results, further studies are needed to characterize the role of mir-20a-3p in BBB permeability after stroke.

"Case Report: Primary Neuroendocrine Breast Cancer"
College of Medicine
By: Allison Shanks

Neuroendocrine tumors of the breast are a rare subset of breast carcinomas. They are set apart from other breast tumors through unique protein expression and genetic mutations. There is not a universal treatment regimen for this type of cancer because of its low prevalence. We present a case of successfully treated primary breast neuroendocrine carcinoma and discuss relevant literature regarding treatment options.

"SmartStrokes: Evaluating Digital Cognitive Tests on Healthy Elderly Individuals"
Department of Computer Engineering. College of Engineering
By: Raniero Aaron Lara Garduno

Clinical neuropsychological tests typically involve performing guided drawing exercises on pencil and paper under specialist supervision. Automating the process using sketch recognition technology can help in reducing the lengthy diagnosis time as well as provide an opportunity for potential patients to complete these trials remotely. We have developed a digital testing suite that incorporates several of these tests for use in Microsoft Surface tablets, and have visited senior activity centers in our vicinity to perform trials on cognitively healthy patients. Our results are promising, with test completion times matching those of recorded normative data of completed paper-and-pencil examinations. We intend to incorporate this data with ongoing studies with patients suffering from cognitively degenerative diseases to help create behavioral profiles that a computer could recognize.

"Memoirs of A Deadly Love: Tracking Public Health Information and Activism Through Gay Art and Literature During the AIDS Epidemic"
Department of Epidemiology, Rangel School of Pharmacy
By: Micaela Sandoval

The AIDS epidemic has widely been considered to be one of the greatest public health crises since the advent of modern medicine. This study examines both official health agency publications and a variety of gay and mainstream media concerning the epidemiology, pathology, and stigma of HIV/AIDS in the United States from 1981- 1983. The investigation compares the quantity and quality of public health information being distributed through gay periodicals, gay literature and art, national syndications, and government channels to qualitatively analyze gaps in the public health information stream. Utilizing the Don Kelly Collection of Gay Literature within Cushing Memorial Library & Archive, we will provide a comprehensive view of the most prominent voices of the time as well as an understanding of the deeper prejudices inherent to that period, as they interfered with the practice of public health education and outreach.

"A Descriptive Model of the Current PTSD Care System: Identifying Opportunities for Improvement"
Department of Industrial Engineering, College of Engineering
By: Jukrin Moon & Alec Smith

Primary Objectives of this poster is to 1) present a descriptive model of the current Post Traumatic Stress Disorder (PTSD) care system for veterans, 2) identify areas of improvement within the current PTSD care system, and 3) present ideas for potential support systems for PTSD patients.

Post-traumatic stress disorder (PTSD), a mental health disorder that people develop after witnessing or living through distressing events or situations, is estimated to impact 23 percent of veterans from recent wars (Kessler et al. 1995). The U.S. Department of Veterans Affairs (2016) reported that "22 suicides per day" occur among veterans with PTSD. Despite these alarming rates, the Veterans Affairs (VA) do not have the necessary budgets or personnel to meet the needs of all the veterans. Due to these inadequate measures, there exists a critical need to improve the current PTSD care system.

To address such need, healthcare tools such as mobile apps (e.g., PE Coach and CPT Coach) have been developed and widely adopted; however, these tools have been designed in isolation without taking into account the overall care system. This could lead to a loss of potential opportunities for improvement. For instance, PTSD Coach is a widely adopted mobile app offering many advantages for veterans, but its remote capabilities that could have been addressed otherwise are largely absent.

The lack of systems perspective in currently available tools is partly due to the absence of clear understanding of the current PTSD care system to inform the design of such systems. In this poster we present a descriptive model of the PTSD care system built using the data gathered in interviews with healthcare providers and patients as well as a systematic investigation of literature. The model captures both the healthcare providers' and the patients' views of the system and helps in identifying the underlying limitations and problems of the current PTSD care system which would lead to the design of a tool that meets the needs of these stakeholders.

The semi-structured interviews with healthcare providers (e.g., clinicians, psychiatrist, and biofeedback specialists) and patients are in progress. The interviews are transcribed, coded, and analyzed by graduate and undergraduate researchers using an interview analysis tool called MAXQDA. During the coding process, each transcript is coded by at least two coders to avoid bias. Inter-coder reliability is then analyzed and reported. More specifically, each coder coded the transcripts by reading the transcripts and mapping the related portions to the codes. The coding outcomes of multiple coders was compared using MAXQDA. When encountered with non-negligible differences, we double-checked our coding system, whether or not it was well-defined and well-communicated to all coders. After coding, we compared the responses from different interviewees for the same code to integrate dispersed and sometimes conflicting answers and discussed the codes until a consensus was reached.

As a result of these iterative interview analysis processes, we have built an end-to-end descriptive model of the current PTSD care system. In this poster presentation, the resulting descriptive model will be presented using Unified Modeling Language (UML), visualizing the dynamic flow of activities. We used an iterative model building approach, where interviews were used to validate and improve the model. The visual model helped the research team to formulate additional probing questions to solicit information on specific activities, processes, or decision points that were inadequately addressed in previous interviews.

Our preliminary results identified two important research gaps. First, patients often forget their homework assignments, and therefore can benefit from technological mitigation in form of a memory-aid tool. Second, both patients and clinicians may benefit from having access to information pertinent to periods of "hyper-arousal" and other mental state changes. The remote collection of such data using sensor-enabled mobile devices can provide an objective assessment that could complement the subjective self-assessment data. We are currently designing a smartwatch technology to serve this purpose. This tool is briefly showcased in this poster.

"Integrating Outcomes with Treatments to Better Inform Clinical Decision Making"

Department of Computer Engineering, College of Engineering
By: Mohammad Atif Tahir, Akintayo A Akinleye, & Muppala N Prasanth Raju

From one appointment to the next, healthcare providers have limited interaction with their patients, yet patients have similar patterns of care. Certain medications have common side effects; comparable injuries heal in a usual amount of time; and so on. By modeling patient interventions with outcomes, healthcare systems can equip providers with better feedback from

STUDENT RESEARCH WEEK

their patients. In this work, we present a methodology for analyzing medical records according to a specific ontology directed at allowing closed-loop feedback between encounters with providers. Working from redacted veterinary texts, we use a combination of data processing and machine learning algorithms, alongside human clinical expertise, to interpret medical records and extract knowledge. Our current focus is automated detection of therapy changes and outcomes through natural language processing techniques. The ultimate goal of this research will be to inform the development of a system which can draw on these models to support knowledge-driven clinical decision-making.

Veterinary Integrative Biosciences; Veterinary Large Animal Clinical Sciences; Veterinary Pathobiology; Veterinary Physiology & Pharmacology; Veterinary Small Animal Clinical Sciences

STUDENT RESEARCH WEEK

"Lactational Exposure to Hexavalent Chromium Disrupts Thyroid Histoarchitecture and Decreases Thyroid Epithelial Cell Proliferation in F1 Offspring"

Department of Biomedical Sciences, College of Veterinary and Biomedical Sciences
By: Saumia Thomas

Hexavalent chromium (CrVI) has been used in more than 50 industries worldwide. Increased use and improper disposal of chromium waste had lead to increased occupational exposure and environmental contamination. According to September 2016 report from the environmental working group (EWG), drinking water from almost every state in the US has significantly contaminated with CrVI. There is not much data on the effects of CrVI on the thyroid gland development. CrVI can cause a wide range of effects, including functional and cellular damage of the thyroid. The goal of this study is to investigate the basic mechanisms involved in CrVI-toxicity on the thyroid, and the protective role of vitamin C on CrVI-toxicity of the thyroid. Lactating Wistar rats received potassium dichromate (25 mg/L) in drinking water. Groups of control and CrVI-treated rats were supplemented with vitamin C (500 mg/L) (through oral gavage). During postnatal days (PND) 1"21 the pups received respective treatments via the mother's milk. Pups from both control and treatment groups were continued on regular diet and water from PND-21 onwards and were euthanized on PND-25. CrVI increased follicular cell death and decreased thyroid follicular cell (TFC) proliferation by decreasing PCNA and cyclin D1. CrVI also increased interfollicular spaces. In addition, CrVI also disrupts the expression of thyroperoxidases and TSH receptors. Vitamin C treatment mitigated the deleterious effects of CrVI toxicity on the thyroid gland. Our data indicates that CrVI toxicity could be a potential risk to postnatal thyroid gland development. However, Vitamin C may play a protective role against CrVI-induced thyroid gland toxicity and may potentially attenuate CrVI toxicity on the thyroid gland.

"Effects of pirfenidone in a mouse liver fibrosis model"

Department of Toxicology, College of Veterinary and Biomedical Sciences
By: Dr. Oleksii Seniutkin

Background and aims: Liver fibrosis is a consequence of chronic damage and excessive regeneration with redundant accumulation of extracellular matrix proteins, including collagen. Etiology of liver fibrosis may include infectious agents, environmental, and autoimmune factors. Liver fibrosis is also a precursor of liver cirrhosis and hepatocellular carcinoma. Current treatment options for liver fibrosis are primarily directed at inflammation with few options currently available to combat fibrogenesis. Pirfenidone (Esbrie®) is a currently approved anti-fibrotic agent for the treatment of idiopathic pulmonary fibrosis which downregulates the production of growth factors and procollagens I and II, and inhibits fibroblast proliferation. We aimed to test anti-fibrotic potential of pirfenidone in liver in a mouse model of sub-chronic cytotoxic fibrosis induced by carbon tetrachloride (CCl_4).

Methods: Several studies were conducted to evaluate anti-fibrotic effects of pirfenidone in liver. First, a 4-week dose-finding study was performed, male B6C3F1/J mice were treated with CCl_4 (0.2 ml/kg intraperitoneal injections twice a week for 4 weeks) while on the diet with varying doses of pirfenidone (0 mg/kg, 100 mg/kg, 300 mg/kg, 600 mg/kg). Second, a 14-week sub-chronic study of 300 mg/kg dose of pirfenidone was conducted, male B6C3F1/J mice were treated with CCl4 (as above for 14 weeks) while on the diet with pirfenidone.

Results: Pirfenidone treatment decreased liver fibrosis in both studies. In a dose-finding study, pirfenidone had a significant anti-fibrotic and anti-inflammatory effect by significantly blunting collagen deposition in liver, serum transaminase levels, and preventing ballooning degeneration of hepatocytes at 300 and 600 mg/kg dose groups. In a sub-chronic study, pirfenidone treatment also resulted in a significant reduction in collagen deposition in liver; however, it had little effect on the markers of inflammation and liver injury.

Conclusions: Pirfenidone showed anti-fibrogenesis effects in sub-acute and sub-chronic cytotoxic liver fibrosis model in mice; however, anti-inflammatory effects were observed only in sub-acute study.

“Comparative Analysis of Toxicokinetics and Toxicodynamics of Trichloroethylene in Cytochrome P450 2E1 Knockout and Humanized Transgenic Mice”

Department of Toxicology, College of Veterinary and Biomedical Sciences
By: Yu-Syuan Luo

Trichloroethylene (TCE), a widely used industrial chemical, is a ubiquitous environmental contaminant and a known carcinogen. Toxicity of TCE is associated with generation of oxidative and glutathione conjugation metabolites. Upon absorption, TCE can be metabolically activated by cytochrome P450s (CYPs), and then subsequently converted to trichloroacetic acid (TCA) and trichloroethanol (TCOH). This oxidative pathway is qualitatively similar across species; however, important quantitative differences exist. It is thought that CYP2E1 is a major contributor to TCE oxidation; however, inter-species differences in the contribution of CYP2E1 to TCE metabolism and toxicity are not well understood. Therefore, the role of CYP2E1 in metabolism and toxicodynamic effects of TCE was investigated using male and female wild-type [Sv129], Cyp2e1 knockout [Cyp2e1(-/-)], and humanized Cyp2e1 [hCYP2E1] mice. It was hypothesized that CYP2E1 status would determine the extent of oxidative metabolism of TCE which in turn will have pronounced impact on the toxicity of TCE. Liver, kidney, and serum were collected 5 hours after treatment with TCE (600 mg/kg, p.o.) or vehicle (5 % alkamuls EL-620 in saline). The amounts of TCA formed in liver, kidney, and serum of TCE-treated animal in both sexes was hCYP2E1 > wild type > Cyp2e1(-/-), concordant with hepatic CYP2E1 protein levels. Levels of TCOH exhibited weak trends as Cyp2e1(-/-) > hCYP2E1 Ëœ wild type in liver and kidney of male, but not female mice. The mRNA expression of peroxisome proliferator-activated receptor alpha-regulated genes, palmitoyl acyl-Coenzyme A oxidase 1 (Acox 1) and cytochrome P450, family 4, subfamily a, polypeptide 10 (Cyp4a10), was determined by real-time PCR. Compared to sex- and strain-matched vehicle-treated controls, male hCYP2E1 mice displayed a significant upregulation of hepatic Acox 1 and Cyp4a10. In conclusion, our results demonstrate that CYP2E1 is an important, but not exclusive player in the oxidative metabolism of TCE in vivo. Inter-species and inter-individual differences in expression and activity of CYP2E1 may contribute to quantitative differences in TCE metabolism; however, other metabolizing enzymes may also contribute to the adverse health effects associated with exposure to TCE.

"Investigation of Neurological Effects of Theiler's Murine Encephalomyetlitis Virus in Varying Strains of Collaborative Cross Mice"

Department of Biomedical Sciences, College of Veterinary and Biomedical Sciences
By: Caitlin Edwards & Raena Eldridge

Theiler's murine encephalomyelitis virus (TMEV) is a picornavirus that produces various effects in mice of different genetic strains, similar to neurological conditions seen in humans such as multiple sclerosis (MS). The purpose of this study was to evaluate whether mice of the Collaborative Cross (CC) resource could be used to demonstrate the differences in behavioral phenotypes and immune response seen in genetically diverse human populations, with an ultimate goal of furthering our knowledge about how viral infections can lead to different neurological effects based on one's genetic makeup. This study involved 37 mice (19 females, 18 males) from 4 CC strains (CC013, CC019, CC041, and CC061). These mice were injected with either TMEV or phosphate buffer saline (PBS) as a control. Approximately half of the mice were evaluated for 7 days post infection (dpi) to determine the acute phase effects of the virus. The remaining mice were evaluated for 28 dpi (start of chronic phase). We measured weights and quantitative neurological phenotypes (e.g. gait parameters, rotarod) of the mice to evaluate TMEV responses. The phenotypic differences between the strains demonstrated diverse effects of TMEV on different genetic backgrounds. We quantified levels of TMEV RNA in the brain via qRT-PCR at 7 and 28 dpi to compare immune response/viral clearance. In general, the strains with higher TMEV levels over time demonstrated progressive symptoms such as paralysis and prolonged encephalitis, while strains with reduced levels of TMEV began to resemble the control mice in relation to weight gain and phenotypic symptoms.

"Diet Dependent Regulation of SIM2s in DCIS Progression"

Department of Toxicology, College of Veterinary and Biomedical Sciences
By: Garhett Wyatt

Currently, 15-30% of cancer deaths in the US, including breast cancer, are a result of a high fat diet (HFD) and obesity. Due to lack of biomarkers and insufficient understanding of the underlying molecular mechanisms leading to invasive progression, there is currently no way to predict which ductal carcinoma in situ (DCIS) will progress to invasive ductal carcinoma (IDC). Our preliminary data shows that a HFD down-regulates and methylates the bHLH/PAS transcription factor, Singelminded-2 (SIM2s), promoter. Thus we hypothesize that Omega-3 fatty acids (FA) will block DCIS progression by preventing down regulation of SIM2s. We have shown both in vitro and in vivo that Simb 2s expression is repressed in mammary epithelial cells by HFD. For 12 weeks Sim2+/- mice were fed a HFD or a control diet. The resulting mammary glands from the HFD showed reduced SIM2 expression as compared to control. We also found that treatment of MCF10A cells with palmitate decreased levels of SIM2s. SIM2s is also repressed with increasing nuclear factor kappa beta (NF-KB) signaling. Co-transfection of a SIM2 promoter-luciferase construct into MCF10A cells with increasing amounts of p65 subunit of NF-kB showed that SIM2 promoter activity was suppressed in a dose-dependent manner. With transduction of inhibitor of kappaB alpha super repressor (IkB-SR) we found again that inhibition of NF-kB increased SIM2s transcript levels. In contrast, transduction of inhibitor of kappa kinase beta (IKKB) showed reduced levels of SIM2s levels due to activation of NF-kB. Together, these results suggest that

NF-kB affects levels of SIM2, which will subsequently affect invasive progression of DCIS to IDC. Therefore, elucidating the mechanisms of SIM2 stabilization to avoid invasive progression will be critical in developing novel therapeutics for breast cancer treatment.

Education, Admin., & Human Resource Dev.; Educational Psychology; Health & Kinesiology; Teaching, Learning & Culture

“AquaHaptic: Aquatic Based Navigation System”

Department of Computer Engineering, College of Engineering
By: Larry Powell

The current method for swimmers to navigate around is to use visual land markers. The process they use which is land point markers to track their progress and direction to their destination. This is a complex and difficult process and is considered a factor of the swimmers ability to perform water based tasks. We propose to fix this is by using AquaHaptic which is a mobile vibrotactile navigation system. We believe that the system will provide optimal navigation and decreasing the swimmers cognitive load to avoiding obstacles.

“DXA Body Composition is Weakly Related to Blood Lipids, Blood Pressure, and Glucose in Firefighters”

Department of Kinesiology, College of Education and Human Development
By: Kalen Johnson

Current published data are inconclusive regarding whether DXA body composition measures of fat, lean, and regional fat mass are predictive of other CVD risk factors. PURPOSE: To determine if DXA measures can be used in a cardiovascular risk-predictive manner to indicate unhealthy levels of circulating lipoproteins in firefighters. METHODS: 256 male firefighters (age=35Â±10; ht=179Â±6.6 cm; wt=94Â±16 kg; BMI=29.9Â±4.6; fat mass=27.5Â±10.4 kg; lean mass=63Â±7.5 kg; gynoid%fat=28.7Â±6.5%; android%fat=36Â±11.3%; glucose=85Â±12.9 mg/dL; SBP=128Â±9 mmHg) underwent an annual cardiovascular risk profile screening and DXA scan; resting BP was also measured. We drew fasting blood samples, analyzed by a clinically certified lab, to determine glucose, HDL, LDL, total cholesterol, and triglycerides. Statistics included simple statistics and Pearson’s correlations. RESULTS: Table (*=p<.01)

CONCLUSIONS: Though the correlations were statistically significant, none of the DXA body composition measures explained a physiologically relevant portion of the variance in the CVD risk markers measured. We suggest that factors other than body fat contribute to lipid and blood pressure profiles in firefighters, a population at high risk for CVD.

“Was that a cookie?! On the neuroscience of attentional bias in obese adolescents”

Department of Educational Psychology, College of Education and Human Development
By: Siqi Chen, Yajun Jia, & Diana Guerra

Attentional biases have a large influence on directing people to important environmental stimuli and shaping subsequent emotional, motivational, and cognitive processing. While effects of attentional bias toward food stimuli have been found in obese adults, far less is known about such cognitive processes in obese adolescents. Research into the neural correlates of these processes can be critical to understanding the mechanisms of adolescent obesity, which can provide important implications for prevention and treatment options. We aim to investigate cognitive processes of obesity using event-related potentials (ERPs), and study whether obese adolescents process emotional and food-related information differently from normal-weight adolescents. Since data collection just began, we will present our study design, hypotheses, and some preliminary results demonstrating the effectiveness of the task. We employed the attentional blink paradigm including negative, neutral and food conditions to investigate the impact of visual food cues on attentional capture. The attentional blink is typically considered as an attentional capacity-limited phenomenon. Participants are often unable to accurately report a second target (T2) presented less than 500ms after the first target (T1) when images are presented in rapid succession. We examined multiple ERPs components including P2 activation linked to attention orientation, N2 activation that is linked to attentional conflict, and late positive ERP components such as P3, which is linked to motivational tendencies. In this dual response experiment, we will explain our hypothesizes for 1) lower N2, P2, and P3 activation of T2 for negative and food T1 compared to a neutral T1, 2) lower N2, P2 and P3 activation of T2 for obese adolescents compared to normal-weight adolescents for negative and food T1 trails.

"Roaring Twenties: What Did It Take to be a Math Teacher?"

Department of Curriculum & Instruction, College of Education and Human Development
By: Danielle Bevan & Katherine Vela

During the dramatic social and political changes of the twenties, candidates who were interested in teaching were required to pass qualifying tests to become certified. These candidates had to pass a minimum of eight exams, the core subjects, such as mathematics, language arts, science and history to receive the lowest level certificate.

State created certification exam questions for arithmetic found at the George Memorial Library, a Texas Regional Historical Resource Depository, in Richmond, TX were examined to determine what candidates had to know in order to teach elementary mathematics. These questions were categorized into current mathematical branches to look for similarities and differences.

Other records at the library included teachers written responses to the arithmetic state created certification exam questions. Teacher responses were matched to the state created certification exam questions to classify the responses according to the conceptual knowledge required to answer the questions correctly and to draw conclusions about the content knowledge of the teachers.

The results from this study will provide a glimpse into the Roaring Twenties and what candidates had to know in order to be an elementary mathematics teacher. This information will help determine how curriculum is driven by the culture and needs of the time period.

“Using the Irish Potato Famine of 1845 in Science Education”
Department of Curriculum & Instruction, College of Education and Human Development
By: Libby Defries

This study discusses the Irish Potato Famine of the 1840â€™s as a way to develop science literacy among middle school students. Famine is a natural disaster often neglected in teaching curriculums and not associated with life in the United States. This paper focuses on the essential questions: What caused the Irish potato famine and what were the consequences? How did science practices progress after the famine? How do scientists work to prevent such a disaster from happening again? Can famine occur where we live in the United States? Who were notable contributing scientists in the study of the Irish potato blight? How does learning about the Irish potato famine exemplify the nature of science? Research was conducted through Texas A&M University databases, scholarly websites, documentaries, books, and during a weeklong university study abroad program in both Northern Ireland and The Republic of Ireland. This study will show how teachers can use the Irish potato famine to teach various science concepts to middle grade science students.

“The Ecolinguistics of the Gaelic language during Irish Potato Famine”
Department of Curriculum & Instruction, College of Education and Human Development
By: Wei Xie

The purpose of this research is to examine the ecolinguistics of the Gaelic language during Irish potato famine, and to call attention to not only social context for the attempted conversion from Gaelic to English, but also the effects and impacts of ecology context at that time. Ecolinguistics is an interdisciplinary field of study which combined the concepts of ecology and linguistics in the language ground. The researcher analyzed this conversion on five different factors: history, politics, economy, education and ecology. The researcher found that the process of converging from Gaelic to English and then to an English-dominated society during the potato famine was varied among social classes. The researcher would like to discover the ecological impacts of this phenomenon on Ireland.

“Teen Dating Violence Prevention Programs: A Narrative Review of the Current Evidence”
Department of Health Education, College of Education and Human Development
By: Amie Carreon, Caitlin Holden, Skye McDonald, & Megan Buck

Background: Teen dating violence (TDV) has physical, social, and emotional consequences on youth as they mature through adolescences. To prevent teen dating violence, schools are uniquely positioned to provide programs and services which target the attitudes, knowledge, and skills needed for teens to safely communicate and navigate dating relationships. In selecting and adopting TDV prevention programs, schools may reference existing national evidence-based and/or practiced-informed lists which include programs shown to have positive effects on preventing teen dating violence. Currently, the TDV evidence-based and/or practice informed list includes 11 TDV program models. The purpose of this study was to examine and synthesize the empirical evidence about the effectiveness of school-based TDV prevention program models.

Methods: A search algorithm was employed using MEDLINE and PsycINFO databases to collect articles published between 2000 and 2017 in the health education, behavior, and promotion published literature. All articles met the inclusion criteria and discussed evaluation results from one of the program models on the TDV evidence-based and/or practice-informed list. Qualtrics, an online survey software, was utilized to abstract data and an inter-rater review was conducted on each article in the final sample.

Results: The search yielded 92 articles for full-text review by the research team. Of the 11 TDV programs models reviewed, strong evidence for positive effects was found among 6 of the program models. Extensive evaluation of programs such as Safe Dates and When Push Comes to Shove demonstrated standards-based TDV programs can help delay or decrease risks associated with experiencing a violent interaction with a dating partner among middle and/or high school adolescents.

Conclusions: Findings from this study synthesize the current evidence on the effectiveness of TDV program models. School health professionals and researchers can use this information when selecting, adopting, or integrating TDV prevention into existing health education curriculum.

“Flow2Code - A Mobile Tool for Programming Beginners”

Department of Computer Science, College of Engineering
By: Jorge Ivan Herrera-Camara

Programming is being taught in many engineering programs around the world since its considered a problem solving skill that most engineers must have. Unfortunately, introductory programming courses have a high failure rate and many students struggle to understand code. Different teaching approaches have emerged to cope with this difficulties. Flowchart based programming have been widely used around the world to be able to aid students visualizing an algorithm before actually jump into coding. Flowcharts play an important role when learning programming by conveying algorithms graphically and making them easy to read and understand. When learning how to code with flowcharts and the transition between the two, people often use either computer based software to design and execute the algorithm conveyed by the flowchart or just plain diagram tools for it. This require the users to learn how to use the computer based software or tools which often leads to a steep learning curve. And most of the available tools do not provide any feedback to see if the code is actually correct or provide a desired output.

We claim that combining off-line sketch recognition and computer vision algorithms on a mobile device the learning curve can being diminish. By drawing the flowchart on a piece of paper and using a mobile device with a camera to be able to capture it and be able to execute the code to verify its correctness. Flow2Code is a code flowchart recognizer that allows the users to code simple scripts on a piece of paper by drawing flowcharts. This approach attempts to be more intuitive than existing approaches since the user does not need to learn how to use a system to design the flowchart. Only a pencil, a notebook with white pages and a mobile device is needed to achieve the same result.

“Fracking Our Racist Perceptions: An Autoethnographic Archaeological Dig”

Department of Curriculum & Instruction, College of Education and Human Development
By: Bailey Morris, Vicki G. Mokuria, & Juan Carlos Laxa

This research is a self study of the continuing social influences in the lives of the researchers by means of self reflection and collaborative discussion. Using auto-ethnographic methodology, the influence of racism and "otherness" throughout a person's relationships can be acknowledged and observed through stages of social development. By beginning analysis on the early childhood memories, bias in adulthood can be followed from origin and stages of evolution. Discussion of discovered biases and specific memories, or lack thereof, allows for the issue of "resistance" to be challenged and overcome in addition to increased awareness of racial influences. The goal of this self archaeological dig is to begin dialogue between opposing ideas and mindsets to allow more understanding between them in addition to changing attitudes toward conflicting theories beginning with the individual.

“Reaching a Consensus on Conceptualization of Authentic Leadership
and Examining the Diversifying Research Contexts”

Department of Education Human Resource Development,
College of Education and Human Development
By: Jihye Oh

Purpose: The purpose of this research is to clarify the current state of authentic leadership research and to present whether authentic leadership has reached a consensus on definitions, components, and measurements in academic writings to date.

Design/method/approach: We examined 75 authentic leadership studies in 5 databases from 2011 to 2016 by using an integrative literature review with the aim to provide a reference tool and a systematic understanding on authentic leadership.

Findings: The findings revealed that there is a consensus on definition, components, and measurement of authentic leadership. Furthermore, authentic leadership is developing into a research category utilized in multidisciplinary fields of research across both cultural and organizational contexts.

Research implications: This research suggest that there is a critical need to further investigate authentic leadership in a mixed-method and developmental inquiry such as authentic leadership followership.

Practical implication: Authentic leadership can be used in multiple ways such as training program, role modelling, and OD interventions to build faithful relationships between leaders and followers and thereby achieving organizational goals.

Originality/value: This research will serve as a reference tool to understand authentic leadership systematically and to expand the knowledge of authentic leadership by exploring various research contexts of authentic leadership.

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By: Danielle Bevan & Katherine Vela

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State created certification exam questions for arithmetic found at the George Memorial Library, a Texas Regional Historical Resource Depository, in Richmond, TX were examined to determine what candidates had to know in order to teach elementary mathematics. These questions were categorized into current mathematical branches to look for similarities and differences.

Other records at the library included teachers written responses to the arithmetic state created certification exam questions. Teacher responses were matched to the state created certification exam questions to classify the responses according to the conceptual knowledge required to answer the questions correctly and to draw conclusions about the content knowledge of the teachers.

The results from this study will provide a glimpse into the Roaring Twenties and what candidates had to know in order to be an elementary mathematics teacher. This information will help determine how curriculum is driven by the culture and needs of the time period.

Aerospace Eng; Biomedical Eng; Chemical Eng; Civil Eng; Computer Sc & Eng; Electrical & Computer Eng; Engineering Tech. & Industrial Distribution; Industrial & Systems Eng; Materials Sc & Eng; Mechanical Eng; Nuclear Eng; Ocean Eng; Petroleum Eng

“Numerical Investigation of Thermo-Hydrodynamics of Droplet Impingement for Surface Cooling Applications”

Department of Mechanical Engineering, College of Engineering
By: Jayaveera Muthusamy

Droplet impingement has a wide range of applications such as inkjet printing, fuel sprays in IC engines, electronic cooling, cancer cell treatment and other scientific applications. The objective of this study is to investigate the hydrodynamics due to high frequency micro-droplet train impingement on a pre-wetted solid surface. Though, many researchers studied the hydrodynamics, there are still some uncertainties and needs for better understanding. Experiments are inevitable in engineering research and applications, however they have limited extractable data at a time. Therefore, a benchmarked numerical method could be complementary to experiments with an extensive data at lower cost and time. However, limitations of physical models, numerical errors, inaccuracy of numerical schemes make the computational study cumbersome. In this study, the effects of crown propagation dynamics were investigated numerically and experimentally. The findings from both studies are used to improve the analytical crown propagation model developed by Yarin and Weiss. A reasonable agreement was reached between numerical and experimental data in terms of transient crown propagation dynamics. Upon validating the hydrodynamics, heat transfer will further be studied in order to understand the coupled convection process.

Numerically, the ANSYS Fluent CFD tool was used to simulate the droplet train impingement and heat transfer process. Coupled Levelset -Volume-of-Fluid (CLS-VOF) multiphase model was used to perform the numerical simulations with mesh sensitivity study, Explicit/Implicit model study, time step sensitivity study and many other numerical studies to fix all appropriate boundary conditions. In addition to that, initial film thickness and impingement velocity sensitivity study have also been carried out. Experimentally, a single stream of mono-dispersed HFE-7100 droplets was generated using a piezo-electric droplet generator at different frequencies with range of droplet Weber number (We). Frequencies combined with We define the spreading-splashing pattern during the impingement process. The Spreading cases were studied both in 2D-axisymmetric and 3D simulations whereas splashing conditions were studied using 3D simulations. This numerical study combined with experiments will benefit in understanding the relationship between the droplet parameters, crown propagation dynamics and surface heat transfer for different cooling applications involving impinging droplets.

“Enhancing photocatalytic CO2 reduction by coating an ultrathin Al2O3 layer on oxygen deficient TiO2 nanorods through atomic layer deposition”

Department of Mechanical Engineering, College of Engineering
By: Huilei Zhao

Anatase nanorods (ANR) of TiO2 with active facet {100} as the dominating facet were synthesized and oxygen deficient TiO2-X nanorods (ReANR) was prepared by reducing TiO2 using NaBH4. On the surface of ReANR, a thin layer of Al2O3 was coated by atomic layer deposition (ALD), and the thickness of Al2O3 was tailored by varying the cycle number (1, 2, 5, 10, 50, 100, or 200) of ALD operation. The growth rate of Al2O3 was 0.25 Ã… per cycle as evidenced by high-resolution transmission electron microscopy, and the amorphous structure of Al_2O_3 was determined based on X-ray diffraction results. ANR, ReANR and Al_2O_3 coated ReANR were tested for CO_2 photoreduction with water, with CO and CH_4 as the major and minor products, respectively. Compared with ANR, ReANR had more than 50% higher CO production and more than ten times higher CH_4 production due to the oxygen vacancies that possibly promoted CO_2 adsorption and activation. With less than 5 cycles of ALD, Al_2O_3 coated ReANR had enhanced overall production of CO and CH_4 than uncoated ReANR, with 2 cycles being the optimum, about 40% higher overall production than ReANR. Whereas, when more than 5 cycles were applied, both CO and CH_4 production decreased with increasing number of ALD cycles. Photoluminescence (PL) analysis showed the both 2 cycles and 200 cycles of Al_2O_3 ALD coating layer on the ReANR were able to reduce the charge carrier recombination rate, likely because of the passivation of surface states. However, a relatively thick layer of Al_2O_3 may act as an insulation layer to prohibit electron migration to the catalyst surface. This work gives valuable insights on the application of ALD coating on photocatalysts to promote CO_2 photoreduction to fuels.

"In situ detection of lubricant additives using tomography techniques"

Department of Materials Science and Engineering, College of Engineering
By: Yunyun Chen

Additives in a lubricant play important roles but direct observation of their performance has not been possible. In this research, we directly observe the fate of micro- and nano-particles as lubricate additives. Using the K-edge tomography technique, it is possible to detect particular additives in a grease and observe their distribution through 3D visualization. A commercial grease was added with inorganic particles of Fe_3O_4 . It was found that under a shear stress, those particles adhere to the calcium complex thickeners. Due to sliding, the grease formed a film with increased density.

"Investigation of Combustion Dynamics and Stability with Nonlinear Intermittency"

Department of Aerospace Engineering, College of Engineering
By: Nicholas Diskerud

Modeling combustion dynamics requires a nonlinear approach to resolving the background physics. In this study, lean-premixed combustion to analyzed as it undergoes type-II intermittency in an oscillating system.

"ProvThreads: Integration of Data and User interaction in Analytic Provenance Visualization"

Department of Computer Science, College of Engineering
By: Sina Mohseni

Provenance visualization provides an overview of analysts' actions and insights during the exploratory data analysis. Our work aims to visually summarize interaction behaviors and show how different interactions are used to explore different data topics. This research presents

ProvThreads, a novel visual design that incorporates topic modeling outcomes to illustrate relationships between user interactions and information. ProvThreads projects a series of analysis paths to demonstrate both topic coverage and the progression of an investigation over time. We describe the approach and design for ProvThreads, and we discuss preliminary evaluation using provenance test data collected from user studies. This early released research demonstrates how an analytic process history could be reformed in continuous segments presented by threads of investigations.

"Sensing and correcting lateral misalignment in inductive wireless power transfer devices"

Department of Mechanical Engineering, College of Engineering
By: Ivan Cortes

In an increasingly technological world, more devices are in need of reliable ways to be powered without compromising mobility. Wireless power transfer (WPT) is of special interest because it eliminates the need for physical contact between a power source and a receiving device. One of the most common methods for WPT is inductive power transfer (IPT), where a voltage is induced in a receiving device using magnetic fields. The goal of this research is to help extend the applicability of IPT technology by using an automatic positioning system to provide lateral alignment between a wireless charger and a receiving device. Maintaining alignment allows for the maximum power transfer to occur. To sense misalignments, small sensing coils are placed symmetrically on the receiving device. Magnetic field symmetry causes misalignments to result in a measurable voltage difference between the sensing coils. Experiments using this setup give a sensing resolution of less than 1 mm when applied to a smartphone wireless charger. The voltage readings from the sensing coils are used for feedback control of a two-dimensional positioner. The complete system successfully reduces wireless charging misalignments in real time. Similar results are expected if using other IPT systems with scaled geometry. Future work includes adding more sensing degrees of freedom and testing the method using other wireless chargers, such as those used in electric vehicle charging.

"Liquid Surfactants for Processing Boron Nitride Nanosheets (BNNSs)"

Department of Chemical Engineering, College of Engineering
By: Touseef Habib

Boron nitride nanosheets (BNNSs) are a tremendous nanomaterial with excellent material properties, but obtaining them through liquid-phase exfoliation remains challenging due to low yields in common solvents. Recent studies suggest co-solvent mixtures or mixtures of alcohol and water at certain weight ratios can yield BNNSs dispersions with a higher concentration. The role of alcohols, specifically the role of t-butanol for BNNSs stability in dispersions will be explained. Through carefully crafted experiments and with molecular dynamics simulations, it was established that t-butanol behaves like a liquid dispersant; interacting with both water molecules and nanosheets to prevent aggregation. The BNNSs obtained from these dispersions are not only of high quality (as shown by TEM images), but the dispersions can also be freeze dried to obtain non-aggregated BNNSs powder. The freeze dried BNNSs powder are re-dispersible without the need of any additional exfoliation steps; the freeze dried BNNSs powder can be utilized in different industrial processes (from coatings to polymer fillers) without the worry of aggregation.

“Solid-state Synthesis and Thermoelectric Properties of Magnesium Silicide”
Department of Chemical Engineering, College of Engineering
By: Azhar Ali

Magnesium silicide is an attractive material for thermoelectric applications due to its low toxicity, thermal and mechanical stability, low density, and high relative abundance. However, due to the high vapor pressure of magnesium and its propensity for oxidation, it is often difficult to synthesize large quantities of high quality magnesium silicide using typical melt synthesis techniques. Here, we present a facile, scalable, and reliable technique for the synthesis of pure magnesium silicide from the constituent elemental powders. Solid-state reaction between magnesium and micron-sized silicon particles in a three-zone tube furnace is used to produce the magnesium silicide powder, which is consolidated via hot uniaxial pressing into pellets. X-ray diffractometry (XRD) and Raman spectroscopy confirm the absence of impurities and contaminants in the synthesized magnesium silicide powder. With thermoelectric power factors comparable to those reported in the literature, the synthesized magnesium silicide pellets exhibit promising thermoelectric behavior.

“Robust Phase Detection in Distribution Systems”
Department of Electrical Engineering, College of Engineering
By: Mohammad Sadegh Modarresi

This paper proposes an on-line algorithm to detect the phase connection for end users in a power distribution system. In distribution systems, feeder switching often changes the phase connection information of end users in the real-time operation. Recently, Advanced Metering infrastructure (AMI) are being installed in distribution systems. They enable utilities to record end-point voltages in defined intervals. This paper first presents a method to find phases belonging to same phase using synchronized data and fixed topology of distribution grid. Then, this paper presents a method to clean the noisy data through Artificial Neural Network (ANN) trained by the historical data. The proposed methods is tested using modified 13-bus IEEE distribution test system on the low-voltage side.

“X-Nav: Guiding Humanity Through The Final Frontier”
Department of Aerospace Engineering, College of Engineering
By: Stoian Borissov, Grayson Bridges, Jeffrey Butcher, Steve Mena, William Vlasak, Victoria Wright, Anthony Gardner, & Farid Saemi

Navigation is no simple task for spacecraft. Most spacecraft require communications with the Earth so they can navigate through space. This takes a lot of effort from ground crew stations and also leaves the spacecraft without a navigation system in case anything interrupts communications with the ground. In order to make them more independent, teams of researchers around the world and here at Texas A&M are developing ""autopilots"" for spacecraft. The autopilot which our team is developing is called X-Nav, and you can think of it as a galactic scale GPS, where the GPS satellites are replaced by a special kind of star known as an x-ray pulsar. These are incredibly massive and bright stars that shoot out continuous beams of x-rays as they spin, acting like stellar lighthouses. We perceive this effect as a periodic flashing or pulsing, hence the name ""pulsar"". This repeated pulsing that we see is incredibly steady, even steadier than the ticking of an atomic clock! The frequency of the incoming signal barely changes at all even over thousands of years. Every pulsar has its own unique signal that we use as a fingerprint to identify that pulsar. Astronomers have been cataloging these fingerprints for decades now, and just like a forensic scientist, when a new fingerprint is observed, spacecraft operators check the database to see if it’s already on file. If a spacecraft sees a pulsing light, it can look to the pulsar database to see if that pulsar is there. If the pulsar is found, then it can be used for navigation, but how?

As a spacecraft moves through space, the signal from the pulsar will appear to change. Think of a fingerprint that is smudged or distorted, but is still identifiable. How the pulsar fingerprint appears gives astronomers and spacecraft operators extra information. For example, the pulsar signal might arrive earlier or later than expected, or its frequency might change due to Doppler effects. If these deviations can be measured by the observing spacecraft, then it can learn more about where it is and where it is going. Eventually, the hope is that a spacecraft will be able to observe several pulsars, and based off of the multiple incoming signals get a really good idea of its position and velocity. This works very similarly to a GPS system, but on a galactic scale. The pulsars that we are looking at are scattered all over the galaxy, and some of them are even located in other galaxies outside the Milky Way!

“Facilitating Context Switching Through Tangible Artifacts”

Department of Architecture, College of Architecture
By: Osazuwa J. Okundaye Jr.

Modern information workers typically juggle multiple tasks at the same time and manage these multiple task threads or working contexts through either physical or digital artifacts. These artifacts help the worker to keep track of the identity and state of the tasks. This practice of using artifacts in this manner isn’t as well supported for digital representations of work contexts. This paper details work on a prototype system, “Context Manager,” that creates explicit representations of work contexts and their related documents and links them to physical RFID-infused artifacts. An evaluative study of the system was conducted and its findings are analyzed in accordance with grounded theory.

“Characterization of Tab-Induced Counter-Rotating Vortex Pair for Mixing Applications”
Department of Mechanical Engineering, College of Engineering
By: Jeongmoon Park

An experimental investigation was carried out to explore the effects of four vortex generators (VG) on the onset of flow instabilities, the paths and characteristics of the induced coherent counter-rotating vortices at a Reynolds number Re Ëœ 2000. The flow field around the VG was characterized using a smoke visualization technique. The taper angle of the VG was varied based on the used tab geometries, including triangular, trapezoidal and rectangular tabs, which shared the same height, inclination angle and base width. Results reveal that each VG was able to generate a counter-rotating vortex pair (CVP), and that taper angle has direct effects on the path of the CVP, the onset location of Kelvin-Helmholtz instabilities, and the circulation strength of the vortex structures. Furthermore, a linear relation between VG taper angle and the onset of instability was observed experimentally. Before the onset of K-H instability, the path of the CVP in the wake of a VG can be predicted using a pseudo-viscous model, which was validated experimentally.

“E-readers for the Blind: Accessible Reading and Annotation of Digital Documents”
Department of Computer Science, College of Engineering
By: Niloofar Zarei

This ongoing research aims to provide smooth digital reading experience and advanced annotation support for individuals with blindness or severe visual impairment (IBSVI). We design an Spatial Touch Audio Annotator and Reader (STAAR) system, an iPad E-reader application designed for IBSVI. STAAR enables users to read at their own pace, with audio rendering as the words are touched in lines of a displayed PDF document. A tactile overlay on the iPad touch screen and various aural feedbacks help user to track text line locations. The user can add digital annotation within PDF documents text, in the form of voice recordings (audio notes), or access previously added notes by touch.

“Path Plan Performance Evaluation of the Challenge 1: A Small Unmanned Surface Vehicle For Radiation Detection and Mapping”
Department of Computer Science, College of Engineering
By: Grant Wilde

This work presents a novel experimental method for path plan performance tests for unmanned vehicles, and compares the performance of a traditional raster scan versus a spiral-like path plan for a near holonomic unmanned surface vehicle. Currently, unmanned ground vehicles (UGV), unmanned aerial vehicles (UAV), and unmanned surface vehicles (USV) use a simple raster scan to insure complete coverage of a predefined, obstacle free area. Raster scans require a 180 degree change in heading which can be difficult for marine vehicles to complete. A spiral-like path plan presents the possibility of removing the number of sharp turns at the expense of adding more slight turns. The paths were compared for twenty-five unique convex polygons (fifty runs) that were used to survey a 1.15 acre pond using the Challenge 1, a Lutra airboat. The total survey time, total survey distance, root mean square (RMS) of cross- track error, Hausdorff Distance (max RMS error), and percent coverage were calculated for twenty-five trials (fifty runs). No statistical significance was seen between time, distance, or root mean square of cross-track error. The spiral-like path plan resulted in 1.53 meter decrease in Hausdorff Distance over that of the raster scan ($p < 0.0005$), but the raster scan resulted in a 4.22% increase in percent coverage ($p < 0.027$), suggesting that the raster scan is the better choice in practice. However, the results are expected to apply only to airboat-types of USV and spiral paths may be more efficient for non-holonomic vehicles.

"Design of a Novel Compact and Low-weight Upper-limb Exoskeleton for Rehabilitation of Stroke Patients"

Department of Mechanical Engineering, College of Engineering
By: Amin Zeiaee & Rana Soltani Zarrin

The goal of this research is to develop a rehabilitation device to facilitate recovery of upper-limb stroke patients. To this end, design process and features of the CLEVER (Compact, Low-weight, Ergonomic, Virtual/Augmented Reality Enhanced Rehabilitation) ARM, a novel exoskeleton for rehabilitation of stroke patients, is presented. The current research effort is focused on designing a lightweight and ergonomic upper-limb rehabilitation exoskeleton capable of producing diverse and perceptually rich training scenarios. To this end, the knowledge available in the literature of rehabilitation robotics is used along with formal conceptual design techniques, and the achieved design concept is optimized through an iterative process. This poster briefly reviews the systematic approach used for the design of exoskeleton and elaborates on the specific details of the proposed design concept, and its advantages over other design possibilities. Kinematics of the proposed device is studied analytically and experimentally with the aid of a 3D printed prototype. It is shown that CLEVER ARM covers the majority of the workspace of healthy arm. The process of optimization of the design, motorization of device and the fabrication challenges are presented as well. Design of this rehabilitation robot will pave the way for home-based therapy for stroke patients.

"Development of a Landscape Irrigation Runoff Mitigation System"

Department of Computer Engineering, College of Engineering
By: Udaya Bhaskar Kothapalli

Urban/municipal water use continues to represent a significant portion of overall water demand across many regions of the U.S., and given the rapid pace of urban growth, the sector is likely see even greater increases throughout the coming decades. Outdoor water use can account for 50% or more of annual residential water use, with studies showing that homeowners often overwater landscapes by as much as 2 to 3 times the amount needed. Water conservation has been a major focus of extension outreach programs, municipalities, and water management districts, yet adoption of these programs has been challenging, especially in relation to proper lawn/landscape irrigation practices. Irrigation runoff from lawns into adjacent streets and storm sewers is a persistent problem that has been compounded by day-of-the week irrigation restrictions in many communities. A patent-pending "Landscape Irrigation Runoff Mitigation

System" (LIRMS) has been developed for mitigating irrigation runoff losses from residential, commercial, or recreational landscapes in situations where automatic irrigation systems are used; primarily where landscapes adjoin paved streets draining to storm water sewer systems. Low-cost, yet durable flow sensors have been designed for use in the system, capable of detecting very low flow volumes when runoff begins. If runoff is detected above a defined threshold, the flow sensor communicates back to the irrigation system controller, which is paused for a given period of time (pause time is depending on factors including soil texture/infiltration rate, soil moisture, slope, etc.) before resuming the irrigation cycle. Upon resuming the cycle, if runoff flow is again sensed, the system again is paused, with the cycle continuing until the run time has been satisfied or allowable irrigation window has expired. Results of 2015/2016 field tests on St. Augustinegrass lawn plots at the Texas A&M Urban Landscape Runoff Facility demonstrate that the system 1) reduces total runoff volumes by up to 50%, 2) reduces peak runoff flow rates by 10x (from 0.3 to 0.03 L s-1), and results in improved soil wetting efficiency per liter of water applied. The team is currently partnering with water purveyors in the region to determine how to best utilize LIRMS to impact municipal water conservation efforts.

"HUGME: Using Visual Communication Markers with Gesticulations for Improved Expressiveness"

Department of Computer Science, College of Engineering
By: Jung In Koh

Recent trends in computer-mediated communications (CMC) have led to expanded instant messaging (IM) with richer content, so-called visual communication markers (VCM) such as emoticons. However, there is a potential loss of subtle emotional conversation in IM, which is delivered by non-verbal communication. Since gesture is a powerful signal of emotional content, we propose an application that combines communication of textual messages and VCMs with gesticulations. We provide 15 user-defined gestures generated by users from a previous investigation of intuitivity. The proposed system consists of three main components: hand detection, finger identification, and gesture recognition. In the gesture recognition, the multidimensional feature vector for each gesture is used, where every value represents each of possible gesture classifications. For evaluation, the expected experimental result would be promising and demonstrate that gesture-driven VCMs are useful.

"Randomized Gaze Tracking Based Authentication"

Department of Computer Engineering, College of Engineering
By: Adil Hamid Malla

Privacy of the system has been of paramount importance for every stakeholder of the system, be it the user or the system provider. There have been a lot of improvements in both the sensor attacks as well as the replay attacks. Shoulder surfing is one such attack, which lets the privacy of the user in jeopardy. It is an act of spying when an authorized user is trying to login in the system.

Shoulder surfing can be done either the perpetrator trying to look for the pin/password or using a video analysis system to capture the same. Although many solutions have been proposed to address the issue, but the success has been limited as compared to the demand of the system in realistic world.

In this work we have used the gaze based authentication system as a potential solution against the privacy attacks on the system. We have also addressed the problem of dual video attack.

The system consists of circular shapes of different colors. The position of the shapes is randomized using an algorithm to avoid collisions. These shapes tend to move on the screen when a user wants to get authenticated. The movement of the shapes is again randomized so as to avoid the replay attacks. The password of the user is a combination of the colors we have used three (3) here. The user has to follow the shapes having the color which he selected for his password. The user is authenticated based on the path the user follow corresponding to the color he has selected for his password. The system is evaluated with twelve users to test accuracy of the template matching and randomness of the path generation. With template matching algorithm the system achieves 98.8% accuracy. Our user study also shows that Gaze-driven authentication is a foolproof system against shoulder-surfing attacks; the unique pattern of eye movements for each individual makes the system hard to break into. The additional layer of making the shapes and the path random increases the randomness of the system to be traced back using the video analysis attack on the system.

“Effects of Induced Vibration Modes on Droplet Sliding in Dropwise Condensation”

Department of Mechanical Engineering, College of Engineering
By: Jose Eduardo Mejia

Research studies over the years have confirmed that dropwise condensation is more effective than film condensation. However, droplet shedding in dropwise condensation still is one of the limiting steps in the overall condensation phenomena, even when using engineered surfaces. Moreover, engineered surfaces can lead to undesired contact angle hysteresis of droplets, which limits condensation rates. Therefore, external stimuli should be considered to promote adequate droplet shedding during condensation events. To that end, an acoustic system has been developed to induce droplet shedding via substrate-droplet resonance. In order to understand the relationship between the droplet-sliding angle and body forces such as a gravity and acoustic streaming, a mathematical model has been postulated and validated, capable of predicting the critical sliding angle of droplets. The theoretical model can be used to determine the rolling angle in term of contact angle hysteresis, droplet volume and other characteristics of the droplets.

“Reference Path Generation for Upper-Arm Exoskeletons Considering Scapulohumeral Rhythms”

Department of Mechanical Engineering, College of Engineering
By: Rana Soltani Zarrin & Amin Zeiaee

There is an emergent need for developing path generation methods for rehabilitation robotics that comply with anatomical movements of human body. A reference path generation method for upper-limb rehabilitation exoskeletons considering the movement of shoulder joint during arm motions is presented. The developed method is based on Central Nervous System’s (CNS) governing rules for coordination of arm motions. This is the first computational model to consider the motion of the inner shoulder in path generation. Taking the motion of shoulder center into account is necessary for motions that require large arm elevation such as Activities of Daily Living (ADL). Existing reference generation methods which utilize computational models are based on the assumption that the shoulder joint does not move, and the origin of the reference frame is defined at the center of this joint. These computational methods are developed for simple point-to-point reaching movements with limited range of motion (RoM) which justifies the assumption of fixed shoulder center. However, ADL tasks include larger scale inward and outward reaching motions, during which the center of shoulder joint moves significantly. The proposed motion planning method is developed for upper-arm exoskeletons with 3 Degrees of Freedom (DoF) in shoulder and 1 DoF in elbow. The outputs of the proposed model are compared with the natural motion of arm during ADL tasks, recorded via a motion capture system. Comparison of the results show that the proposed model is able to reproduce human ADL motions and can effectively be used for reference generation. To the best of our knowledge this is the first exoskeleton path generation method for ADL tasks that considers alignment of robotic joint with anatomical joints. Results of this research can be used to generate training motions in upper-limb rehabilitation devices, and can facilitate recovery of stroke patients.

“Understanding Fundamental Phenomena Affecting Water Conservation Technology Adoption of Residential Consumers using Agent-based Modeling”

Department of Civil Engineering, College of Engineering
By: Kambiz Rasoulkhani

More than one billion people will face water scarcity within the next ten years due to climate change and unsustainable water usage, and this number is only expected to grow exponentially in the future. At current water use rates, supply-side demand management is no longer an effective way to combat water scarcity. Instead, many municipalities and water agencies are looking to demand-side solutions to prevent major water loss. While changing conservation behavior is one demand-based strategy, there is a growing movement toward adoption of water conservation technology as a way to solve water resource depletion. Installing technology into one’s household comes with it an additional cost and motivation, creating a gap between the overall potential households that could adopt this technology, and how many actually adopt. This study identified and modeled a variety of demographic and household characteristics, social network influence and external factors such as water price and rebate policy affecting water conservation technology adoption of residential consumers. Using Agent-based Modeling and data obtained from the City of Miami Beach, the coupled effects of all of these factors were evaluated to

examine the effectiveness of different pathways towards adoption of more water conservation technologies. The results showed that income growth and water pricing structure, more so than any of the socio-demographic or housing characteristics, impacted household adoption of water conservation technologies. The results also revealed that the adoption of inexpensive water conservation technology is more effected by the socio-demographic and housing characteristics than for expensive technology. Rebate allocation did influence expensive technology adoption, with potential to increase the adoption rate by 50%. Additionally, social network connections were shown to have an impact on the rate of adoption independent of price strategy or rebate status. These findings will lead the way for municipalities and other water agencies to more strategically implement interventions to encourage household technology adoption based on the characteristics of their communities.

"Crossword Puzzle with Handwritten Letter Recognition"
Department of Computer Science, College of Engineering
By: Anamika Bedi

It presents a way to recognize handwritten English alphabets in Online Crossword Puzzle. There are several steps involved but they can be summarized into two major steps. The first step involves the preprocessing of the handwritten letters where the sketch of each letter is converted to its equivalent bitmap matrix. The second step involves feeding these bitmap matrices to the Neural Network for training. Handwritten letter samples from four different persons were used to train the Neural Network which helped in achieving a 88.5% accuracy in recognizing the letters.

"Simulating Anthropomorphic Upper Body Actions in Virtual Reality Using Head and Hand Motion Data"
Department of Visualization, College of Architecture
By: Dustin Han & Shyam Prathish Sargunam

The use of self avatars in virtual reality (VR) can bring users astronger sense of presence and produce a more compelling expe-rience by providing additional visual feedback during interactions.Avatars also become increasingly more relevant in VR as they pro-vide a user with an identity for social interactions in multi-user set-tings. However, with current consumer VR setups that include onlya head mounted display and hand controllers, implementation ofself avatars are generally limited in the ability to mimic actions per-formed in the real world. Our work explores the idea of simulating awide range of upper body motions using motion and positional datafrom only the head and hand motion data. We present a method todifferentiate head and hip motions using information from capturedmotion data and applying corresponding changes to a virtual avatar.We discuss our approach and initial result.

“A Sketch-based System for Chinese Handwriting Education”
Department of Computer Science, College of Engineering
By: Tianshu Chu

Learning Chinese as a second language is a difficult task for students in English-speaking countries due to thousands of characters to remember and learn to write. Existing systems that assist Chinese handwriting education are lack of either interaction in teaching or practice, or personalized feedback and instructions. In this work, we are attempting to build a freehand educational user interface that help students learn and practice Chinese handwriting by use of sketch recognition techniques.

The past decade has seen an increased popularity in Intelligent Tutoring Systems that support freehand sketching. This has greatly revolutionized the way students learn because 1) sketch-based tutoring is offering a more interactive and user-friendly way for teaching and learning and 2) Artificial Intelligence techniques can be applied to aid students' learning by making use of digital data. Numerous sketching interfaces have arisen in engineering domains that require graphical illustrations, such as mechanics, civil engineering, and electronics. However, few sketch-based systems have existed to educate Chinese handwriting. The system we are presenting first uses sketch recognition techniques to automatically recognize students' input data, then analyzes the input based on both technique and vision aspects, and finally gives scores and feedback to help them improve their writing skills. In this work, we are aiming at American college students that have little knowledge about the Chinese language, and expecting our application to improve the users' writing skills through good usability and valuable feedback

Architecture; Construction Science; Landscape Architecture & Urban Planning; Visualization

“A Walkability Assessment of Texas A&M University Town”
Department of Urban & Regional Planning, College of Architecture
By: Pranjal Manohar Dixit & Gulafshan Ghori

Walkable neighborhoods are now an important concept while promoting healthy lifestyle and city planning. Walkability is seen as a way to potentially reduce the ecological footprint, minimize car travel, reduce energy consumption and limit encroachment on open lands (Van der Ryn and Calthorpe 1986; Ewing et al. 2008). In university towns, the close proximity of numerous departments and buildings leads to more students preferring to walk on-campus. But this trend significantly subsides when movements outside campus is considered. The stark difference in pedestrian infrastructure on and off campus is overwhelming. To analyze this, a comprehensive assessment of the pedestrian infrastructure of Texas A&M University and the surrounding neighborhood was carried out by our team. The purpose of our study was to identify the key problems which the neighborhoods are dogged with and offer possible design approaches to tackle these problems. Auditing tools like Neighborhood Environment Walkability Study (NEWS) and CDC auditing tool were used to gain insight into the current scenario of walkability in College Station and a comparative study with similar University towns was made.

Given the recent demand for internationalization and globalization of our world, a cross border student mobility around the world has ensued; the inflow of international students in the United States has increased significantly. Findings revealed that international students deal with academic challenges, social isolation, and cultural adjustment. Another potential problem many international students, and students without cars, face is getting to grocery stores from the campus or to go anywhere on campus, especially when there are no buses running. It questions the urban planning of the city and essentially Walkability. The crux of the problem being that one cannot really get around without a car. Not many international students have a U.S. driver’s license, because they do not have a car or anyone to teach them how to drive. Our study would help plan means to integrate the on and off campus pedestrian infrastructure.

We believe that international students contribute to the diversity and internationalization of their classrooms, campuses, and communities and therefore the university needs to be prepared to meet international students not only academically but also socially and culturally. Considering, ""the international students"" as inclusive elements, we have assessed the campus and a quarter mile surrounding area for Walkability ease.

“Redirected Reach: Enabling Natural Hand Interaction At Multiple Virtual Locations With Passive Haptics”
Department of Visualization, College of Architecture
By: Mohamed Suhail Mohamed Yousuf Sait, Shyam Pratish Sargunam, & Dustin Han

In many virtual reality applications, it would be ideal if users could use their physical hands to directly interact with virtual objects while experiencing realistic haptic feedback. While this can be achieved via interaction with tracked physical props that correspond to virtual objects, practical limitations can make it difficult to achieve a physical environment that exactly represents the virtual world, and virtual environments are often much larger than the available tracked physical space.Our approach maps a single physical prop to multiple virtual objects distributed throughout a virtual environment.

Additionally, our work explores scenarios using one physical prop to control multiple types of object interactions. We explore considerations that allow physical object manipulation using orientation resetting to physically align the user with a physical prop for interaction. The resetting approach applies a discrete positional and rotational update to the user's location when the user virtually approaches a target for interaction, and the redirected reach approach applies a translational offset to the user's virtual hand based on the positional difference of the virtual and physical objects.

“Lorecraft: Art, Meaning, & Enchantment”

Department of Visualization, College of Architecture
By: Bailey Lynn Rogers

My research is rooted in art, visual narrative, and worldbuilding. The work outlines a “roadmap”of sorts to facilitate the creation of imaginary worlds and construct within them a greater overall sense of inventiveness, consistency, and completeness. This approach gives an overview of major concepts involved in worldbuilding, outlining considerations and connections for a creator to tie together, define, or emphasize as necessary for their created world. The system encourages top-down design, which starts with big-picture ideas and broad categories that can then be more precisely defined and detailed. Starting the immense undertaking of worldbuilding is particularly daunting, as it incorporates multiple disciplines and ideas that continue to defy precise definitions. My work is bolstered primarily by the studies of philologist and author J. R. R. Tolkien, psychologist Carl Jung, and educator and author Mark J. P. Wolf. I call this particular facet of worldbuilding design “lorecraft;" “lore” here meaning the backstory, systems, and structures that support and enrich an imaginary world, and “craft” meaning a labor that takes considerable skill and artistry to produce with satisfactory results.

“Coordinating Attention and Cooperation in Multi-User Virtual Reality Narratives”

Department of Visualization, College of Architecture
By: Mohamed Suhail, Cullen Brown, & Ghanshyam Bhudra

Limited research has been performed attempting to handle multi-user storytelling environments in virtual reality. As such, a number of questions about handling story progression and maintaining user presence in a multi-user virtual environment have yet to be answered. We created a multi-user virtual reality story experience in which we intend to study a set of guided camera techniques and a set of gaze distractor techniques to determine how best to attract disparate users to the same story. Additionally, we describe our preliminary work and plans to study the effectiveness of these techniques, their effect on user presence, and generally how multiple users feel their actions affect the outcome of a story.