

**Spin-Forbidden Photodissociation of Ozone**

Megan Aardema

Ozone is an important molecule in atmospheric processes, and it protects the surface of the earth from UV sunlight. UV light can photolyze ozone, producing products that are also involved in atmospheric reactions. When ozone is dissociated by light in the Hartley band (200-300 nm), 90% of the dissociations occur along a spin-allowed channel producing excited singlet products ( $O(^1D)$  and  $O_2(^1\Delta_g)$ ). The other 10% undergo a spin-forbidden dissociation resulting in ground state triplet products ( $O(^3P)$  and  $O_2(^3\Sigma_g^-)$ ). At wavelengths longer than the 310 nm threshold for the spin-allowed singlet channel, the quantum yield of  $O(^1D)$  is temperature dependent and remains near 0.1 for all temperatures at wavelengths longer than 325 nm. The temperature dependent yield can be attributed to singlet channel dissociation of excited ozone, but the yield at longer wavelengths is indicative of a spin-forbidden dissociation channel producing  $O(^1D)$  and  $O_2(^3\Sigma_g^-)$ . Velocity map imaging and resonance-enhanced multi-photon ionization are used to study the dynamics of these processes.

Oral # 2\_Space Science - Graduate

**Optimizing Particle Identification in a Nuclear Physics Experiment**

Mr Bassam Emad Aboona

Identifying particles in a nuclear physics experiment is, oftentimes, essential to the physics analyses that utilize the data collected by such experiments. The Solenoidal Tracker at RHIC (STAR) at Brookhaven National Laboratory uses multiple techniques for particle identification, one of which is the Time-of-Flight (TOF) detector. In this presentation, we discuss improvements that were done recently to extend and optimize the use of the TOF detector in STAR.

**Micro-Encapsulation of Bitumen as a Means of Solid-Phase Midstream Transport**

Ms FNU Anita

"The high viscosity of bitumen impedes its transportation through conventional means such as pipelines. Rheological challenges with transportation of bitumen are typically addressed through dilution with light hydrocarbons and thermal jacketing, which consume considerable energy and result in wasteful consumption of pipeline capacity with diluent fluids. Liquid phase transportation further poses the risk of spillage and ecological contamination. Enabling the transportation of bitumen as a solid-phase material through roadways or marine vessels would mitigate the transportation constraints of pipelines and effects of oil spills. The formation of bitumen prills that can be reversibly fluidized at the point of recovery (e.g., a refinery) presents a considerable challenge. In order to prepare solid-phase bitumen, we have sought to encapsulate lighter fractions of bitumen within a cross-linked asphaltene shell. Asphaltenes, conjugated p-systems with aliphatic tails and various pendant functional groups, are extracted from bitumen and reconfigured to coat the outer surfaces of bitumen droplets, thereby constituting core-shell capsules. An automated jetting system equipped with a dual flow nozzle has been reconfigured to prepare bitumen droplets. Modulating the frequency and voltage in conjunction with the collection bath enables uniform bead formation and prevents particle coalescence. Two different approaches have been used to coat the asphaltenes onto bitumen droplets. In the first approach, asphaltenes are dispersed in a solvent and pumped through the dual nozzle. The core-shell capsules are collected in a water bath designed to prevent bead agglomeration and allow for crosslinking of the asphaltene shell. In the second approach, powdered asphaltenes are used to coat bitumen. Both the approaches have been optimized to produce a large number of beads. The release of bitumen in response to application of a mechanical stress has been studied as a function of the thickness of the cross-linked asphaltene shell. The micro-encapsulation approach holds promise for safe and efficacious transportation of viscous liquids."

**Characterizing Thermochemical Non-Equilibrium Effects in High-Speed Flows**

Ms Ashley Britt

The complexities governing the interactions between vehicles travelling at hypersonic velocities and the surrounding gas medium are challenging to accurately model and predict. The aerodynamic forces acting upon these vehicles lead to drag and thermal loading affecting the performance and stability of the flight vehicle. Three-dimensional processes, such as turbulent mixing complicate the predictive computational modeling of flow behavior and thermochemical non-equilibrium (TNE). Systems with TNE phenomena are prevalent in hypersonic flight and planetary re-entry scenarios and current computational models predicting flowfields under these conditions require empirical validation. The current computational frameworks, particularly in post shock environments, rely on approximate treatment of both the complex chemical reactions and energy transfer processes. The latter treatment, characterization of both initial state of the TNE and its evolution in high-speed flows can be studied with optical diagnostic techniques to provide the empirical validation needed to improve the computational models. Ground tunnel testing aims to duplicate flight conditions while also providing unprecedented optical access to apply diagnostic techniques. Optical diagnostic techniques allow for the study of the flow field non-intrusively. While using a DC plasma discharge to generate well-controlled TNE into the flow field, three optical diagnostic techniques will be used to study the flow. Optical emission spectroscopy (OES) can be used characterize plasma discharges to determine properties such as the degree of dissociation and the electronic temperature. Coherent anti-Stokes Raman Spectroscopy(CARS) is a technique that can be used to study the nitrogen vibrational temperature profile within a hypersonic environment. Vibrationally excited nitric oxide monitoring (VENOM) is a novel approach to study velocimetry and thermometry simultaneously in hypersonic flows. The goal of this project includes expanding the current optical diagnostics techniques to provide empirical validation for the current computational models. The future goal is to implement the optical diagnostic techniques into a hypervelocity expansion tunnel to study post shock environments that better emulate re-entry, i.e. to include high-temperature chemical non-equilibrium.

**Laser Diagnostics for Boundary Layer Measurements in Hypersonic Flows**

Ms Madeline Smotzer

Vehicles re-entering the atmosphere travel at hypersonic speeds- at least five times the local speed of sound. Accurate models of boundary layer formation at these speeds provide information related to the drag forces and thermal loads a vehicle may experience. Turbulent boundary layers are more complex to model due to the fluctuating molecular dynamics i.e. the heat and mass flux. Empirical data of these fluctuating quantities are limited because they require simultaneous measurements of velocity, temperature, and density. The Boundary Layer Transition (BOLT) geometry is designed to have a boundary layer that evolves from laminar to transitional to turbulent as seen in the computational results. Experimental data is needed to validate these calculations. Fluorescence-based laser diagnostics are used to make boundary layer measurements at the molecular level with molecular probes. Nitric oxide was chosen as the molecular probe in air due to it being diatomic and similar in mass to N<sub>2</sub> and O<sub>2</sub>. The combination of molecular Tagging Velocimetry (MTV) and 2-line planar laser induced fluorescence (PLIF) is a novel technique developed by our lab called Vibrationally Excited Nitric Oxide Monitoring (VENOM). In a small-scale wind tunnel VENOM has proven to be able to simultaneously measure temperature and velocity as well as trace small-scale movement of the flow. These simultaneous velocity and temperature measurements can be used directly to find the heat flux of a turbulent boundary layer assuming a constant specific heat model. By extending molecular probe laser diagnostic techniques to geometries such as BOLT it will allow for a better understanding of turbulence and the origins of turbulence at the molecular level.

**Deep Learning Based Image Segmentation of Mesenchymal Stem Cells**

Ms Sakina Mohammed Mota

Cell-based therapy is an attractive strategy for the long-term management of various chronic diseases. Mesenchymal stem cells (MSCs) are a heterogeneous group of cells that have demonstrated clinically relevant therapeutic effects. The proliferative and therapeutic potential of MSCs can be characterized by the culture quality, which is reflected by MSC morphological phenotype. Morphological analysis has been a robust method for monitoring culture quality, but a visual inspection is subjective and time-consuming. Our goal is to develop an automated algorithm to segment MSCs for an objective, non-invasive, and rapid cell assessment.

We have built an algorithm to segment MSCs using two parallel U-Nets trained with 25 phase-contrast micrographs having 117 cells. The first U-Net segments cell-regions, and the second segments candidate nuclei. Using the nucleus as a marker helps localize individual cells and addresses the over and under-segmentation of cells. The output from the two models is used to count the number of markers within each cell-region. A region with more than one marker is identified as a cluster and is segmented further by a marker-controlled watershed to identify single-cell bodies. Results were validated using visual inspection from MSC experts. Our independent test dataset of 15 images consisted of 64 cells. We obtained a sensitivity of 0.938 and a precision of 0.845 for cell detection and a Dice-Sorensen score of  $0.894 \pm 0.026$  for segmentation. The proposed algorithm shows the potential to segment MSCs with high accuracy and robustness. Automated cell segmentation enables rapid quantification of cytomorphological features and may drive stem cell quality control processes.

**Assessing the effects of dark sweet cherry (DSC) juice consumption on inflammation and cognitive function in obese adults: A human clinical pilot trial**

Mrs Shirley Arbizu

**Background:** Published studies have proved the anti-inflammatory effects of dark sweet cherries (DSC) in obese research models.

**Objectives:** To assess the effects of DSC juice on biomarkers of obesity-related metabolic disorders, inflammation, and cognitive performance.

**Methods.** Eligible participants (>18 years old, body-mass index (BMI) = 30-40 kg/m<sup>2</sup>, no history of chronic disease and/or medication/antibiotics), were assigned to cherry or placebo groups following a single-blind randomized design after a 2-week run-in period. Participants were asked to drink 200 mL cherry juice supplemented with 3g DSC powder (n = 11) or a placebo drink (n = 10) twice a day for 30 days. Wellness checks, anthropometric measurements, cognitive function/psychological assessments, and fasting blood samples were collected on study days 1 and 30.

**Results:** Baseline data showed no differences in anthropometric measurements between experimental groups. Results from blood markers of liver and metabolic disorders showed no difference between endpoint and baseline values for both cherry and placebo groups. However, median (25%, 75% interquartile) values for erythrocyte sedimentation rate (ESR) and reactive oxygen species (ROS) at day 30 (ESR= 6 (4, 13), ROS = 29 (13, 53) showed improvement compared to day 1 (ESR= 7 (2,16), ROS = 33 (21, 65)) in cherry group, while in placebo group values showed less or no improvement (ESR = 12 (8,24), ROS = 30 (20, 72) at day 30), vs (ESR= 10 (7, 18), ROS = 37 (29, 75) at day 1). These results suggest an anti-inflammatory cherry juice action and may be correlated with a trend for improvement in all of the cognitive tasks and physiological assessments in the cherry group. The trail-making tests (A and B), which assess executive functioning, improved (p = 0.0273 and p = 0.0342, respectively) as well as the Digit Span Forward task (DSF) (p = 0.0137), which examines short-term memory storage and executive control processes. The Digit Symbol Substitution test (DSST) used to assess processing speed, sustained attention and working memory showed improvement for the cherry group, although non-significant (p = 0.0527).

**Conclusions:** These preliminary findings suggest that consumption of DSC juice rich in anthocyanins and other phytochemicals over 4 weeks may improve cognitive function in obese participants with a possible link to lowered inflammation.

**Funding:** This work was supported by the Northwest Cherry Growers.

**Unique Presentation of Pulmonary Nocardiosis as Mediastinal Lymphadenopathy**  
Mr Wajahat Dawood

A 59-year-old male with a history of refractory acute myeloblastic leukemia presented for evaluation of suspected pneumonia in the setting of non-neutropenic fever, chronic dyspnea, fatigue, leukocytosis, and thrombocytopenia. A computed tomography (CT) of the chest revealed necrotic adenopathy extending from the aortopulmonary window to the left hilum with invasion into the left main bronchus and subcarinal space. PET/CT revealed FDG-avid lymphadenopathy suggesting malignancy.

Further bronchoscopic investigation revealed a submucosal lesion in the left main stem bronchus. Endobronchial ultrasound (EBUS) revealed a necrotic lymph node in the subcarinal space with biopsies displaying filamentous organisms consistent with *Nocardia nova*. Patient was treated with trimethoprim-sulfamethoxazole (TMP-SMX) and amikacin with follow up imaging demonstrating complete resolution of the lymphadenopathy.

**Discussion:**

*Nocardia* is a rare, opportunistic pathogen commonly affecting immunocompromised patients, although up to one-third of infections occur in immunocompetent patients(1). The classical presentation of nocardiosis includes pulmonary nodules, cavitation, consolidation, pleural effusion, and hilar mass with mediastinal lymphadenopathy(2). Extrapulmonary findings involve cellulitis, lymphocutaneous syndrome, and metastatic brain abscesses(3).

Although over 50 *Nocardia* spp exist, most are susceptible to TMP-SMX. For complicated infections, combination therapy with other *Nocardia*-active agents is generally recommended such as amikacin, imipenem, ceftriaxone and cefotaxime, moxifloxacin, and linezolid(4). Medical literature reveals very few instances of nocardiosis presenting radiographically as an isolated mediastinal mass or lymphadenopathy. Three such cases were immunocompromised patients with myasthenia gravis, sarcoidosis, and HIV/AIDS(5,6,7) while a few others were immunocompetent(8,9,10). Our case was atypical in its presentation of a mediastinal lymphadenopathy in an immunocompromised patient with significant necrosis.

**Conclusion:**

This case emphasizes the significance of bronchoscopy and EBUS in conjunction with radiological imaging and tissue biopsies to evaluate an unusual presentation of pulmonary nocardiosis. Furthermore, it is crucial to retain bacterial infectious processes within the differential as it is the second most common cause of mediastinal lymphadenopathy(10).



**Risk of Stroke in Self-Expanding vs. Balloon-Expanded Transaortic Valves**

Mr Jonathan Lutgens, Mr Ravi Gaddipati

**Background**

Transcatheter aortic valve implantation (TAVI) is an established treatment for severe aortic stenosis. There is mixed data on the incidence of stroke with self-expanding (SE, Medtronic Evolut) vs. balloon-expanded (BE, Edwards Sapien) valves, and much of the data is limited to a 30 day followup. In this multicenter retrospective study, we compare the rates of post-TAVI stroke before the patients 1 year follow up visit.

**Methods**

Between 2014 and 2019, 2553 patients were identified who underwent BE (n=1853) or SE (n=700) TAVI across 4 hospitals in Texas. The median age of the cohort was 80.9 (range 32 - 101) and was 54.7% male. The median Society for Thoracic Surgeons (STS) short-term risk score was 5.5% (interquartile range = 3.66% - 8.29%). The primary endpoint was the rate of stroke events recorded during the 1 year followup period (median 366 days, interquartile range 345 - 389). Stroke events encompass ischemic, hemorrhagic, transient ischemic, and undetermined subtypes. The absolute risk reduction and chi-squared statistic was calculated for BE vs. SE valves.

**Results**

There were 39 (5.57%) stroke events in the SE group. Of these, ischemic stroke accounted for 30 (77%), hemorrhagic stroke for 1 (2.5%), transient ischemic attack for 5 (13%), and undetermined type for 3 (7.7%). There were 64 (3.45%) stroke events in the BE group. Of these, ischemic stroke accounted for 38 (59%), hemorrhagic for 7 (11%), transient ischemic attack for 12 (21%), and undetermined type for 7 (12.3%). The absolute risk reduction was 2.12% for BE valves (95% CI = 0.2% - 4%, p = 0.017).

**Conclusion**

Balloon-expanded valves were associated with a 2.12% decrease in risk for stroke events within 1 year of aortic valve implantation. The most common stroke type in both self-expanding and balloon-expanded valves was ischemic.

**MicroRNA363 as a Novel Neuroprotectant for Long Term Stroke Outcome**

Mr Aditya Panta

Depression and cognitive impairment are commonly seen after stroke and a third of patients will develop these symptoms a year after stroke. Despite a large number of studies on the beneficial effects of neuroprotectants, few studies have examined the effects of these compounds/interventions on long-term cognitive impairment. Our previous work showed that the microRNA mir363-3p reduced infarct volume and sensory-motor impairment in the acute stage of stroke in middle-aged females but not males. Thus, the present study determined the impact of mir363-3p treatment on stroke-induced depression and cognitive impairment in middle-aged females. Sprague-Dawley female rats (12 months of age) were subjected to middle cerebral artery occlusion (MCAo; or sham surgery) and injected (iv) with mir363-3p mimic (MCAo + mir363-3p) or scrambled oligos (MCAo + scrambled) 4 h later. Depressive behavior was assessed in 3 months by high barrier high reward T-maze test (motivation and anhedonia), Social Interaction (sociability) and Forced Swim Test (feeling of helplessness), while cognitive function was assessed in 6 months by the novel object recognition test (declarative memory) and the Barnes maze (spatial memory). The MCAo + scrambled group showed significant behavior deficit in the tests for depression and cognitive function. In contrast, mir363-3p treated animals were similar to either their baseline performance or to the sham group. Histological analysis showed significant retrograde degeneration of meso-striatal projection (reward pathway) and deterioration of specific white matter tracts due to stroke, which was attenuated in mir363-3p treated animals. The present data shows that a single dose of neuroprotectant delivered 4h after stroke can abrogate long-term effects of stroke.

**Mucinous Dilation of the Appendix on a Patient with Lower Abdominal Pain**

Mr Mojahed Mohammad K Shalabi, Mr Kenneth Ford IV

Appendiceal mucocele (AM) is used to describe a dilated appendiceal lumen filled with mucinous material. While the clinical picture of AM is highly variable, it most often occurs in middle aged individuals and is 4 times more common in women. AM can have an insidious onset, slowly developing over years, or it can have an acute onset that mimics appendicitis. Pseudomyxoma peritonei is the most feared sequelae of an unmanaged or undiagnosed AM. This rare condition occurs when the mucinous tumor, most commonly arising from the appendix, escapes a ruptured or perforated mucocele and seeds the peritoneal cavity, resulting in the accumulation of mass-like mucin throughout the abdomen. On imaging, a cystic mass with mucinous dilation of the lumen of the appendix is considered pathognomonic for the diagnosis of AM. On ultrasound “onion skinning” of lamellated mucin within a cystic mass of the appendix is considered highly characteristic. On CT, one would expect to see a well circumscribed, low attenuation cystic mass with a blind ended pouch that is continuous with the base of the appendix. Mural calcifications are characteristic but not required to make the diagnosis. Ultimately the goal of imaging is to make this diagnosis before the mucocele ruptures. Four histologically distinct entities are associated with an AM. They include mucinous cystadenoma, mucinous cystadenocarcinoma, mucosal hyperplasia, and a retention cyst. Benign cystadenomas and the malignant counterpart, a cystadenocarcinoma, can only be definitively differentiated on histologic evaluation. Irregular, uneven, or nodular luminal margins and intramural calcifications increase suspicion of mucinous cystadenocarcinoma. A retention cyst is a benign process most commonly associated with a fecalith obstructing the appendix leading to the gradual retention of mucous. Both benign and malignant processes can create an AM, so further evaluation and surgical intervention is imperative.

**Called and Challenged: Examining the Experiences of Women Clergy in Brazos County and Harris County, Texas**

Ms Sarah Rutherford

By the first decade of the twenty-first century, women clergy in many denominations had been able to be ordained for more than fifty years and made up half of qualified seminary graduates. Despite these significant shifts in the realms of policy and education, however, women are still underrepresented as clergy within their respective denominations. Women therefore appear to decline to pursue ordination or to leave pastoral ministry at a higher rate than men. Existing literature suggests three main reasons for women leaving ministry: challenges with hiring discrimination, the pay gap, and various forms of burnout. This study uses qualitative methods to explore the reasons which may lead clergywomen to leave ministry in Brazos County and Harris County, Texas, through open-ended interviews with clergywomen and women who formerly served as clergy. By focusing on clergy within a specific regional context, this study examines the influence of regional bodies and local cultural norms on the experiences of clergywomen. I find that all of the above factors influence clergywomen's choice to stay in or leave ministry and that many women's decisions to leave ministry are based on a combination of these reasons. Drawing on sociological theory that seeks to explain how members maintain evangelical churches as white spaces by enacting "race tests," I suggest that women clergy are subject to similar "gender tests." Though not identical in every way to race tests, gender tests do serve a similar function, which is to maintain predominant norms, in this case related to a gendered conception of the ideal clergy person. The resulting perpetuation of the idea of inherently male clergy exacerbates existing hiring discrimination and congregational bias against women clergy.

**Remote Mental Health Evaluation and Lookout Program for College Students**

Mr Brandon Watanabe, Joseph Cahill

In the midst of a mental health crisis, there exists an immense need for mental health resources and interventions for college students. The ongoing pandemic has further escalated this problem by overwhelming counseling services and making mental health interventions increasingly difficult to access. To address this issue, the Applied Cognitive Ergonomics Lab has furthered development of a mental health application called mHelp that utilizes wearable technology to allow students to self-manage their mental health through features ranging from virtual counseling to biofeedback. In order to increase the effectiveness of this application, smartphone and smartwatch prototypes were developed to conduct a study documenting the perceived intuitiveness and usability of the mHelp remote application. To achieve this objective, 23 virtual usability sessions were conducted with participants who identified as having struggled with their mental health in order to effectively gauge user perceptions of the application and identify any major usability obstacles of the mHelp app. These sessions were transcribed and systematically analyzed using keyword analysis, the System Usability Scale (SUS), and general numerical ratings of features in order to determine the frequency and severity of usability obstacles. From this data analysis, 25 major usability concerns were identified, along with over 100 moderate or minor usability concerns. These concerns were then incorporated into a full redesign of the smartphone and smartwatch application that are now in the process of undergoing a third round of usability testing before the application undergoes a final redesign and is released to the Texas A&M student body.

Oral # 15\_ General Psychology- Undergraduate

**The Intersectionality Identified Within Cognitive Dissonance with a Concentration on the Interactions Between Religiosity and the LGBTQ+ Community**

Mr Luke Tillman

Since their individual conceptions, the LGBTQ+ community and religion have been at odds. I believe that this feud is rooted in the cognitive dissonance of the individuals involved in both of these communities. Both of these communities are identity centered, yet for some reason, there are these unwritten reasons why participation in both is unacceptable. The LGBTQ+ community does not believe that religion is affirming of the community, whereas large groups of the religious community view the LGBTQ+ community as wrong or bad. In my thesis, I examined the different coping mechanisms used by individuals affected by a specific form of cognitive dissonance, specifically, people who participate in religion while simultaneously being a member of the LGBTQ community. I used a qualitative and quantitative approach by combining an interview followed by a self-report survey with a variety of well-being measures. These measures indicated the overall effectiveness of the different coping mechanisms. As my experimentation window is coming to close, I am starting to identify some very interesting conclusions. Specifically, regarding the individuals that are in the LGBTQ+ community and have left religion.

**The Effects of the COVID-19 Pandemic on College Students' Mental Health**

Ms Mashal Syed, Avery LaRue

The COVID-19 pandemic has had many detrimental effects, many of which have gone unnoticed. Specifically, the pernicious toll on the mental health of college students. The Applied Cognitive Ergonomics Lab conducted timely research collecting qualitative data through virtual interviews, using the Perceived Stress Scale-10 (PSS) on a diverse range of 195 college students. 71 percent of participants indicated an increase in overall stress and anxiety due to the outbreak. This increase was associated with concerns on academic performance, feeling of social isolation, and financial difficulties. However, the most prevalent stressor, with 91 percent of participants reporting, was a concern for one's own health or that of their loved ones. The second most frequent stressor was difficulty concentrating (173/195) followed by disruptions to sleeping patterns (168/195). Furthermore, coping mechanisms adopted by participants include both negative and positive methods. The negative techniques used by 23 percent of the participants include sleeping, drinking, smoking and ignoring the news about COVID-19. The positive coping mechanism most sought out was students seeking support from others at a rate of 34 percent. 128 of the participants did not seek counseling services, because of barriers such as being uncomfortable around specialists, lack of trust in counseling, and downplayed severity of symptoms which contributes to the lack of support students experienced. The findings of the study highlight the negative effects of COVID-19 and brings awareness to this pertinent issue.

Oral # 17\_ Computer Science- Undergraduate & Graduate

**Music Link - Focused Media Aggregation**

Mr Kyle Grabfelder, Nicholas Isom, Caden Stewart, Rebecca Carlson

Music Link is a social media aggregation tool focused on creating feeds for particular content creators. Users will select creators through their Spotify account and Music Link will create a feed of posts by that creator from platforms such as Twitter, Facebook, and Instagram. A combined feed featuring posts from all selected creators will also be available. We aim to evaluate the effectiveness of our application by measuring the speed in which users can find particular posts, the reduction in users' social media usage, and the relative intuitiveness of the platform.



Oral # 18\_ Computer Science- Undergraduate & Graduate

**Machine Learning Applications for Energy Storage**

Mr Matthew Yen, Evan Palmer, Yazmin Soto

Machine learning has become increasingly utilized for the development of energy storage technologies attributed to its high computational efficiency and predictive accuracy. Its application in materials science research has demonstrated promising results for accelerating the discovery of materials with desirable electrochemical properties for developing highly efficient energy storage devices. We explore the various machine learning algorithms and latest approaches aimed towards designing new electrode and electrolyte materials, improving the performance of batteries and supercapacitors, and monitoring the health of energy storage systems. Furthermore, we investigate the predictive accuracy of these models in order to gauge practicality and expose the current limitations of machine learning models. Our review provides an overview of the latest applications of machine learning in energy storage research, and provides future direction for improving upon its implementation.

Oral # 19\_ Computer Science- Undergraduate & Graduate

**ReadMyPDF**

Mr Jonathan Lugo, Cameron Brock, Keith Bryant, Trevor Moore

Our senior capstone group is developing a pdf reader application that can read aloud the text found within a pdf regardless of its origin. This application will allow pdf documents to be more accessible and help those with reading disabilities, visual impairments, or people who prefer reading through hearing, to obtain the information found within pdf documents. Whether a pdf was created from a text document, or from a scanned image, our program will have the capability to read aloud the text to the user.

Oral # 20\_ Computer Science- Undergraduate & Graduate

**Hangar Informed Engagement**

Mr Yun Phelps, Allyson King, Evelio Sosa, Natalie Martinez, Olin Zhou, Turner Levey

Hackathons are valuable events that allow people to quickly prototype intriguing projects they otherwise wouldn't have time for. Mentors with industry knowledge can give valuable feedback on feasibility, usability, design, and development environments. Hangar is an open-source web application by American Airlines that aims to meet the needs of communication specific to hackathons. It currently has a simplistic tech-help queue along with other features. To improve engagement, our additions to Hangar would include collecting information from students, displaying the information to mentors before matching, collecting and displaying admin analytics, and the ability to automate messages.

Oral # 22\_ Computer Science- Undergraduate & Graduate

**THE EFFECTS OF INTEGRATING EXTERNAL APPLICATIONS INTO LEARNING  
MANAGEMENT SYSTEMS (LMS)**

Mr Siddarth Pandian

Learning Management Systems (LMS) have become the new norm for education at all levels. Due to the increasing popularity of LMS's, supplemental learning applications are now being tailored to work with an LMS by the use of Learning Tools Interoperability (LTI), which is a standard that helps provide the capability to connect external applications. Despite these advances in educational technology, some instructors seem to have a hard time adopting them. This thesis has two main goals: One is to identify the underlying factors which influence an instructors decision to use an LTI app, and the second goal is to create an LTI app using the current Mechanix platform created by the Sketch Recognition Lab (SRL). In order to identify the underlying factors, a survey was used that targeted major motivational theories and sent out to (N=30) professors.

Oral # 23\_ Computer Science- Undergraduate & Graduate

**Identifying Hijacked Reviews on E-Commerce Listings**

Mrs Monika Manohar Daryani

Fake reviews and review manipulation are growing problems on online marketplaces globally. “Review Hijacking” is a new review manipulation tactic in which unethical sellers “hijack” an existing product page (usually one with a lot of positive reviews), then update the product details like title, photo, and description with those of an entirely different product. With the earlier feedbacks still attached, the new product appears well-reviewed and boosts its search ranking.

We analyze the extent of this problem by applying various Information Retrieval methods on Amazon public datasets. We further propose Deep Learning approaches using Siamese LSTM and BERT to detect this e-commerce fraud.

**Resilient Performance of Incident Management Teams during COVID-19**

Ms Jainita Chauhan

At the onset of the COVID-19 pandemic, Incident Management Teams (IMTs) have been widely established across the US to direct and support on-scene response. Despite the critical roles of IMTs to cope with the unprecedented public health crisis, current knowledge of IMT resilience is severely limited. To better understand the resilient performance of IMTs during the pandemic, this paper documents findings of situation reports (SITREPs) published by IMTs using a content analysis method. Results show four categories of the resilient actions of IMTs during the COVID-19 pandemic: space, supply, staff, and system. Key findings in each category include actions to enforce social distancing measures, organizing and maintaining the stock of PPE resources, maximizing staff resources while minimizing their exposure to the virus, and widescale communication efforts. IMTs sought to make decisions that would ensure the health and safety of everyone impacted, mitigate the spread of the virus, and protect the fundamental human needs of the community affected. The findings of this study will inform future efforts to address challenges to the IMTs and make IMTs more resilient in future public health crises.

**Friction Stir welding of Mg Alloys**

Mr Haseeb Bajwa

Magnesium is one most abundantly found materials in nature and its use in the industry extends to a vast majority of fields leading from the manufacturing of small luxury items to industries as big as automobile or aerospace. In the present work, we are testing WE43 Mg alloy sheets which are joined together by friction stir welding (FSW) for mechanical and corrosion properties. For mechanical properties, we have used tensile and hardness tests as well as % joint efficiency. The study comprises of two hardness tests; Nano-indentation and Vickers hardness test where the Nano-indentation test will also allow us to obtain data on other mechanical properties such as the Young's Modulus of elasticity using the Oliver Pharr's method which is integrated as an analytical model inside the machine. A 3.5% NaCl immersion test will be done on the sample to determine the rate of corrosion. In this study, two samples will be used. One is going to be the base metal while another sample is the welded metal sheet and these two will be compared for strength, hardness, and the rate of corrosion. Microstructure analysis will be done to determine the cause behind the change in properties. This research will demonstrate the effects of FSW/FSP on WE43 alloy.

**In-situ data analysis for improved reliability of structural/building damage health estimation in a post-earthquake environment**

Mr Madhu Areti

Building/Structural health assessment in a post-earthquake environment is crucial to execute the rescue operations, and for disaster impact analysis. Current state-of-practice evaluation involves manual damage analysis by either foot-on-ground inspections or satellite imagery, which typically are time-consuming, and prone to limitations based on subjectivity. So, machine-vision-based automation techniques for damage estimation became a popular research focus in recent years, and are proven to minimize subjective errors. Current state-of-the-art algorithms aim to leverage the fast-paced development of artificial intelligence techniques. So, they have a dependence on the availability of multiple datasets gathered at different times or disaster environment characteristics for optimal damage detection performance. However, generalizability in varied disaster environments is crucial for automation of damage detection algorithm, especially when knowledge about the disaster site and impacted buildings is limited “ which is a common scenario. We propose an iterative framework based on damaged point labeling to automate the detection of concrete-spalling, and through-hole damages using 3D point cloud data. Damaged region detection is based on spatial and geometric characteristics of in-situ data, and is independent of the manual inputs regarding the disaster environment/damage characteristics. The experiment results showed a 25% increase in the 2D-delineation accuracy when compared to the state-of-the-art iterative analysis algorithm. The improved detection accuracy, in-situ data analysis nature, and generalizability to different disaster site datasets contribute to producing reliable structural health estimation results. The increased reliability over multiple disaster site analysis demonstrates the potential of the proposed algorithm complimenting human efforts for efficient disaster response planning.



Oral # 27\_ Engineering (2)- Undergraduate & Graduate

**Waterway Maintenance Budget Allocation in A Multimodal Network**

Mr Ahmadreza Mahmoudzadeh

The inland waterway system carries a significant percentage of the national freight. Maintenance operations including dredging and dam repair are important to maintaining the effective and efficient operation of the system. Dredging projects are for recovery of the navigational channel draft from the shoaling effect while lock/dam repair is about maintaining a maximum possible operational hours to reduce the waiting and delay of vessels therein. The special feature in this study is that the shoaling effect is random, as is subject to weather and other effects. This study specially deals with maintenance fund allocation to these maintenance requests by first proposing a multimodal approach for formulating the waterway maintenance problem in a connected network, which considers rivers, locks/dams, and highways and railways.

**Digital Clay: The future of the past**

Mr Mehdi Farahbakhsh

The current research is part of a more extensive study on the robotic-assisted Additive Manufacturing (AM) of scaffold-free shell structures using a clay-based material. The main study introduces three scales: micro-, mezzo-, and macro- that are respectively responsible for material properties, binding between layers, and the geometry of architectural forms. This paper focuses on the mezzo scale and introduces a novel workflow to evaluate and improve the structural integrity in the AM process of large-scale architectural forms.

AM offers advantages over traditional construction technologies, increasing material efficiency, fabrication precision, and speed. However, many AM projects in academia and industrial institutions do not comply with building codes and, consequently, are not considered safe structures for public utilization and have remained as test prototypes for display purposes only. This research introduces a heuristic workflow for investigating the impacts of three selective process parameters on the bond strength between layers of paste in robotic-assisted Additive Manufacturing of large-scale structures.

Material deposition in a robotic-assisted AM process in the real world is subjected to environmental stimuli like temperature, humidity, the load of upper layers, the nozzle's pressure on the printed layers, etc. Those stimuli add a secondary geometrical characteristic to the printed objects, which is missing in the initial digital model. The proposed workflow introduces a method to add the secondary geometrical characteristic to the initial 3D model by employing X-ray CT scanning, digital image processing, and 3D reconstruction. In this method, the results are evaluated in a numerical simulation.

Oral # 29\_ Engineering (2)- Undergraduate & Graduate

**Activating Industrial Symbiosis in the Circular Economy: Quantifying the Effects of a Novel Living Wall as a Double Skin Façade on the Building Surface and Microclimate**

Mrs Patricia Njideka Kio

Living walls improve environmental conditions of dense urban areas but studies show that living walls are not economically sustainable. Metal cutouts from vehicle body assembly were used as primary material for vegetation modules in a novel living wall. This innovative strategy is investigated in three parts. Firstly, the cooling effect of this novel living wall is evaluated by comparing the energy budgets of different surfaces in the microclimate over various seasons. Full day measurements taken for three seasons from 7:00am to 10:00pm and extended measurements for three summer periods were analyzed. Secondly, the thermal performance of the modules, soil and vegetation are investigated in greater detail using more campaign measurements and thermal images. Finally, a life cycle analysis utilizing results from the first two parts compares the novel living wall with two traditional metal living wall systems to illustrate whether the novel living wall is economically sustainable.

Oral # 30\_ Engineering (2)- Undergraduate & Graduate

**Optimizing Inventory Placement in a Two-Echelon Fulfillment System with Committed-Delivery-Time-Dependent Demand**

Ms Yue Wang

We study a two-echelon, single-product system where a regional fulfillment center supplies multiple local distribution centers (LDCs) using a committed supply time (CST) to each LDC and committed delivery time (CDT) to customers. The system faces periodic, uncertain demand, with an expected value that depends on price, CDT, and the number of LDCs. Our proposed model determines the values of price, CST, and CDT that maximize expected profit per period. We characterize key properties of optimal solutions that permit efficient solution for a fixed number of identical LDCs, and consider the impacts of several demand growth models as the number of LDCs increases.

Oral # 54\_ Engineering (2)-Undergraduate & Graduate

**Modeling and optimization of immersion medium for phototherapeutic light-emitting diode array for uniform light distribution**

Ms Blanche ter Hofstede

We present an optical simulation of an LED array to evaluate the effects of immersion media of varying thickness on the uniformity of light distribution for near-field illumination in phototherapy applications. We have compared different immersion materials (air, water, and silicone) placed between the LED array and the receiver in order to create a more uniform irradiance distribution while optimizing lighting efficiency. Both optical-grade silicone and water showed an increase in uniformity over an area of 14.4 cm<sup>2</sup> as the thickness increased without a significant decrease in irradiance at the tissue.

Oral # 31\_ Public Services- Graduate

**Opportunities and Challenges for the Water and Sanitation Sustainable Development Goal  
(SDG 6)**

Mr Mijat Barjaktarevic, Julie Roth

In 2015, the UNGA announced 17 Social Development Goals (SDGs) aiming to tackle some of the most urgent global challenges. One of them, SDG 6, addresses problems related to clean water and sanitation. SDG 6 is broken into six targets featuring indicators ranging from water and sanitation provision to water resource management. This research hopes to understand the state of SDG 6 progress five years after its implementation.

By using the cross-analysis method of quantitative and qualitative data reported by relevant stakeholders, this research project aims to 1) provide a brief overview of the SDG 6 and their interconnectedness with emerging global challenges, 2) map the SDG 6 against global funding, 3) provide an overview of achieved results for the previous period, and 4) highlight the current major challenges hindering the further progress.

Finally, the analysis includes a case study of Jordan, which aims to understand the effectiveness of SDG 6-related funding in a nation facing extreme water scarcity, climate change challenges, and refugee crises. By analyzing the funding for different sub-sectors within water and sanitation connecting each subsector with the related SDG 6 target, the analysis illustrates which aspects of SDG 6 are receiving the most attention in Jordan. The case study concludes that some SDG 6 targets receive disproportionately more funding and presents recommendations for how donors can effectively coordinate SDG 6 donations in challenging contexts.

Oral # 32\_ Public Services- Graduate

**Mapping the Gaps in Service Provision for Foster Youth with Disabilities Transitioning out of the Foster Care System**

Ms Claire Elizabeth Gilmore, Allie Rodriguez, Annel Guadalupe, Ashley Myers, Emily Peterson, Lily Bivins, Marie Bat, Prabodh Gedam, Sarah Guinn, Sydney Gardner

Disabled foster youth are a vulnerable population and the availability of transitional resources in the state of Texas are unclear. A review of the literature identified challenges to foster youths'™ transitions including communication gaps, ineffective transition programming, information deficits, and a possible shortage of resources. This project aims to investigate the current state of the foster care system and services for youth with disabilities transitioning out of foster care in Texas. To investigate the scope of services provided by nonprofits to youth transitioning out of care, the team has interviewed nonprofit professionals and distributed a survey statewide. Quantitative and qualitative analysis of the survey and interview data will be conducted and compiled into a detailed report on the needs of youth, unaddressed issues in service provision, and recommendations for better service provision.

**Especially Heinous and Vicious Felonies: Deconstructing Possible Rape Narratives within  
Law & Order: SVU: A Pilot Study**  
Ms Gemini Alexis Creason-Parker

Rape culture has been a prevailing phenomenon in society for decades, but it has not been until recent years that research has focused on this widespread problem. Such research has derived a traditional rape narrative based on stereotypes regarding the “ideal” victim, the perpetrator, and the crime. Research has identified that this narrative is being perpetuated by television and movies. Furthermore, research has concluded these mediums can affect one’s level of rape myth acceptance (RMA) and their view on the crime, criminal, and victim (e.g. Gerbner’s cultivation theory). However, while scholars have explored the use of the traditional rape narrative on screen, which commonly aligns with a blitz rape script, they have not investigated the use of other scripts. One such script that has differing characteristics from the traditional narrative includes the party rape script, which is frequently associated with parties on college campuses. This crime as a sub category of rape may or may not be portrayed to the same extent that the traditional rape narrative is on television and in movies. This study involved a content analysis of the popular show, Law & Order: SVU. By using the traditional and party rape scripts as guides, the researcher uncovered to what extent the show perpetuates each narrative as they apply to college rape. Because not all rapes are identical, it is critical that scholars understand their differences. Seeing how specific categories of rape are portrayed on television will allow for more unique solutions to prevent and respond to rape.



**A Social Semiotic Discourse Analysis of Cinematic Portrayals of Science: Implications for Public Learning**  
Ms Jean Parrella

Entertainment media play a significant role in the dissemination of science to the public. The persuasive ability of media texts, primarily film and television productions, can influence the public's understanding and retention of scientific information. I used a social semiotic discourse analysis, containing both qualitative and quantitative components, to examine the representation of science and scientists within fictional films. Using the Internet Movie Database, I identified 16 culturally significant films—four released each decade beginning with 1980—to include in my final sample for analysis. Findings from a denotative analysis revealed nine themes: unusual behavior, egotistical scientist, unethical decision-making, public distrust, genetic modification danger, government involvement, working conditions, innovation, and comradery. Eight of the nine themes included sub-themes, supported by a variety of icons, indices, and symbols representing verbal and visual depictions of science and scientists. A quantitative analysis of signs within each theme revealed scientists are most represented as antisocial, egotistical, and unhealthily obsessed with their work. In addition, scientists are often shown making unethical decisions in their research. Findings indicate that science fiction film viewers are likely to interpret scientists as unsociable, unapproachable, and untrustworthy. Cinematic depictions of science have done a disservice to the American public by representing science and scientists poorly within science fiction films in all genres. To challenge these negative depictions, scientists should find relational elements to connect with their audience, approach discussing scientific awards or achievements carefully, and articulate the values and ethics they maintain when conducting research.

**Towards More Inclusive Higher Education Globally: Priorities for Gender Equality**

Ms Carmen Nicole Benson

Education is transformative. For women and girls, each year of completed secondary education increases their average lifetime earnings by at least 10%, and increased education of women and girls across education levels is correlated to reduced child marriages, improved child and maternal health, and increased women's participation in the private and public sectors (Psacharopoulos & Patrinos, 2018; USAID, 2018; World Bank, 2019). While significant progress towards global goals in education and gender equality in education has been made in the past decade, the gap between men and women, as well as between socio-economic groups, is still evident (World Bank, 2019).

This study provides a focused analysis of the U.S Agency for International Development's country and regional-level strategies, responding to three primary research questions: 1) to what extent is university education emphasized at the strategic level, 2) to what extent is women's access to university education emphasized at the strategic level, and 3) what are the common program approaches related to women's access to university education? Employing a qualitative content analysis method, which requires systematic and transparent identification, sorting, and synthesis of policy documents, we analyzed all USAID Country Development Cooperation Strategies published publicly as of 31 August 2020, including 62 total strategies (Berelson, 1952; Cavanagh, 1997; Fraenkel et al., 2019; Hsieh & Shannon, 2005).

The results of this study are important in informing future policy and program implementation, particularly for donor organizations and implementing partners seeking to build higher education capacity in developing countries while prioritizing gender equality in higher education.

**Using Data Surveillance to Understand the Rising Incidence of Tularemia Cases in the United States, 2010-2018**

Ms Alexandra Bishop, Emily Brockinton, Esha Kothapalli, Krishnendu Sreekumar, Scott Clark, Tanvi Vishwanath, Tatyana Canales

Tularemia is a rare but potentially serious bacterial zoonosis that has been reported from all U.S. states except Hawaii. The etiologic agent, *Francisella tularensis*, is highly infectious and can be transmitted through arthropod bites, direct contact with infected animal tissue, inhalation of contaminated aerosols, and ingestion of contaminated food or water. Tularemia infection can be life-threatening, but if the disease is identified and diagnosed in a timely manner, the infection can be successfully treated with antibiotics. We summarized surveillance data from 2010 to 2018 for tularemia. There were 1,834 cases of tularemia from 2010 to 2018 in the United States. The average national incidence was 0.60 cases per million person-years (PY). When comparing these results to a study from 2001-2010, the average national incidence increased from 0.41 to 0.60 cases per million PY. The highest statewide incidence between 2010 and 2018 was in South Dakota with 12.68 per million PY, while the lowest incidence (where incidence did occur) occurred in Florida with 0.022 per million PY. Cases of tularemia were reported more frequently among males by gender, white by race, and non-Hispanic by ethnicity. Incidence was highest among the age group 40 to 64 years, but all age groups reported infections. During this time period, the highest number of cases occurred from May through September. This is common for tick-borne illnesses, as these months have high tick activity coupled with increasing human activity outdoors. Moving forward, we will continue to investigate the increasing incidence of tularemia in the United States, possibly tying ecological factors with explanations for the increasing incidence.

**Linear IgA Bullous Dermatitis misdiagnosed as Recurrent Herpes Zoster**

Mr Mojahed Mohammad K Shalabi

Linear IgA bullous dermatosis, also known as linear IgA disease, is an autoimmune subepidermal blistering disease that affects the skin and mucosal membranes. Linear IgA bullous dermatosis in general has an incidence rate of 0.5-2.3 cases per million a year. One case has been reported in the literature describing zosteriform linear IgA bullous dermatosis, making this presentation very rare. Despite its low prevalence in the population, linear IgA bullous dermatosis has a bimodal peak of age distribution. It affects children up to the age of 10 and in adults over the age of 60. In the majority of cases, the inciting event or the cause of linear IgA bullous dermatosis is idiopathic with no association; however, it has been shown to manifest in patients taking common drugs (e.g. vancomycin, captopril, trimethoprim-sulfamethoxazole, amoxicillin, simvastatin, furosemide, lithium, phenytoin, and amiodarone). Cases of drug-induced linear IgA bullous dermatosis are less common than its idiopathic counterpart. Our patient denied any recent or remote use of any of the implicated medications listed above. Pathogenesis of linear IgA bullous dermatosis is due to IgA autoantibodies directed against different antigens of the basement membrane and hemidesmosomes of the skin which help anchor the epidermis to the dermis. The classic clinical presentation for this disease includes tense blisters on an erythematous base in a string of pearls, crown of jewels, or rosette arrangement. First-line therapy for idiopathic linear IgA bullous dermatosis is oral dapsone. Lesions can begin to resolve as early as 72 hours after starting treatment. Second-line agents include sulfapyridine and colchicine for patients unable to take dapsone, such is the case for patients with the genetic disorder glucose-6 phosphate deficiency.

**The effect of radiation on healthy bone density in spine metastasis patients**

Mr Ravi Gaddipati

**Objective**

Increased rates of insufficiency fractures are reported after radiation therapy without well-defined causality. Here, we conduct a cross-sectional study on the density change of non-lesioned vertebral bone after irradiation, relative to control bone in patients with spinal metastases.

**Methods**

Patients were identified who received radiation therapy for spinal metastases to a region including an adjacent vertebra without identifiable malignancy on pre-treatment CT. Every patient had an untreated vertebra of similar type available as a control. A Hounsfield-density calibration curve was used to measure the vertebral body density before and after treatment. Analysis of covariance was used to model vertebral bone density changes with respect to treatment status. Significance was established as  $p < 0.05$ .

**Results**

We identified 36 patients who fit the study criteria. The irradiated healthy bone received a median dose of 30 Gy. The median biologically effective dose (BED) was 60 Gy ( $\alpha/\beta = 3$ ) and 39 Gy ( $\alpha/\beta = 10$ ). Median follow-up imaging intervals between pre-treatment and follow-up CT scans was 13.4 months. Levene's test was used to confirm the equality of error variance assumption of ANCOVA ( $p = 0.093$ ). The mean change in the density of the irradiated vertebral bone was -3.59% (95% CI = -8.51% - 1.32%,  $p = 0.149$ ).

**Conclusions**

We found no significant change in vertebral bone density attributable to radiation treatment. Further work is needed to elucidate if increased fracture rates after radiation are due to factors other than bone density.

**Onychomadesis in an Adult Patient with Hand, Foot, and Mouth Disease**

Mr Mojahed Mohammad K Shalabi

Coxsackievirus, also known as hand foot and mouth disease (HFMD), is generally considered to be a rare illness in adults. Traditionally, HFMD has been strongly associated with enterovirus 71 and Coxsackievirus A16 however, global outbreaks of a new virulent CVA6 strain have been reported since 2008. CVA6 has been shown to affect both children and adults and is associated with a more profound disease course that includes fever, sore throat, malaise, herpangina, a vesicular or maculopapular rash, and onychomadesis; a temporary cessation of nail growth that can lead to proximal separation of the nail plate from the nail matrix. A study of a HFMD outbreak, of children in Taiwan, showed the incidence of onychomadesis, following infection with a CVA6 strain was 37 percent (48/130) compared to 5 percent (7/145) in non-CVA6 infections. Additionally, 69 percent (33/48) of patients who developed onychomadesis were reported to experience concomitant palmoplantar desquamation before or at the time of nail changes. Another study of a HFMD outbreak, in Spain, noted differences in the prevalence of onychomadesis in regard to age with a 55% (18/33) occurrence rate seen in the youngest age group (9–23 months), 30% (8/27) in the middle age group (24–32 months), and 4% (1/28) in the oldest age group (33–42 months). The mean latency period of onychomadesis ensuing HFMD ranged from 1 to 2 months, average length 40 days, with only an average of 4 nails shed per case. To date only a small number of reports of HFMD-induced onychomadesis in adults have been described in the dermatological literature. It is reported that 11 percent of exposed adults become infected with HFMD however, fewer than 1 percent develop clinical manifestations. HFMD-induced onychomadesis is typically self-limited and usually no treatment is indicated. Patient reassurance, hydration, and supportive care are the ideal management for HFMD.

**Measuring accessibility to Intensive Care Unit (ICU) beds under the uncertainty of supply and mobility**

Mr Jinwoo Park

As the spread of COVID-19 gets severe, many hospitals suffer the shortage of their Intensive Care Unit (ICU) beds capacity, and it deteriorates the sufficient access to health care facilities. However, the conventional approach of spatial accessibility measurement not only utilizes static input variables for their supply, demand, and mobility but also assumes full capacity is available, so that it often overestimates the accessibility to health care facilities (e.g., ICU beds). The number of readily available ICU beds is particularly critical as it is closely related to the fatality rate. In this context, it is highlighted that the credibility of accessibility to the health care resource. To address the issue, this research incorporates the uncertainty in the available capacity of ICU beds and time-variant mobility into spatial accessibility measurement. We populate the uncertainty in the data from their historical fluctuations and conduct Monte-Carlo simulation to measure spatial accessibility from the stochastic perspective. As a result, the spatial accessibility to ICU beds substantially changes throughout the simulation due to the uncertainty in the inputs. Specifically, the robustness of accessibility is tied with the number of alternative supplies. Downtown, where numerous hospitals are located, demonstrates high accessibility with high reliability, whereas rural areas with scarce health care facilities have low and unreliable accessibility. In addition, our result reveals that inequity of spatial accessibility to ICU beds deteriorates as the degree of reliability (i.e., probability of obtaining a certain degree of accessibility) increases. Therefore, our approach would shed light on the uncertainty aspect of the measures of spatial accessibility and would help decision making processes on where additional infrastructures should be located.

**An applied approach to evaluating less expensive Cosmic Ray Neutron Sensors for soil moisture monitoring**

Mr Kade Flynn

Cosmic Ray Neutron Sensors (CRNS) are a relatively new technology for measuring soil moisture at the field scale. Fast-moving neutrons produced from solar rays' interaction with the atmosphere collide with hydrogen in the environment and in the soil and lose energy, becoming slow neutrons. Estimates of soil moisture can be made over time by measuring the number of slow neutrons at the Earth's surface, comparing this value to the number of incoming fast neutrons in the atmosphere, and considering static sources of hydrogen in the environment such as vegetation and atmospheric water vapor. Networks of CRNS have been established in the United States, United Kingdom, and Australia, and there is a growing interest in this technology within the research community. Most CRNS utilize  $^3\text{He}$  from the production or recycling of nuclear weapons in their proportional counting tubes to measure slow neutrons. This material is expensive, unsustainable, and its cost will continue to increase. This high cost limits not only the application of CRNS outside of the research community, but it also limits their adoption within the research community. One alternative way to count neutrons is Li-Foil Multi-Wire Proportional Counters (Li-Foil MWPC). This technology can directly replace  $^3\text{He}$  proportional counters, is less expensive, and is more sustainable to produce. In this study we compare two CRNS units- one produced using  $^3\text{He}$  for neutron detection and another unit which uses Li-Foil MWPC. These units differ in both cost and size and therefore the number of neutrons detected per unit time or counts per hour (cph). In this study, we investigate the relationship between cost, cph, and sensitivity to soil moisture. We also investigate the use of CRNS in high-clay soils, where factors such as surface ponding of water, high bulk density, and high water holding capacity may limit the depth and accuracy of CRNS measurements. To calibrate and validate both CRNS units we took soil samples to calculate bulk density and volumetric soil water content within the radial footprint of the sensors. We also used a profile of in-situ soil moisture sensors within the immediate footprint of the CRNS units to validate neutron-based soil moisture estimates.



**Machine Learning Assisted Detection of Excess Water-Producing Wells in Unconventional Shale Plays**

Mr Jonathan Foster

Excess water production from oil/gas wells drilled in unconventional shale formations of Permian Basin leads to environmental concerns related to the disposal of produced water and also leads to significant expenses in water management programs. This is particularly an issue in the western-most region of the Permian Basin, the Delaware Basin, where water-to-oil ratios are as high as 10:1 for an oil-producing well. To better understand the factors governing the excess water production, this paper analyzes subsurface data from 20 wells targeting the Bone Springs sands and the Wolfcamp shale formation, which are the primary unconventional-resource targets in the Delaware Basin. The dataset was expanded by adding 53 wells from both the Fort Worth Basin and Gulf Coast Region. For purposes of this study, a data-driven workflow was developed to use 5 well logs from the 300-feet depth interval above or below the kick-off point for each well to detect high water-producing well. The 300 ft of logged data above or below the KOP are divided into six 50-ft intervals. From these banded intervals, 7 statistical parameters were computed for each of the 5 logs. In doing so, 210 features were generated for each well. The 210 features were reduced to most relevant and informative 21 features by first thresholding based on p-value and F value from an ANOVA F-test, followed by the use of Pearson Correlation. The dimensionally reduced 21 features were used to train classification methods to predict the whether a well is a high-water producer (HWPs) and low-water producer (LWPs). Logistic regression performs the best in identifying and predicting excess water production. Due to the limited size of dataset, 100 iterations of cross-validation were performed using the logistic regression. In Delaware Basin, the prediction performance has a median F1 score of 0.96 and a median Matthews' Correlation Coefficient of 0.92. Median scores for both the Fort Worth and Gulf Coast datasets are above 0.80. Most informative features for this task was determined using permutation importance test. For the Delaware Basin, the statistical parameters computed using deep resistivity and porosity logs from the nearest 50-ft band just below the KOP are the most informative features for detecting excess water-producing well.

**Mudstone chemostratigraphy of Upper Pennsylvanian- Lower Permian strata along the Glass Mountains, implications for stratigraphic subdivisions.**

Mrs Maria Gutierrez Azuaje, Ben Richards, Jake Sleight

One of the most prolific unconventional targets in the Permian Basin is the Lower Permian Wolfcamp Group, which is comprised of organic-rich mudstones interbedded with carbonate beds. These strata are exposed in the southern flank of the Delaware Basin, along the Glass Mountains, in Brewster County, Texas. These outcrops provide a window to study the unconventional reservoirs of the Wolfcamp Group and decipher stratigraphic variability in a carbonate platform slope to basinal depositional setting. Research on these outcrops, identified the unique geochemical signatures (chemofacies) for mudstone from the underlying Pennsylvanian Cisco Group, as well as within the Wolfcamp Group.

The chemofacies identified are based on mineralogical and elemental composition from X-Ray Diffraction (XRD), Energy Dispersive X-Ray Fluorescence (ED-XRF), hand-held Spectral Gamma Ray (SGR) measurements, total organic carbon (TOC), and petrographic analyses. Three mudstone facies are identified from the oldest to the youngest termed chemofacies 1, 2, and 3. Chemofacies 1 is a mixed siliceous- calcareous with micas, feldspar and clays, zirconium enrichment and low TOC. This facies is interbedded with calcareous and dolomitic sandstone and corresponds to the Cisco Group. Chemofacies 2 is a siliceous mudstone, with muscovite and clays, typically with no carbonate. Chemofacies 3, the youngest, is a mixed siliceous- calcareous and no feldspar and cyclically interbedded with carbonate beds. Chemofacies 2 and 3 belong to the Lower Wolfcamp Formation and both are marine with mixed detrital and biogenic silica and some organic matter (0.4 – 1.07 % TOC). Temporal geochemical changes suggest that the detrital source of sediment might change in the system and paleogeographic settings impacted mudstone composition.

**Coupling hydrogeophysics with hydrodynamic modeling to infer subsurface hydraulic architecture of an alluvial floodplain**

Mr J Michael Martin

This paper underscores the importance of spatially dense geophysical datasets for making informed decisions in water management strategies. Such decisions may require understanding how site-specific subsurface architecture—especially hydraulic connectivity—impacts the response of a shallow aquifer to anthropogenic hydrologic disturbances (e.g. over-pumping of a shallow aquifer). At a 0.2 km<sup>2</sup> alluvial floodplain site characterized by thick clay over fine sand to gravel and shale bedrock in the sub-tropical, sub-humid belt of the Gulf Coast of the United States, we image an asymmetrically-shaped, compartmentalized, sand-dominated channel-belt using electrical resistivity tomography and thirty-one time-domain electromagnetic soundings probing to depths of ~40 m and ~90 m, respectively. Lithological interpretation and a hydrological model are developed based on the geophysical data and nearby sediment cores, where groundwater's electrical resistivity varies is 9.1 Om. In a modelling scenario wherein the compartmentalized sand channel-belt starts out dry (i.e. an over-pumped shallow aquifer), we simulate 26 weeks of infiltration due to flooding on the surface. Preferential filling of the channel-belt occurs through its sides rather than from above, generating a new understanding of the hydraulic connectivity around and into asymmetrically-shaped, sand-dominated channel-belts. This insight can inform decisions about the optimal placement of shallow water wells in a heterogeneous alluvial floodplain aquifer system and also highlights the dangers of over-pumping.

**Adopting Grazing Management Practices: Lavaca County Beef Cattle Landowners' Intentions**

Ms Taylor Olsovsky

Water quality protection is a high priority for the Lavaca River Watershed. Due to high levels of contamination, a watershed protection plan has been written and is being implemented to address these concerns. Beef cattle operations are listed as a potential issue contributing to the polluted waters. Without proper grazing management practices, animal waste can easily enter the surrounding water sources. Using proper stocking rates and other practices can improve both the water and land quality as well as profit margins long term. Additionally, the Natural Resources Conservation Services (NRCS) offers both technical and financial assistance in implementing the grazing management practices, yet researchers and practitioners question if landowners are aware of the resources. This study measured the effect of knowledge of stocking rates and awareness of the NRCS and Texas State Soil and Water Conservation Board on behavioral intention to adopt grazing management practices. A regression analysis found three items, based on county appraisal district recommendations, based on calculated grazeable acres, and household income from agriculture production, to have the most variance on Lavaca County landowner intention to adopt grazing management practices. From this finding, researchers could explore the barriers and motivators of adopting practices as well as more characteristics of the females within the sample. Practitioners could work with the local county appraisal district to expand awareness of their resources and the impact of using proper stocking rates. Additionally, practitioners could mail informational flyers to landowners to inform landowners of their privacy rights when working with the agencies.

**Implications of Virtual Reality Adoption for Texas A&M AgriLife Extension Programs**  
Mr John Mark Palmer III

Virtual reality (VR) is the forefront of future agricultural sciences dissemination. VR will be a beneficial asset to improving global food security and better understanding climate impacts. Texas A&M AgriLife Extension connects research to industry and stakeholders across Texas. One thing that we can garner from this pandemic experience is that having VR tools to relay information in times where you may not have access is vital to education for both youth and adult students. VR allows people from all backgrounds to have immersive experiences at their leisure. The impact of VR learning in the agricultural sciences is relatively unknown in the literature. Therefore, I examined research publications implementing VR learning published in the premier journal for VR scholarship “Virtual Reality”. I included only literature published from 2014-2020 to narrow the scope of the study. I examined 24 publications from volumes 16 through 24 and included articles that met the following parameters: (a) adoption; (b) engagement; (c) learning; and (d) barriers. Each publication that met the parameters of this study was investigated and content for each study was organized in a matrix. The literature synthesis indicated adoption was dependent on VR accessibility. Participants reported engagement was influenced by active learning curricula. The literature indicated increased learning was dependent on the visual quality of materials. Cybersickness was the primary barrier to participants meeting learning outcomes through VR dissemination. Extension program developers should take into account the role of accessibility, engagement, learning, and cybersickness prior to developing VR curricula for target audiences.

Oral # 48\_ Agriculture- Graduate

**Cover Crop Mixes for Conservation Agriculture**

Ms Jodie McVane Reisner

Cover crops can play a vital role in developing resilient farms. Weed suppression, erosion control, building healthy soils, and adding diversity to cropping systems are just a few. The current availability of diverse cover crop choices allows the farmers to choose from a range of cover crops. Moreover, cover crop mixes can be an important addition to less diverse row crop management systems, while enhancing the provision of ecosystem benefits. This presentation focuses on an experiment currently being conducted at Texas A&M University, College Station in evaluating various summer, summer/winter, and winter cover crop mixes suitable for the Southeast Texas region.

**Effect of Organic Amendment, Tillage and Cover Cropping in Soil Active Carbon**  
Ms Binita Thapa

The major challenge of food production systems is to supply the demand for food from a growing human population without increasing the adverse effects of agricultural practices on natural resources such as soil, water, and air. To accomplish this, there is a need to adopt agricultural management techniques that will ensure the sustainability of agriculture, such as addition of carbon amendments, tillage reduction and cover cropping. These practices also serve to increase soil organic carbon which has the potential to partially mitigate climate change by reducing carbon dioxide (CO<sub>2</sub>) accumulation in the atmosphere.

The study was conducted at Texas A&M University's farm at Snook, TX. The soil is mapped as Weswood series (22% sand, 37% silt, 41% clay). Individual plots were 3 m x 5 m. The study design was split-split plot. The whole plot factor was tillage (conventional disking vs no-till). The split plot factor was cover crop (mix of oat, winter pea and mustard vs. no cover crop). Carbon amendments: biochar and composted biosolid (applied as 500 kg dm C ha<sup>-1</sup> basis) were randomly arranged within the blocks as the split split factor. The soil samples were taken at 0-5cm and 5-15cm depth after the harvest of crops. Total and active carbon were measured. Statistical Analysis was performed using SAS software (SAS Institute; Cary, NC). ANOVA and Comparison of means (Fisher's protected LSD) was performed using PROC GLM at a = 0.05 significance level. We found that active carbon was significantly affected by carbon amendments, tillage practice, cover cropping and depth. We also observed the interactive effect of tillage\*depth, cover\*depth, carbon\*depth and tillage\*cover\*carbon after the termination of cover crop. Biochar treatment had higher active carbon compared to others.

**Precision Agriculture Adoption Benefits: A Synthesis of Literature from 1999-2020**

Ms Chin-Ling Lee

Precision Agriculture (PA) applies in the traditional farming practice with the new technology, new practices make the updated agriculture. According to the definition of PA by the International Society of Precision Agriculture in 2019, the purpose of PA application is to support management decisions to achieve the agricultural production quality, create production profits, improve the efficiency of resource use, and environmental sustainability. A variety of countries have reported positive outcomes from precision farming adoption, however, after decades of efforts, there are still diverse factors that influence the adoption of PA.

In recent years, several agricultural journals have published many articles on the research and development and application of PA technology, and Precision Agriculture is a journal that mainly publishes articles in the field of precision agriculture. In these published papers, it is believed that the application of PA is helpful for agricultural production management decisions and production efficiency. I included only literature published in the Journal of Precision Agriculture to narrow the scope of this study. From volumes 1 through 22, I reviewed 33 articles whose titles met the following themes on the publication title: (a) Production quality; (b) Improve profitability; (c) Improve the efficiency of resource use; and (d) Environmental sustainability. The literature synthesis indicated “Improve Profitability” is the top reason that motivates producers who adopt PA because meets their economic needs. Among these 33 articles, the United States was the most used as PA experimental area; and wheat was the most used crop in the experimental field.



Oral # 51\_ Engineering (1)-Undergraduate & Graduate

**Computation of rotational vibrational spectra for use in supersonic flow spectroscopy**

Mr Eric Comstock

The construction of a commercially viable supersonic combustion ramjet has been at the forefront of aerospace engineering research for years. However, research into this problem requires careful analysis of supersonic flames to determine their properties. A useful tool in this is measuring Raman scattering from a laser directed at a supersonic flame to determine the compositions of different parts of the flame. To assist with this method, a program has been developed to simulate combinations of gases at arbitrary temperatures to compare with experimentally-found spectra to determine the partial pressures and temperatures of the different gases inside the flame.

Oral # 52\_ Engineering (1)-Undergraduate & Graduate

**Persistence of negative vacancy and interstitial formation energies in atomistic models of amorphous silicon**

Mr Mack Wesley Cleveland

Amorphous solids have each atom uniquely arranged so that properties, such as vacancy formation energy will vary internally. We address the question of whether amorphous silicon can ever have exclusively positive vacancy and interstitial formation energies. We use LAMMPS to simulate structures of amorphous silicon and find vacancy formation energies for all atoms in amorphous silicon structures of various sizes and quench rates. The removal of the atoms with negative vacancy formation energies produced more atoms with negative vacancy formation energies. The magnitude of the vacancy formation energy increased with the size of the simulated cell. The negative vacancy formation energies are shown not to be the product of the samples being overly dense.

**Ecological Uniqueness for Understanding Component Importance in Power Grids**

Mr Andrew Foster

The identification of critical components in electric power grids is an important challenge power engineers face. Similarly, many ecologists face the challenge of identifying important species in food web networks. Drawing similarities between power grid networks and food web networks, this study utilizes proposed identification methods from ecology literature to identify critical components in electric power grids. These ecological methods used include measures of Sum of the Trophic Overlap (STO) and Weighted Trophic Overlap (WTO). We also study a method proposed from power engineering literature that uses the Normalized Line Outage Distribution Factor (NLODF) to compare the different methods. The intention of this study is to determine if bio-inspiration in criticality metrics provides a feasible tool to use in power grid analysis. The proposed engineering method utilizing NLODF is found to be more accurate in identifying critical lines in power grids when considering all lines in the grid. However, the ecological metric STO is found to be as good as NLODF when considering the top 10, 20, or 30% of lines. STO was the most accurate metric in the largest grid analyzed, suggesting STO may be more accurate in larger grids. The comparable performance of the ecological and engineering methods suggests the ecological methods can be used to accurately identify critical components in electric power grids.

Oral # 55\_ Engineering (1)-Undergraduate & Graduate

**NOVEL APPROACHES IN NON- DESTRUCTIVE CMOS MICROWAVE  
SPECTROSCOPY SYSTEMS FOR CHEMICAL/BIOMETARIAL  
CHARECTERIZATION**

Ms Elif Kaya

The dielectric permittivity of many materials has a sole unique frequency response at RF/microwave frequencies. Taking advantage of this property, microwave broadband dielectric spectroscopy (MBDS), which is a nondestructive, cost-effective, and real-time characterization procedure, is a promising technique to determine the complex permittivity of materials for a wide range of applications including chemical/ biological sensing, disease diagnosis (such as distinguishing breast cancer cells, monitoring blood glucose concentration, and identifying antibodies, and so on), bio-threat detection, oil exploration and processing, agriculture and food quality/safety, and drug development in the pharmaceutical industry. Spectroscopy systems are similar to radars; we measure either the signal passed through the material or reflected from the material and then using some post-processing methods to define or characterize the unknown materials.

**Quantifying Community Resilience Based on Fluctuations in Visits to Points-of-Interest  
Derived from Digital Trace Data**

Mr Cristian Podesta

This research establishes a methodological framework for quantifying community resilience based on fluctuations in a population's activity during a natural disaster. Visits to community points-of-interests (POIs) serve as a proxy for activities to capture the combined effects of perturbations in lifestyles, the built environment, and the status of business. This study used digital trace data related to unique visits to POIs in the Houston metropolitan area before, during, and after Hurricane Harvey in 2017. With this data, resilience metrics in the form of systemic impact, duration of impact, and general resilience (GR) values for the region were examined along with their spatial distributions. The results show that certain POI categories, such as religious organizations, building materials and supplies dealers, and grocery and merchandise stores had higher resilience metrics – low systemic impact, short duration of impact, and high GR values – while categories such as medical facilities and entertainment had lower resilience metrics – high systemic impact, long duration of impact, and low GR values. Spatial analysis revealed that areas in the community with lower levels of resilience metrics also experienced extensive flooding. This insight demonstrates the validity of the approach proposed in this study for quantifying and analyzing data for community resilience patterns using digital trace/location intelligence data related to population activities. While this study focused on the Houston metropolitan area and only analyzed one natural disaster, the same approach could be applied to other communities and disaster contexts. Such resilience metrics bring valuable insight into prioritizing resource allocation in the recovery process.

Oral # 56\_ Sociology- Undergraduate & Graduate

**Will it Play in Peoria? Using Twitter to Assess the Impact of China's Belt and Road Initiative on Public Sentiment in Recipient Nations**

Mr Kedar Pandya, Mr Austin Sibu

Although much attention has been given recently to China's Belt and Road Initiative, considerably less systematic work has been done on how such projects are received by the general public in BRI partner nations. This project uses big data techniques on Twitter to assess the impact of Belt and Road on general sentiment about China in BRI recipient countries. To what extent does BRI play a role in creating perceptions about China? Are recipient nations' publics open to deeper engagement, or do Chinese BRI projects provoke animosity and discord? Are there disconnects between governments, media, and the public in opinion of China? Is there any systematic variation across regions, levels of development, or types of projects that inspire positive or negative sentiments? What aspects of BRI projects capture public attention, and how long does this attention last? Although hardly likely to be the last word on these important questions, this study seeks to measure the impact of BRI projects from a uniquely human perspective using big data analysis on original social media datasets.

**Gender, race, and self-derogation: Why are white women deprecating themselves?**

Ms Taylor Nichole McGown

Despite having a disadvantaged socioeconomic position in the society, the black Americans are often reported to have lower feelings of anxiety, depression and self-derogation than whites (Barnes, Keyes and Bates 2013, Blazer, Kessler and McGonagle 1994, Hughes and Demo 1989, Louie and Wheaton 2019, Williams et al. 2007). Our early results using a two-generation study over time from 1971 to 2008 shows that, consistently, the biggest difference in self-derogation is among women. White women, regardless of age and generation, have higher levels of self-derogation than black women, and higher levels of self-derogation than white and black men. In this paper we explore this disparity between white and black women and attempt to understand why white women have generally higher levels of self-derogation. Using the same unique two-generation longitudinal data (KLAMS 2016), spanning the period of 37 years, we explore different explanations for this disparity. We consider women's work experience; social support networks; and control beliefs to explain the gap. Prior research has shown that in instances of experiencing discrimination at workplace, white women report higher levels of psychological stress than black women (Maddox 2013). Prior literature has also shown that while black women are more likely to receive racial discrimination as compared to their white counterparts, the former are also more likely to talk about it to someone, hence, employing various means to cope with the discrimination and reducing the related stress (Watson, Scarinci, Klesges, Slawson, and Beech 2002). Galvin and Schieman (2014) have found that high control beliefs, that usually are beneficial for mental health, may be less beneficial for mental health in uncertain role contexts (i.e., in less secure jobs). White women tend to have higher internal locus of control that might not be beneficial for them in jobs that are not secure.

**Two Sides to Every Coin: An Analysis of Julio-Claudian Women on Imperial Roman Coinage**

Ms Charlotte Nicole Deere

While Imperial Roman coinage is a highly studied topic by historians and archaeologists alike, there is still a major gap in this area with regard to the women who appear in it. Many studies have been done on individuals such as Livia, Agrippina the Younger, the Faustinae, and Julia Domna, but none have been completed in a comparative sense. This paper looks at the imperial coinage of the Julio-Claudian dynasty, who set the standards for the principate period of ancient Rome, in order to determine the similarities and differences between each emperor's chosen depictions of their female family members.

It is widely known by numismatists who specialize in Imperial Rome that each coin type was minted with a specific purpose in regard to the public's perception of current events and influential people. The goal of the Julio-Claudian rulers was to maintain and improve the acceptance of autocratic rule under the guise of a republican forum after decades of civil wars and internal strife. This meant that stability was their main point of emphasis and long-term stability within an autocracy demands a clear and competent heir. Heirs are either born or chosen, but either way, it was in the ruling emperor's interest to pick one close within his existing circle made up largely of immediate family members. Of course, families by nature must be somewhat fifty-fifty in their male to female ratio and while males were open for public service, females were open to bearing heirs or securing support of influential Romans unrelated to the imperial family through marriage.

Knowing that imperial women played just as important of a role in ensuring their family's political power as their fathers, husbands, and brothers, it is undeniable that their placement in the public eye, whether it be by their own design, the emperor's, or someone else's, is crucial to understanding the social and political dynamics involved in the rise, reign, and fall of emperors. By analyzing Augustus's, Caligula's, Claudius's, and Nero's coinage (Tiberius has a curious lack of direct reference to the women around him) depicting women such as Iulia the Elder, Livia, Agrippina the Elder and Younger, Messalina, and others, it is clear that mothers of emperors, especially as time goes on, got the highest priority and variability. Additionally, less traditional imagery and more ambiguous messages are directly correlated with times of relative peace and calmness.



Oral # 59\_ Sociology- Undergraduate & Graduate

**Implications of Food Insecurity, Agricultural Involvement and Extension Education on Women's Reproductive Health in Developing Countries**

Ms Bethany Busa

In developing countries, factors such as food insecurity, poor resource accessibility and minimal education often restrict families to subsistence agriculture. Women in these areas greatly contribute to the local economy; however, due to these vulnerabilities, gender inequity and cultural nuances, females lack proper reproductive health care. Primary aid organization efforts have sought to improve maternal mortality and nutrient deficiencies, contraceptive prevalence, pregnancy and childbirth care and reproductive decision-making power. The effect of food-insecurity, agricultural involvement and extension education on women's reproductive health was assessed through the lens of Social Cognitive Theory (SCT), exploring the interaction of cognitive, biological, behavioral and environmental processes to enact change and improve self-efficacy. A content analysis rendered three primary themes defined as the social and biological benefits of women's active participation in agriculture to obtain food security, the adverse implications of agricultural involvement as a result of food insecurity on women's reproductive health and the potential of education and extension to influence positive change within the aforementioned conditions.

**The Concerns-based Adoption Model: Applications for Targeting Farmers' Concerns with the Adoption of Water Use Efficiency Programs in the Mediterranean Region**

Ms Tatum Hardy

International agricultural agencies have recently partnered to address the rapidly evolving problem of water scarcity in the Mediterranean: one of the most climate-responsive regions of the world. According to the International Center for Advanced Mediterranean Agronomic Studies (CIHEAM), the agriculture sector uses 69% of exploitable water in this region, classifying 10 of the Mediterranean States as water insecure. Increased urbanization, population growth, and land use have placed constraints on water availability and are expected to continue to increase climate pressures, indicating a need for improved water management strategies. The Food and Agriculture Organization of the United Nations (FAO) and CIHEAM recommend improving water use efficiency (WUE) to achieve food security and promote sustainable farm management due to depleted rivers and aquifers. While impacts and immediate concerns of water scarcity are evident, adoption of WUE technologies has been historically slow, even when the technology proves to yield desirable results. Socio-economic impacts, legal framework, and the lack of knowledge-exchange programs are more salient on the adoption of sustainable water management than technology alone. Literature indicates an increasing demand for participatory approaches aiming to identify the scope of farmer concerns in order to actively target research objectives and actualize adoption. The Concerns-based Adoption Model (CBAM) has been identified as a useful participatory tool, enabling researchers and practitioners to increase understanding of innovation implementation. This study explored the potential implications of using the CBAM as a participatory tool for agricultural development projects in the Mediterranean region by 1) Identifying studies that have successfully applied the CBAM to an agricultural setting and 2) discussing the potential implications of integrating the CBAM into existing models of adoption to address the concerns of WUE program stakeholders in the Mediterranean region. A content analysis was implemented as the research design to accomplish the objectives of this study. The need for participatory approaches to WUE agricultural development projects was identified as a primary concern experienced by stakeholders in the Mediterranean region. Agricultural extension practitioners should consider using the CBAM to address stakeholder concerns, improve the likelihood of stakeholder involvement in the program development process, and enhance stakeholder innovation adoption.

Oral # 61\_ Sociology- Undergraduate & Graduate

**These are our sports': Kabaddi and Kho-Kho women athletes from the Islamic Republic of Pakistan**

Mr Umer Hussain

Women's participation in sports and physical activities lags behind that of men, particularly among members of underrepresented or marginalized groups. Pakistani women from the rural areas of southern Punjab represent one such group. The aim of this study was to examine how traditional sports that are less well-known outside the Indian subcontinent offer opportunities for marginalized Pakistani women from Southern Punjab to participate in physical activities. Following a phenomenological approach, we conducted 16 semi-structured interviews with Kho-Kho and Kabaddi women athletes from underrepresented groups in Pakistan. Elo and KyngÅs' (2008) three-phase content analysis process (preparation, organization, and reporting) was used to examine interviews. The results of the study revealed that participants feel constrained by the systematic masculine hegemonic culture institutionalized by Pakistani society and the Western sporting paradigm. However, the participants reported a sense of liberation and security via traditional sports. Our study contributes to the limited knowledge about women's participation in traditional sports beyond the Western world.

**Lived Experiences of Pregnant and New Mothers During COVID-19 Pandemic: A  
Narrative Analysis of YouTube Birth Stories.**

Ms Kobi V Ajayi

**Purpose:**

The COVID-19 virus has disrupted healthcare delivery and services around the globe. These disruptions have caused rapid changes to obstetric care protocols and impacted pregnant women that must give birth with tight restrictions and significant uncertainties. There is a gap in evidence about expectant and new mothers' experiences with birthing during the pandemic. This study sought to describe and understand pregnant and new mothers' lived experiences during the COVID-19 pandemic using authentic birth stories.

**Study Designs and Methods:**

Using a narrative analysis framework, researchers extracted relevant YouTube birth stories using predetermined search terms and inclusion criteria. The mothers' birth stories were narrated in their second or third trimester or those who had recently given birth during the pandemic. Birth stories were analyzed using an inductive and deductive approach to capture different and salient aspects of the birthing experience.

**Results:**

Overall, eighty-three birth stories were analyzed. Within these birth stories, four broad themes and thirteen subthemes emerged. Key themes included a sense of loss, hospital experiences, experiences with healthcare providers, and unique experiences during birth and postpartum. The birth stories revealed that the COVID-19 pandemic brought unexpected circumstances, both positive and negative, that impacted mothers' overall birthing experience.

**Conclusions:**

Results from this study provided a detailed description of women's lived experience with giving birth during the COVID-19 pandemic. Midwives and nurses need to provide clear communication and compassionate patient-centered care to relieve women's anxiety about uncertain and unpredictable policy changes regarding COVID-19 as the pandemic continues to evolve.

**The determinants of Muslim women's pro-sport hijab purchase intention: A theory of planned behavior perspective**

Mr Umer Hussain

In recent years, there is an upward trend of Muslim women buying sporting products. However, there remains a dearth of sport marketing scholarship regarding the key predictors of Muslim women's sporting products purchase intention. The purpose of this study was to explore the predictors of Muslim women's pro-sport Hijab purchase intention through the lens of the theory of planned behavior (Ajzen, 1991). Following Ajzen's (2019) recommendations, I collected data from Muslim women by using a mixed-method study approach: Study 1 (n = 23), Study 2 (n = 282), and Study 3 (n = 347). The study results revealed that Muslim women's pro-sport Hijab purchase intention is profoundly influenced by subjective norms ( $\beta = .578$ ) and their attitude ( $\beta = .187$ ). Further, subjective norms of Muslim women are shaped by their unique injunctive and descriptive normative beliefs. On the other hand, their attitude towards pro-Sport Hijab is dependent upon their distinctive behavioral beliefs. Overall, this study contributes to the limited knowledge about Muslim women's purchase intention of sporting products targeting their religious beliefs. I discuss the practical implications of the study.

Oral # 64\_ Sociology- Undergraduate & Graduate

**Detecting Children's Fine Motor Skill Development using Machine Learning**

Mr Seth Polsley

Children's fine motor skills are linked not only to drawing ability but also to cognitive, social-emotional, self-regulatory, and academic development. Current educators are assessing children's fine motor skills by either determining their shape drawing correctness or measuring their drawing time duration through paper-based assessments. However, these methods involve human experts manually analyzing children's fine motor skills, which can be time consuming and prone to human error or bias. With many children using sketch-based applications on mobile devices like smartphones or tablets, computer-based fine motor skill assessment has the potential to address limitations of paper-based assessment by using automated measurements. In this work, we introduce a machine learning approach for analyzing aspects of children's fine motor skill development.

Oral # 65\_ Work Force Psychology - Graduate

**Tente Theatre Group: Women, War and Healing.**

Ms Karen vannessa Cepeda Rivera

The research project is about the Tente Theater Group. Theater group made up of older women, located in Colombia. The actresses have learned theater empirically through the construction of a theatre play in which they do a memory exercise on the relatives who have been victims of forced displacement.

The project seeks to study the body of the members of the theater group. From two fundamental and transversal elements: resistance and memory. As they are active subjects in their social and daily context, either as human rights defenders, actresses, apprentices, or housewives. The Women of the theatre group have particular bodily characteristics developed in their different areas of life, which may obey general patterns and be subordinate to gender or class roles, and can also express exceptional narratives linked to the reappropriation of the body in the different narrative dimensions.

**Brain Stimulation and Risk Preferences and Behaviors**

Ms Ruixin Jia

Excessive risk-taking or risk-averse preferences may be detrimental to decision making. Overall, too extreme preferences for risk may lead to harmful consequences for individuals in the long-run in multiple domains, such as health, finance, education or cybersecurity. Currently, the internet plays a critical role in our life, for example for distance education, virtual clinic, online banking, etc. With the rise of those interactions and the internet, cybersecurity became a major industry with \$156.5 billion in 2019 in global market size while simultaneously being an important domain where risk-preferences may matter. We study the effect of exogenous transcranial direct current brain stimulation (tDCS) on risk preferences and behaviors. More specifically, we evaluate the effectiveness of brain stimulation to regulate risk preferences in the lab and in a risky environment where subjects make close to real-life cybersecurity decisions. Non-invasive brain stimulation, such as transcranial direct current stimulation may assist individuals with preferences for excessive risk-taking or risk-aversion by improving unwise decision-making. In order to study the effect of non-invasive brain stimulation on risk preferences, we use the Bomb Risk Elicitation Task to elicit revealed preferences in the laboratory. In addition, we use a math test with popup message choices to imitate an applied risky cybersecurity environment where forgoing safety updates, such as antivirus updates can increase the likelihood of costly computer systematic crashes. We hypothesize that the exogenous stimulation will alter individual risk preferences and subsequently individual choices in the risky cybersecurity environment change. Given the ambiguity in the literature, we attempt to fill the gap by altering risk preferences exogenously using transcranial direct current stimulation to examine the changes in risk behavior in a cybersecurity environment. Our contribution to the literature is testing the combination of economic decision making and cybersecurity awareness under brain stimulation context. This is a novel research question that uses a laboratory experiment to measure risk preferences and a reality simulating risk task involving a cybersecurity issue that affects almost every citizen of the world.



**Virtual Reality-based Behavioral Intervention Strategy: Defying Risk Habituation by  
Enhancing Workers'™ Vigilant Behavior**

Mr NAMGYUN KIM

Risk habituation impedes workers'™ ability to properly recognize and respond to hazards in workplaces. Workers, habituated to hazards, tend to underestimate risk and act unsafely. Prolonged or repeated exposure to similar hazardous situations causes a decrease in workers'™ vigilant behaviors (look-ups to check a hazard in workplaces). Sensing and analyzing vigilant behaviors are critical in understanding the risk habituation process. However, it is hard to observe and analyze workers'™ vigilant behaviors in a real working environment. To this end, the aims of this research are to: (1) develop immersive virtual reality (VR) construction environment to expose workers to repeated hazardous situations; (2) improve our understanding of how construction workers become habituated to hazards; (3) develop reinforcement learning strategies which effectively intervene risk habituation and enhance workers'™ vigilant behaviors. Simulated virtual accidents, resulted from unsafe behaviors, were adopted as a reinforcer. The results indicated that an accident experience in the VR environment has a correlation with the increase in workers'™ vigilant behaviors. The outcomes of this research will lay the foundation for further study to employ a virtual reality as a tool for the behavioral intervention strategy that effectively enhancing workers' safety behavior in hazardous situations.

Oral # 68\_ Work Force Psychology - Graduate

**Dispositional Malicious Envy and Workplace Deviance: Divergent Thinking as Mediator**  
Mr Umer Hussain

In the extant scholarship, researchers have underscored that malicious envy has a significant relationship with workplace deviance. However, there remains a paucity of research about specifying how employees can exhibit workplace deviance in an organizational scenario without being caught. In this study, we aim to investigate a relationship between dispositional malicious envy and workplace deviance, mediated by divergent thinking using the social comparison theory (Festinger, 1954). To achieve the study purpose, we collected data via a cross-sectional survey from employees (N = 363) working in the banking and telecom sector in Pakistan. The results illustrate that dispositional malicious envy can lead to workplace deviance through the divergent thinking mediation effect. The study adds to the limited knowledge about how dispositional malicious envy is associated with workplace deviance in the organizational scenario, especially when employees make lateral comparisons.

Oral # 69\_ Genetics (1)- Undergraduate

**Polly: A Software for Detecting Hotspots of Intraspecific Genetic Polymorphism**

Ms Annabel Rose Perry

Polly is a bioinformatics program intended to augment studies of hybridization and speciation. Polly detects hotspots of genetic variation within the genome of a single species. These hotspots contain multiple microsatellite, indel, and single nucleotide variant loci which evolve rapidly and can thus be used to elucidate biological relatedness.

**Identifying potential development markers in *Lucilia sericata* (Diptera: Calliphoridae) to improve insect age estimates for criminal investigations**

Ms Amanda Barraza

The blowfly, *Lucilia sericata* (Diptera: Calliphoridae), is a species of importance in many distinct fields ranging from forensic, medical, and veterinary science to evolutionary science. Previous work shows that *L. sericata* is a primary colonizer of human remains and can be used to aid legal investigations. The time of colonization (TOC) is used to infer the postmortem interval (PMI). The PMI is used to establish how much time has elapsed since death. Entomological evidence can be used to establish this timeline, however, there is an issue with using morphological characteristics alone to determine the age of a larvae collected from remains. Larval age based on development stage can be accurate, but is not precise enough to determine the exact age of the early stages of blowfly larvae, thus leading to imprecision in TOC estimates. A possible solution to determining the exact age of larvae and pupa are identifying specific genetic markers and their functions during stages of development such as the third instar stage to determine age within the development stage. This research employs a previously compiled list of development markers identified from the de novo transcriptome of *L. sericata*. A comprehensive, literature-based review was conducted in conjunction with a review of genetic repositories such as FlyBase to gather updated information on genes expressed at unique time points within development stages. This research has identified 9 genes of importance for the third instar and primer design is currently underway to evaluate their unique expression patterns for utility in legal investigations.

**Antibiotics Can Produce Motile Responses in Bacteria**

Ms Savana Maria Green

In nature, many soil bacteria exhibit unique, competitive interactions when exposed to a variety of stressors. To study this competition, we use two species of bacteria, *Bacillus subtilis* and *Streptomyces* species, which we cultured together. Using this system, we discovered that chloramphenicol produced by *S. venezuelae* induced a motile response in *B. subtilis*. The mechanics of the motile responses exhibited by *B. subtilis* are extremely complex, and the full regulatory network is not known. However, we can use chloramphenicol to study the regulated motile response. To do this, we selected genes in *B. subtilis* based on several factors including implications in morphology, motility, and antibiotic resistance. We tested several genes and found that genes *ycdA* and *yxaM* appear to support motile responses. To confirm a role for the genes, we are using deletion mutants to examine the loss of function phenotypes in competition. Uncovering the regulatory network of *B. subtilis*'s motile responses to competitive bacteria can provide valuable insights into antibiotic resistance which is an issue that has plagued the field of medicine for decades.

Oral # 72\_ Genetics (1)- Undergraduate

**PROTOCOL OPTIMIZATION OF qPCR FOR ANALYSIS OF EFFECTS OF  
ANTIBIOTICS ON MULTIDRUG-RESISTANT SALMONELLA POPULATIONS IN  
EXPERIMENTALLY CHALLENGED SWINE**

Ms Megan Babowicz

Antibiotic resistance is a food safety concern. Antibiotics are given to livestock for many reasons and this promotes the development of strains resistant to the antibiotics. These bacteria can result in resistant infections if they make it to susceptible consumers. My project is a continuation of a previous project wherein swine were challenged with pan-susceptible and multi-drug resistant strains of Salmonella. After several days of bacterial replication the swine were placed on a 14-day antibiotic course in the feed. I am analyzing stool samples collected on key days to examine the antibiotics effects over time on the Salmonella populations. I am analyzing the presence of qnrB19, bla<sub>SHV12</sub>, and invA genes in the samples via qPCR. These genes confer decreased susceptibility to quinolones, increased resistance to extended spectrum  $\beta$ -lactamases, and allow for invasion of the target cell respectively (the invA gene is universally present in Salmonella and acts as a marker for the pan-susceptible strains). I can then determine how many bacteria are in each sample to determine the antibiotics effects. I am currently focused on protocol optimization of the three experiments. The new qnrBMBab primers and probe show the most promise in producing a viable standard curve. bla<sub>SHV12</sub> has shown specificity issues and invA has amplified the genetic material but has detection issues. These issues will be addressed with adjustment of settings and replacement of materials. This optimization allows for streamlining of my own research and the potential addition of these sequences to the public knowledge for gene testing.

Oral # 73\_ Genetics (1)- Undergraduate

**Genetic Assessment of *Setaria* sp. in Cervids Using Molecular Analysis**

Ms Amanda Michaela Varner

Filarial worms are a type of nematode within the superfamily Filarioidea. They often have an intermediate, arthropod, host in addition to a definitive, vertebrate, host. Although there are three recognized species of roundworms in the *Setaria* genus affecting cervids in North America, there is little data on the topic, and many studies identify species morphologically rather than utilizing molecular analysis. Molecular analysis is an established method to identify species through a polymerase chain reaction and genetic sequencing in order to compare genetic material. Given the highly specific nature of genetic sequences, it is relatively simple to detect minute differences in DNA among species. Therefore, the purpose of this work is to investigate filarial worms in cervids in North America in order to gather epidemiological data regarding *Setaria* sp. This will allow for a more definitive understanding of the distribution and variety of hosts affected by these parasites.

Oral # 74\_ Educational Psychology - Graduate

**STEM Without Borders: Influencing STEM Career Interest Virtually and In-Person**

Ms Macie Baucum, Jose Lopez

The sudden onset of the COVID-19 pandemic has caused many dramatic changes to education, including the increase of online learning. Because of this, the organization, curriculum, and pedagogical techniques of synchronous and asynchronous online learning have come under close examination. While online learning has been studied in more formal settings, the implementation of online, informal learning delivers little published research, especially in the fields of science, technology, engineering, and mathematics (STEM). More specifically, the research on the social aspects of online learning is still in its infancy. Our purpose for this research is to report the influence of an online STEM camp on students' STEM career interest compared to a face-to-face STEM camp. In addition, we will also consider the effect that gender has on career interest between the two environments. This research can aid in the continuous development of STEM camps, both online and in person.



**Teachers' Knowledge: The Key to Students' Reading Success**

Mrs Alida K Hudson, Karol Moore, Bing Han

A crucial but often overlooked area of reading education is the importance of equipping educators with adequate content and pedagogical content knowledge to promote effective reading instruction based on the science of reading. We reviewed twenty-one empirical studies to examine the impact of teacher preparation and training programs on teachers' knowledge of the science of reading, focusing on the five core pillars of reading instruction, namely, phonological/phonemic awareness, phonics, fluency, vocabulary/ morphology, and text comprehension. We also identified program characteristics that promoted positive growth in teacher knowledge. Generally, findings support the effectiveness of training and preparation programs in raising teacher knowledge, with targeted, ongoing training in which teachers have the opportunity to apply their learned knowledge and skills under expert guidance producing the largest growth in teacher knowledge. Further, studies in this review demonstrate that improving teacher knowledge and providing support for implementing new knowledge may translate to a change in instructional practice that leads to improved student word-level outcomes. Implications of findings will be discussed.

Oral # 77\_ Educational Psychology - Graduate

**Universal design for learning in postsecondary education: a qualitative study to explore perspectives of students with disabilities**

Ms Yi-Fan Li

This study served as a follow-up to a prior survey study to further examine the learning experiences of students with disabilities in regard to UDL practices. This study used a qualitative research method, interpretative phenomenological analysis (IPA), to conduct the study. The researcher demonstrated her ontological and epistemological standing and her positionality in this study. Focus groups were used to collect data with 10 participants. The standard IPA data analysis process was used to analyze the data, and seven final themes were identified. Discussions and implications were presented in this study.

**Range of Mathematics Abilities within U.S. Grade Four and Eight Classrooms**

Mr Blaine Pedersen

Students enter school with a wide variance in academic abilities and are influenced by various social systems in ways that sustain these disparities over time. As a result, the range of abilities within classrooms is assumed to be large, but to date has not been confidently characterized. While well-intentioned, an educational system that largely determines academic need based on age fails to meet the needs of potentially millions of students it ostensibly serves due to this divergence in academic abilities. Delivering instructional experiences appropriately matched to the students' individual needs is ideal. However, before such instruction can be considered, educators must determine if this type of instruction is feasible under the current system which uses age as a proxy of academic need. To do so will require the ranges of abilities within a typical classroom to be determined, which is absent in the extant literature. If the true ranges of abilities within classrooms are vast, then it is likely that instruction driven by age-based grade-level standards will underserve many students, and delivering appropriately matched instruction may not be feasible.

The current study leverages nationally representative data gathered from the 2015 Trends in International Mathematics and Science Study (TIMSS) to determine the full range of mathematics abilities within U.S. grade four and eight classrooms. These data contain reliable measures with a low floor and high ceiling, capturing the full range of academic abilities within classrooms, as well as accurate indicators for classroom observations, and the design weights needed for appropriate analysis. Advanced statistical techniques for working with complex survey data were used to determine the expected range of mathematics abilities within prototypical U.S. grade four and eight classrooms as well as the proportion of variance in achievement that exists within classrooms.

Results of these analyses indicate that 70% and 35% of all U.S. grade four and eight classrooms contain students scoring in all four of the TIMSS international benchmarks, respectively. The TIMSS international benchmarks are placed on a scale of low, intermediate, high, and advanced, which are rigorously anchored to represent distinct levels of student competency such that the difference between them represents a wide range of ability. This implies that a majority of grade four classrooms contain students who may need assistance recognizing a number in the thousands in the same classroom with a student capable of simple unit conversion involving properties of inequalities, yet they receive similar instruction. Finally, decomposed variance components estimated from unconditional multilevel linear models indicate that about 67% and 45% of the variance in mathematics achievement exists between students within classrooms for grades four and eight respectively, further demonstrating that age is an inappropriate proxy for academic need.

Given this wide range of abilities within U.S. classrooms, it is unlikely that instruction driven by age-based grade-level standards will underserve potentially millions of students. The implications of these results on classroom instruction and the feasibility of the current U.S. educational system to adequately meet the academic needs of the students it purports to serve will be discussed. Further, the knowledge generated from this work will be valuable to all educators and policymakers interested in delivering more targeted learning experiences for all students.

Oral # 79\_ Educational Psychology - Graduate

**Automatically Generated Concept Maps for Teaching Physics**

Mr Michael S. Rugh

The purpose of this study is to investigate the effect using Dynamic and Interactive Mathematical Expressions (DIME) maps may have on self-efficacy and understanding of connections between physics concepts. The DIME Map system automatically generates DIME maps, which are personalizable and manipulable concept maps that allow students to visualize and interact with the mathematical concepts contained in any PDF textbook or document. We used a pretest/posttest control group design with high school students ( $n=31$ ). We used a MANOVA and found the treatment to have a statistically significant ( $p<.05$ ) positive effect on growth in self-efficacy and understanding of connections. Interactions with gender are discussed. We conclude that DIME maps can be valuable learning tools, especially for female students.

**Promoting friendships for young adults in inclusive college courses: Voices of peers & faculty**

Ms Sehrish Shikarpuriya, Courteny Osburn, Alexis Villarreal, Abigail Tassin, Megan Benzal, Christina Williams

Self-determination and socialization are significant indicators of effective transition to employment for young adults with intellectual and developmental disabilities (IDD). Current literature elucidates the social outcomes experienced by young adults with IDD, such as increased loneliness, reduced friendships, and lower employment opportunities. However, inclusive postsecondary programs have committed to bridging this gap by increasing opportunities for social inclusion. Transition literature extensively documents the role of student organizations, employment training, and peer mentorship as pathways to increase friendships and social networks of young adults, but the role of inclusive academic courses have yet to be explored. Understanding the role of friendships in inclusive academic courses could result in meaningful development of self-determination skills, organic and unstructured conversational skills, and social skills necessary for obtaining and maintaining employment. Thus, using a mixed methods design, this study examines the experiences of peers and faculty around social inclusion, and explores factors that contribute to the development of friendships between young adults with and without IDD in inclusive college courses. The co-researchers of this study are undergraduate students with intellectual disabilities to advance inclusive research practices. Implications for this study include reexamining future training or support provided to faculty/instructors for teaching inclusive academic courses. Knowledge of factors that contribute to friendships in inclusive academic courses impacts transition-related training for young adults both in k-12 and postsecondary education. Furthermore, this study equips young adults and their families with knowledge of the expectations held by peers and faculty regarding inclusive courses and informs of positive experiences held by all stakeholders. This study will also contribute to research in teacher education, teacher training, diversity and inclusion studies in academic settings, transition-related initiatives, inclusive postsecondary programs, and for higher education programs.

**The Financial, Academic, and Mental Impact of COVID-19 on International Students in the United States**

Mr Eniola Olatunji, Ayobami Ogunsola, Ifeoluwa Oginni, Mercy Udeh, Yeka Nmadu, Faith Elenwa

**Introduction:**

The United States (US) is one of the top five host countries to International students globally. Since the COVID-19 outbreak in the US, unprecedented challenges have threatened the financial, academic, and mental wellbeing of international students. Under normal circumstances, many international students face challenges regarding their mental health, finances, and academics. The Covid-19 pandemic may have placed many students especially foreign students in a precarious situation.

**Objective:**

Our study aims to analyze the financial, academic, and mental health impact of the Covid-19 pandemic on international students inside the US using a survey of international students at Texas A&M University (TAMU).

**Method:**

In this study, international students are defined as students who leave their home country to study in the US at the undergraduate or postgraduate level. A cross-sectional survey design was adopted using online questionnaires administered through Qualtrics. The study participants were TAMU international students at the College Station campus. Inclusion criteria include enrollment at college, graduate, or post-doctoral level and identification as a non-US citizen or permanent resident. 281 students participated in this study.

**Results:**

Our preliminary findings showed that 59% of international students are satisfied with the University's response to the pandemic, while 24% feel dissatisfied and 17% were undecided. 21% of the study participants reported no challenges to using hybrid learning while 79% of students identified internet access, class schedule, and utilizing online classroom meeting platforms as a challenge. 24% of participants lost funding such as grants, part-time jobs, and scholarships due to the pandemic. Furthermore, 46% of respondents noted that the pandemic did not impact their finance while 52% of the respondents reported a reduction in finance. 55% of international students had a support group for emotional assistance while 45% of students do not. 91% of international students reported negative emotions like anxiety since the onset of the pandemic.

**Conclusion**

Our analysis showed that the pandemic posed a major challenge to international students in TAMU across all three domains. The impact of the pandemic was higher on the mental health of study participants compared to its financial and academic impact.

**Determining the drivers of honey bee (*Apis mellifera*) self-removal behavior**

Ms Jordan Twombly Ellis

The honey bee (*Apis mellifera*) is an economically important pollinator and a tractable system for studying the behavioral consequences of eusociality. As a eusocial species, honey bees live in colonies of thousands of sterile female workers with only one reproductively active female. Therefore, a sterile worker's own genetic fitness is best served by acting in the interest of her colony, even if that behavior curtails her own lifespan. Stressed bees typically leave the colony to forage early, which leads them to be underdeveloped and unproductive foragers. This precocious foraging behavior can even lead to colony collapse. In this study, we test the hypothesis that developmentally stressed worker bees remove themselves from their colony due to extreme stress. To confirm that this behavior is a reaction to severe stress, and not a parasite or social immunity driven behavior, we stressed bees with either cold or Varroa mites during pupation. Bees that we stressed with mite parasitization or cold shock, as well as their control counterparts, were tagged upon emergence and introduced to a common observation hive. We took daily attendance of the focal bees as well as checked a trap engineered to capture self-removing bees every hour. We have found that the stressed bees from both groups live for significantly less time and self-remove at a significantly higher rate than their unstressed counterparts. Stressed bees also have smaller hypopharyngeal glands than their unstressed controls indicating that this is a stress driven behavior and potentially a form of extremely accelerated precocious foraging.

Oral # 83\_ Biology (2)- Graduate

**Varroa destructor mite decision-making process regarding honey bee worker cell invasion and size implications for developing bee brood**

Ms Taylor Reams

Parasitization of honey bees (*Apis mellifera*) by the mite *Varroa destructor* is one of the main causes for the decline of honey bee health. To begin its reproductive cycle, a gravid female mite enters the comb cell of a bee larva just before it is capped, undergoes development and reproduction within the cell, and exits the cell as the adult bee emerges. The main difference between *Varroa* infestations in their original host, *Apis cerana*, and *Apis mellifera* is that in the latter the mites are able to invade and successfully reproduce in worker larval cells. This study examines if worker brood is differently at risk for *Varroa* invasion with proximity to drone brood. This study also measures developmental brood size with *Varroa* invasion and feeding. Understanding distribution of *Varroa* in worker brood and how mite feeding impacts brood developmental will give us a better picture of *Varroa* impact in our honey bee colonies.



**Genetic Determinants of the Flower Color Transition Phenotype in Tetraploid Rose Populations**

Ms Haramrit Gill

Roses are the most popular ornamental plants worldwide and have high economic importance. Enhanced and unique flower color and pigmentation patterns are important breeding objectives in rose breeding. We observed an interesting trait that we call "flower color transition"™ in two tetraploid rose populations: "Stormy Weather"™ X "Brite Eyes"™ (SW X BE) and "My Girl"™ X "Brite Eyes"™ (MG X BE). Rose plants that manifest this trait produce flowers that transition from a light-yellow color to a dark pink/red (accumulation of anthocyanins) as the flower ages leading to bushes peppered with flowers of multiple colors. This phenomenon has not been studied in roses. In this study, we identified quantitative trait loci (QTL) that control this trait. Our preliminary analysis suggests the presence of QTL on chromosomes 2, 3 and 4 and chromosomes 6 and 7 in the SW X BE and MG X BE populations, respectively. The position of QTL identified here coincide with the location of genes involved in the flavonoid biosynthetic pathway. Additional studies are underway to validate these results.

**Dissociation at Daybreak: The Story of NO<sub>3</sub> Photodissociation**

Mr Nick Joseph Shuber

The photodissociation of the nitrate radical has a long history that has changed perspectives on how molecular elimination can occur in atmospheric chemistry. The lower energy molecular elimination channel of this molecule belongs to a family of unique dissociations that avoid conventional transition states, called "roaming". It is the first documented case where a roaming mechanism exhibits significant excited state dynamics, and is also one of the few roaming open-shelled species to be discovered. However, several questions remain regarding the energy specificity of this particular channel, and why the window for molecular elimination is only a few hundred wavenumbers. Through the use of velocity map imaging (VELMI) and resonance enhanced multi-photon ionization (REMPI), the narrow dissociation channel can be used to sample the effects that parent internal energy states have on roaming dynamics, and give insight into why NO<sub>3</sub> dissociates along the roaming pathways. These pathways are suspected to be shared by a similar system to the nitrate radical: the nitromethyl radical, CH<sub>2</sub>NO<sub>2</sub>. Being isoelectronic and suspected of roaming dynamics, the study of this molecule with similar methods could further our understanding of roaming as a whole, as well as what differences within these systems cause their varied dissociation characteristics.

**Determinants of Viral Suppressor of RNA Silencing Activity in the Zika Virus Capsid Protein**

Ms Nese Coskun

Outbreaks of mosquito-borne diseases such as yellow fever, dengue fever, chikungunya and Zikaâ€™s burden to health increases every year. Despite our best efforts at the control of these pathogens, the 2015 Zika epidemic in Brazil caused more than 3,7000 children born with birth defects. A better understanding of how the Zika virus (ZIKV) maintains its transmission cycle may provide valuable insights to novel development strategies for disease control and prevention. ZIKV transmission cycle involves persistent infection of mosquitoes, which is a possible point of human intervention for future disease control strategies. We postulate that to establish and maintain persistent infections of the mosquito ZIKV must have an antagonistic protein against its immune system. ZIKV capsid proteinâ€™s ability (ZIKC) to nonspecifically bind dsRNA, a trigger for the mosquitoâ€™s immune system, suggests that the ZIKC possesses an immune suppressor activity. We designed 25 ZIKC mutants to identify the functional requirements of ZIKCâ€™s dsRNA binding through the introduction of a series of deletions, truncations, and alanine substitutions. The ZIKC mutants tested in the recombinant SINV expression system, as attenuation of the disease phenotype in *Aedes aegypti* mosquito is expected to serve as a reliable proxy for impairment of dsRNA binding and suppression activity. 5 ZIKC mutants with alanine substitutions showed attenuation and thus selected for further investigation in ZIKV infectious clone system.

**Regional and sex-dependent differences in the microbiome of *Ixodes ricinus* ticks**

Ms Maliha Batool

**Introduction:** Understanding the microbial ecology of disease vectors may be useful for development of novel strategies aimed at preventing transmission of vector-borne pathogens. Although *Ixodes ricinus* is one of the most medically important tick species, the microbiome of *I. ricinus* ticks has been dissected for only limited parts of the globe. To date, the microbiome of *I. ricinus* from Eastern Europe has not been defined. The objective of this study was to compare microbiomes of *I. ricinus* ticks within (males vs. females) and between collection sites that represented three administrative regions of Ukraine, Dnipropetrovsk (D), Kharkiv (K), and Poltava (P).

**Methods:** A total of 89 individual microbiomes of questing *I. ricinus* adults were analyzed by targeting the V6 region of 16S rRNA gene through the Illumina 4000 HiSeq sequencing.

**Results:** The alpha diversity analyses demonstrated that, regardless of tick sex, patterns of bacterial diversity in ticks from regions K and P were similar, whereas the microbiome of region D ticks was quite distinct. A number of inter-regional differences were detected by most beta diversity metrics for both males and females. The inter-regional variations were also supported by the unweighted UniFrac results with three region-dependent clusters of female ticks and one distinct cluster of region D males. Lastly, numerous region- and sex-specific differences were also identified in the relative abundance of various bacterial taxa.

**Conclusions:** Collectively, the present findings demonstrate that the microbiome of *I. ricinus* ticks can exhibit a high degree of variation between tick sexes and geographical regions.

**Genome-wide Identification of Copper Responsive Genes in *E. coli***

Mrs Kaitlin Casanova Hampton

Uropathogenic *Escherichia coli* (UPEC) is the primary causative agent of Urinary Tract Infections (UTI), affecting ~150 million people annually. Transition metals are essential micronutrients for pathogens, but can be toxic in excess. We have shown that copper (Cu) is mobilized to the urinary tract as a host immune response, and impairs bacterial colonization during UTI. Primary Cu detoxification systems in *E. coli* are known, but a system-level understanding of *E. coli*'s response to Cu stress is lacking. Our objective is to determine the genes playing a significant role in *E. coli*'s response to copper toxicity through phenotypic profiling. We screened the KEIO library of ~4,000 non-essential, single-gene deletion mutants in *E. coli* BW25113 to comprehensively evaluate the core genes involved in Cu stress response. We identified 60 and 27 mutants that exhibit a consistent Cu-sensitive and Cu-resistant phenotype, respectively. Among these, mutants deficient in the TonB-ExbB-ExbD energy transduction complex, ferric-enterobactin ABC transporter, and enterobactin biosynthesis presented to be Cu-sensitive. Together, the FepBCDG transporter and the TonB-dependent FepA outer membrane transporter imports ferric-enterobactin across the cell envelope. Enterobactin has the highest affinity for iron among siderophores produced by Gram-negative bacteria. Our findings are significant because they indicate that enterobactin-mediated iron uptake is involved in combating Cu stress in *E. coli*. In conclusion, we have identified new genes involved in modulating the response of *E. coli* to Cu stress. Studies are in progress to understand the mechanisms of Cu-resistance/sensitivity.

**Impact of COVID-19 on beekeeping operations in Texas and Louisiana**

Mr Omar Khan

The socio-economic impacts of COVID-19 have yet to be truly revealed; there is no doubt that the pandemic has severely affected the daily lives of most of humanity. It is to be expected that beekeeping operations have been impacted to varying degrees, but no data exists on how widely COVID-19 has negatively affected the industry. An online survey was disseminated by the Texas A&M honey bee lab to various beekeeping organizations throughout Texas and Louisiana in order to collect data on the impact. The data showed that almost every participant (n=219) reported an impact on one or more activities that generally required travelling, like commercial honey operations, outreach, and sales. At a state and local level, the lack of beekeeping schools/conferences has made it more difficult for members to get started and for beginner beekeepers to gain vital experience. Since the basic activities of beekeeping can be related to many agricultural fields, these findings can be extrapolated to other fields to also analyze the impacts of COVID-19.

Oral # 90\_ Agriculture Economics- Undergraduate & Graduate

**Measuring the Impact of Oil Price Shocks on the Texas Economy During the COVID-19 Pandemic**

Mr Sean Kluver

This thesis paper examines the effects of the 2020 oil and gas downturn on local Texas labor markets. The drop in oil prices caused by the events surrounding the COVID-19 virus are unique in US history and create a need for unique and specific analysis. The paper analyzes multiple factors when determining results including oil production, oil price, COVID-19 cases, unemployment, population, etc. Using this data, we will run multiple OLS linear regressions with the aim of finding the magnitude of effect and determining whether certain oil-dependent Texas counties are more susceptible to increases in unemployment when the oil and gas industry experiences a downturn. Our hypothesis based on previous literature and preliminary research is that the regressions will show an economically significant correlation of oil prices with unemployment.

**Promoting Workforce Readiness: Investigating Agricultural Students' Professional Skill Development and Career Identification**

Ms McKenna Leigh Bush, Jean Parrella

Students in the food, agriculture, natural resources, and human (FANH) sciences must master vocation-specific skills and professional skills to function effectively in their careers. Therefore, educators should strive to help students develop both. We used a survey research design to investigate students' perceived importance and development of professional skills. Crawford et al.'s (2011) soft skill clusters guided the development of our survey instrument, which we distributed to all students in the Texas A&M University College of Agriculture and Life Sciences. We achieved a 13.24% response rate ( $n = 991$ ). Using a 7 ranking scale, respondents perceived communication skills to be the most important of all professional skills for career success (81.13%), and decision-making skills to be the second most important (64.48%). In addition, the majority of respondents (52.9%) considered professional skills to be more important than discipline knowledge and discipline technical skills. MANOVA results revealed statistically significant differences between students who knew the type of career they wanted to pursue and those who did not. Students who knew what type of career they wanted to pursue believed their communication skills [ $F(2,750) = 5.28, p = .005, r = .13$ ], decision making skills [ $F(2,750) = 5.52, p = .004, r = .13$ ], leadership skills [ $F(2,750) = 5.50, p = .000, r = .18$ ], professionalism skills [ $F(2,750) = 8.32, p = .000, r = .17$ ], self-management skills [ $F(2,750) = 7.10, p = .001, r = .16$ ], and teamwork skills [ $F(2,750) = 3.11, p = .001, r = .12$ ] were better developed than students who did not know the type of career they wanted to pursue. Results suggest students in the FANH sciences understand competencies required to be successful in the modern workplace. We recommend educators help students identify career interests early in their academic pursuit to enhance their perceived development of professional skills and career-readiness.



**Can one fake video on YouTube influence your scientific perceptions?**

Mrs Taniya Jayani Koswatta

Fake news has been a threat to our society. Fake news especially surrounding scientific controversies such as the health benefits of organic foods has led to changes in eating habits. Using a posttest-only control group design ( $n = 640$ ), we tested how factual and nonfactual information influences the public perception of organic foods. Participants from a southern land grant university were randomly assigned to watch one video, a factual, nonfactual, or control. Members in each group then indicated changes in perception about organic foods immediately after watching the video. Data were analyzed using one-way ANOVA, Kruskal-Wallis, and Two-way ANOVA tests. The nonfactual video had the highest influence on public perception of organic foods. Findings confirmed that the effect of misinformation is higher for individuals who have preexisting beliefs consistent with the message communicated and people have an average to a high level of exposure to health and diet news. These findings suggest that to reduce the susceptibility of misinformation on organic foods, communication should aim to increase healthy skepticism. It should also design communication considering the audience's preexisting beliefs and frequency of health and diet news exposure. Additionally, we found that measuring changes in perception using two scales (numerical rating scale and summed scale) provides better insight on influence made by the message. It helps to overcome possible pitfalls of using one scale.

**Planning Science Outreach: How to find your audience (or not)**

Ms Joanie Theresa King

Front-end surveys are a way to understand an audience before creating a science communication product or implementing an informal science education event. Gathering data about the experiences, knowledge, motivations and concerns of users or participants can help meaningfully focus your content and activities. We developed such a survey to gain information on adults's perspectives on genetically modified (GM) organisms (GMOs), especially genetically modified insects (GMIs), for the purposes of creating an informational video. Respondents were asked ten questions about their perceptions of GMOs and GMIs on a 5-point Likert scale. In addition, multiple choice and true or false questions were asked to gauge respondents' understanding of GM Science and gene expression. Open-ended questions captured what people want to know about GMOs and their preferred way to receive science content. Due to the COVID-19 pandemic, the survey collection methods changed from in-person at various locations across Texas to on-line. Demographic information was collected on age, race, household income, and education. Despite posting the survey link on multiple social networking sites (Facebook, Instagram, and Twitter) and entomology groups, the respondents were heavily biased towards White (86.4%), educated (32.1% with a bachelor's degree and 45.1% with a graduate degree or equivalent), and wealthy (22.3% \$75,000-\$99,999 and 30.9% \$100,000 or more). This research presents our data and calls for more attention and research to be done on filter bubbles (social media bubbles) and a need for broader participation in science communication and informal science learning.

**Transcriptomic analysis of the honey bee (*Apis mellifera*) queen brain in response to pesticide exposure during development**

Ms Myra Dickey

Honey bees (*Apis mellifera*) are the most economically important insect, supplying an estimated \$15 billion annually to our agricultural economy, primarily through crop pollination. Despite their importance, honey bee health has been challenged in recent years due to several factors including poor queen quality, parasites and pathogens, and exposure to pesticides. Our ongoing research projects are focused on understanding how queen health is affected by exposure to agricultural pesticides during development. Developing queens can be exposed to pesticides in the beeswax over time, including miticides used to treat the ectoparasitic mite, *Varroa destructor* and agrochemicals collected by foragers. Because behavior is dictated by neural responses, we want to understand how pesticide exposure during development might affect gene expression in the adult queen's brain. Here, we sequenced the brain transcriptome of experimental queens that were reared by grafting one-day-old larvae into wax-coated cups that were either pesticide-free, or those containing field-relevant combinations of the miticides tau-fluvalinate and coumaphos (FC group), the miticide amitraz (A group), and the agrochemicals chlorothalonil and chlorpyrifos (CC group). We allowed the queens to develop to adult and mate naturally. Once the queens were laying, we then dissected their brains (n = 3 per treatment), extracted RNA and sent the samples for sequencing. Preliminary analysis revealed 247 differentially expressed genes (DEGs) in the FC group, 668 DEGs in the A group and 244 DEGs in the CC group. Gene ontology analysis is ongoing to identify novel pathways associated with queen physiology for the focus of future studies.

**Transporter-mediated modulation of inorganic phosphate concentrations in chloroplast stroma and cytosol in *Arabidopsis thaliana* leaves**

Ms Aditi S Raju

Plants must maintain the concentration of inorganic phosphate (Pi) in the chloroplast stroma within relatively narrow limits. If the concentration is too low then ATP synthesis via photophosphorylation would be restricted, whereas high Pi concentrations would inhibit the synthesis of transitory starch, which is required to meet the plant's need for carbon during the night. However, it is unclear how Pi concentration is modulated in this subcellular compartment.

Pi transporters located in the chloroplast inner envelope are ideally positioned to control the flux of Pi between the stroma and cytosol and thereby coordinate photosynthesis and carbon metabolism with environmental and metabolic conditions. To assess the roles of two plastidic Pi transporters, TPT and PHT2;1, in cellular Pi compartmentation, we generated transgenic *Arabidopsis thaliana* plants with a genetically encoded FRET based Pi biosensor targeted to either the stroma or cytosol of wild-type plants and each of the respective loss-of-function transporter mutants.

Confocal ratiometric imaging revealed that stromal Pi levels in palisade mesophyll cells varied over the course of a photoperiod in each genotype, and were reduced in both *tpt* and *pht2;1* mutants. Stromal Pi levels were further reduced in a double mutant suggesting that TPT and PHT2;1 have specialized, but partially overlapping, roles in chloroplast Pi homeostasis.

Moreover, analysis of cytosolic Pi revealed elevated levels in *pht2;1*, as expected from a defect in chloroplast Pi import, but reduced cytosolic Pi levels in *tpt*, which we hypothesize reflects its coupled roles in Pi homeostasis and carbon metabolism.

**Novel antimicrobial compounds disrupt *Escherichia coli* membrane potential modulation**

Ms Mary Ashley Hudson

The prevalence of antibiotic resistant infections is increasing at an alarming rate, affecting approximately 2 million individuals in the United States each year. Many species of bacteria have given rise to pathogenic strains that fail to respond to last-resort antibiotics. Nevertheless, the rate at which new classes of antibiotics are being developed and utilized has declined since the golden era of antibiotic discovery that occurred during the mid-20th century. Thus, it is critical to identify antimicrobial compounds with novel targets that can work alone or in synergy with currently available treatments. An abundance of evidence suggests that proteins that modulate bacterial membrane potential (MP) make ideal targets for antimicrobials. These targets often play a critical role in important physiological processes in bacteria, such as motility, transport, and ATP production, and several recent studies have demonstrated that altering the MP can increase the efficacy of currently used antibiotics – even those in which resistance has already developed. To uncover novel antimicrobial compounds that target MP modulating processes, I developed and validated a high-throughput fluorescence-based assay and screened ~30,000 library compounds for those that elicit MP changes in *Escherichia coli*, a pathogen and well-studied model organism. Using this approach, I identified 171 compounds that alter MP in a dose-dependent manner and at least four compounds that completely inhibit *E. coli* growth. To identify the targets of the compounds, *E. coli* was subjected to ethyl methanesulfonate mutagenesis to generate resistant strains. Strains that grew in the presence of high concentrations of the MP-altering compounds are being sequenced to better understand the precise molecular mechanisms altering MP. Future work is focused on experimentally confirming compound targets and performing experiments in multi-drug resistant pathogens.

**Connectivity Mapping of Neural Progenitor Cells for Restoring Locomotion after Spinal Cord Injury**

Ms Ashley Tucker

Spinal cord injury (SCI) is a traumatic and life altering event that frequently results in the loss of voluntary motor function after injury. Currently, there are no clinically effective treatments to restore severed locomotor circuitry after injury. Neural progenitor cells (NPCs) are a promising potential therapeutic intervention for SCI due to their ability to mature into all neuronal subtypes of the spinal cord and make functional synaptic connections with surviving host neurons. In order to reconstruct locomotor circuitry following traumatic spinal cord injury using NPCs, it is first critical to determine the number and phenotypes of transplanted neural progenitor cell-derived neurons that establish direct synaptic connections onto spinal cord motor neurons after spinal cord injury. In this study, we used monosynaptic rabies tracing to characterize the presynaptic inputs onto spinal cord lumbar motor neurons in mice that received a T12 spinal cord injury and NPCs. Using immunohistochemistry, we first identified rabies+ neurons outside and within the NPC transplantation site. Rabies+ neurons found within the NPC transplantation site were marked for their location within the graft and distance from host lumbar locomotor pools. We are currently identifying the identity of NPCs that have made direct synaptic connections onto lumbar motor neurons as well as characterizing the neuronal phenotypes of the grafted NPCs. Ultimately, these findings will inform future work to elucidate the transplanted neuron populations that will be most critical for restoring locomotor function after spinal cord injury.

**BMP2 Followed by BMP9 Treatment Induces Articular Chondrogenesis in Mouse Fibroblasts.**

Mr Yu-Lieh Lin

Osteoarthritis affects more than 200 million people worldwide and represents a major health and economical problem. Since articular cartilage has poor self-repair capability, the therapeutic strategies to restore the articular cartilage phenotype focus on transplanting externally cultured chondrocytes or stem cells into chondral lesions. However, the effective clinical outcome is limited because cultured cells tend to differentiate into fibro- or hypertrophic chondrocytes, and not hyaline articular chondrocytes. Our previous studies have reported that BMP9 is a remarkable inducer for hyaline articular cartilage formation both in vivo and in vitro. In addition, P3 fibroblasts isolated from mouse terminal phalanx (P3) digit exhibit strong chondrogenic induction in response to BMP9 treatment. However, P3 fibroblasts are heterogeneous and contain both chondrogenic and non-chondrogenic forming populations. The aim of this study was to clone single cells from P3 fibroblasts and determine their chondrogenic ability. These clonal cell lines were expanded and their response to BMP9 treatment in high-density pellet culture was investigated. Furthermore, clonal cell lines were aggregated and differentiated into chondrocytes using a two-step chondrogenic protocol in an un-coated petri dish that includes BMP2 and BMP9 treatments. Three clonally-derived chondrogenic cell lines were identified (P3\_D7, P3\_D8, and P3\_E3) and each, based on histological analyses, differentiated distinct types of articular chondrocyte in 18-day cultures. Combining histological and molecular analyses the evidence suggests that P3\_D7 and P3\_E3 cell lines form superficial and deep layer articular chondrocytes respectively, whereas the P3\_D8 cell line displays stem cell characteristics, differentiating into articular chondrocytes organized into superficial, middle, and deep layers of articular cartilage. These results will be utilized for the identification of different types of articular cartilage progenitor/stem cells to improve clinical strategies of cell-based osteoarthritis therapy.

**Impaired de novo bone formation in the Dp16 Down Syndrome mouse model**

Ms Kirby Michele Sherman

Down Syndrome (DS) is a common birth defect caused by trisomy of human chromosome 21 (Hsa21). Previously, we have shown that DS patients have low bone turnover leading to decreased bone mineral density, delayed accrual of peak adult bone mass, and presumably increased fracture risk. However, it is not known whether low bone remodeling in DS patients impacts bone healing and de novo bone formation. In this study, the DS mouse line Dp16 C57/Blk was used to investigate de novo bone formation after amputation of the terminal phalanx (P3). P3 amputation is a standardized model of mammalian injury that faithfully triggers de novo bone formation. Here, we tested the hypothesis that P3 de novo bone formation is attenuated in Dp16 mice. At 8 weeks of age, Dp16 DS and WT mice underwent P3 amputation, followed by sequential in vivo microCT to determine the anatomical, volume, and length changes over 63 days post-amputation (DPA) of de novo bone formation. Dp16 DS mice had significantly lower BV/TV compared to WT pre-amputation. Following amputation, P3 digits of Dp16 DS males had significantly less bone length at 21 and 28 DPA and less bone volume at 35DPA compared to WT, although all differences were resolved by 63DPA. Our preliminary data suggests DS males exhibit attenuated bone accrual; reaching complete P3 regeneration by 63DPA compared to 42DPA for WT. Histological analysis of the later stages of P3 regeneration will provide novel insight into the delayed regeneration seen in the Dp16 mouse model of DS.



**Raman-Based Identification of Tick Species by Spectroscopic Analysis of Their Feces**  
Mr Nicolas King Goff

The United States Cattle Fever Tick Eradication Program prevents the reintroduction and spread of two tick species (*Rhipicephalus annulatus* and *R. microplus*) that are arthropod vectors of pathogens causing bovine babesiosis, also known as Texas cattle fever. Both tick species and pathogens are endemic in Mexico. Surveillance procedures to detect and identify these ticks is presently dependent on human physical inspection of individual cattle. In this study, we investigated the possibility of the identification of tick species based on spectroscopic signatures of their feces which are deposited on the skin of cattle during blood-feeding. For this, multiple spectra were collected from individual grains of feces of seven different species of ticks. Our results show that RS can be used to reveal different chemical compositions of these excrements, which allows for the identification of the tick species based on its feces. Additionally, using chemometric methods, we distinguished between these different tick species with high accuracy. Though the use of a portable spectrometer reduced the resolution of the spectra compared to the confocal, it still has the potential to be used to differentiate between tick species based on their feces. This study demonstrates Raman spectroscopy's efficacy in the detection of tick species of veterinary importance.

**Honey bee (*Apis mellifera*) macronutrient regulation and Deformed wing virus tolerance**

Ms Cora Garcia, Jordan Gomez

Deformed wing virus (DWV) is one of the leading causes of overwinter collapse in managed honey bee (*Apis mellifera*) colonies due to its effects on an individual's physiology, including decreased longevity due to crumpled wings from adult emergence and poor hive task performance. DWV titers are highest in colonies that are heavily parasitized by the mite *Varroa destructor*, which is a vector of the virus. Organisms have been proven to alter their diets to meet nutritional needs in response to infection of pathogens, through increasing protein ratios to improve immunity or through the reduction of protein ratios to limit nutritional sources available to the pathogen. This project is focused on the use of various diets with varying nutritional specifications to manage DWV levels in honey bee colonies. Caged cohorts of test bees were injected with a DWV inoculum created from DWV positive bees. To assess the effects of diets differing in the ratios of proteins to lipids on DWV infection, no-choice assays were performed with three different test diets. This no-choice assay showed that mortality of DWV infected bees was highest when fed a high protein diet, and that there is significant risk associated with feeding high-protein diets. This work will elucidate the benefits of a honey bee diet with specific macronutrient ratios to combat viral infections in a realistic method that is both effective, and practical to beekeepers.

**The Attenuation of Belowground Indirect Plant Defenses Following Sustained Herbivory  
by *Acalymma vittatum***

Mrs Emma Manuel

To defend themselves from herbivory, plants can produce volatile organic compounds as indirect defenses that recruit natural enemies to kill insect herbivores. These herbivore-induced plant volatiles (HIPVs) are activated when plants sense an insect herbivore is present, often in response to feeding damage. However, some herbivore species can circumvent plant indirect defenses. In a recent study, we found that striped cucumber beetle larvae (*Acalymma vittatum*) attenuate HIPVs from roots of cucumber (*Cucumis sativus*) plants with sustained herbivory. Although *A. vittatum* herbivory initially induced HIPV production, after larvae fed continuously for seven days, HIPVs were not different from undamaged roots. We suspect that *A. vittatum* larvae harbor microorganisms (fungi and/or bacteria) in their regurgitant that inhibit *C. sativus* indirect defenses. To test this hypothesis, larvae were treated with antimicrobials (AB) to reduce their microbial symbionts and then placed on plant roots. Plants received either AB-treated larvae, untreated larvae, or no larvae, and dynamic headspace sampling was used to collect the HIPVs from all plants. The results after 24 hours of herbivory demonstrated that *A. vittatum* larvae induced HIPVs from *C. sativus* roots, with elevated HIPV production from plants damaged by AB-treated larvae. After seven days, HIPV production was not statistically higher than control roots. However, there was a trend toward higher HIPV production from plants damaged by AB-treated larvae, compared to plants wounded by untreated larvae, providing support for our hypothesis that microbes associated with *A. vittatum* regurgitant could be involved in HIPV suppression.

Oral # 103\_ Biology (1)- Undergraduate

**Evaluating the effectiveness of a commonly used protein source on honey bee colony growth during the summer dearth**

Ms Mary Beth Buchman

In recent years, beekeepers in the USA have been faced with high annual loss of managed honey bees (*Apis mellifera* L.) colonies. The Bee Informed Partnership recently reported that surveyed beekeepers lost 32% of their colonies in summer 2019, the highest loss rate reported during this period to date. Poor nutrition is suspected to be a major contributor to summer colony losses, as many regions across the country experience resource dearth. To supplement bee nutrition, beekeepers commonly provide their colonies with pollen substitutes commonly composed of alternative protein sources such as whey, eggs, yeast, soy, or lentils. In this experiment, we set out to test if a protein source commonly used as a summer supplement can be as beneficial to colony health and maintenance as natural pollen. We established 15 honey bee colonies of similar size during the summer resource dearth (n=5 per treatment) and measured food consumption and colony growth metrics (population, brood, and stored resources) when the bees were given 1) no supplement (negative control); 2) a soy-based pollen substitute; or 3) natural pollen (positive control). We expected colonies receiving the pollen supplement patties to consume the highest amount of food, experience the greatest colony growth, and contain the most physiologically fit workers compared to colonies that received either the soy-based diets or no supplement at all. The results from this ongoing project will help inform beekeepers about how to better regulate nutrition in their colonies to improve their health and productivity during the summer dearth period.

**Risk Assessment of Sulfur in Dried Distiller Grains with Solubles and Finished Cattle  
Feeds in Texas**

Ms Ashli A. Brown

In the United States, there has been an increase in sulfur (S) concentrations in animal diets due to the greater inclusion of ethanol co-products, such as Dried Distillers Grains with Solubles (DDGS) (Drewnoski et al., 2014). The average S concentration in DDGS is 0.65% to 0.8% on dry matter (DM) basis, but can exceed 1% in some samples, which limits use of DDGS in ruminant diets (Buckner et al., 2011; Drewnoski et al 2014; Kim et al., 2012; Shurson, 2009). Generally, acceptable concentrations of sulfur are essential for normal growth and reproduction of bacteria in the rumen of cattle. However, excess sulfur may decrease trace mineral absorption of copper and molybdenum, decrease dry matter intake, and negatively affect the overall health of cattle. This is due to the accumulation of ruminal hydrogen sulfide and subsequent toxicity, which can lead to S-induced polioencephalomalacia (PEM) and death (Drewnoski et al., 2014; Gould, 1998; Gould, 2000; Sarturi et al., 2013). Thus, there has been a concern associated with excess dietary S in cattle diets and the U.S. Food and Drug Administration (FDA) has identified S as a hazard in DDGS and finished feed for cattle (FDA-2018-D-0388).

The greater use of DDGS in cattle diets has led to an increase in S exposure and subsequent toxicity. However, the risk of sulfur toxicity is not well defined. This computational study investigated the probability of S toxicity in feedlot cattle diets containing 0% to 50% DDGS inclusion rates with a range of 0.11% to 1.1% S in DDGS on DM basis. Although S may be introduced into cattle consuming diets through a variety of sources, here, it is assumed that DDGS are the prominent source of S and the maximum DDGS inclusion rate in feedlot cattle diets does not exceed 30%. The intent of this study is to assess the risk of S-induced PEM and death in feedlot cattle diets based on varying DDGS inclusion rates, through a qualitative and quantitative risk assessment using stochastic modeling . Stochastic modeling showed that the risk of sulfur-induced PEM and death increases as the DDGS inclusion rates in feedlot consuming diets increase. Additionally, these calculations evaluated S concentrations in DDGS and DDGS inclusion rates in feedlot cattle diets to provide a better understanding for the risk of S toxicity in feedlot cattle and for the benefit of labeling cattle feed ingredients.

Oral # 105\_Molecular and Cell Biology (1)- Undergraduate

**Ank-Containing *Coxiella burnetii* T4SS effector ankK targets host cell NF- $\kappa$ B activation during infection**

Mr Ricardo Leo Alfaro Zeledon

*Coxiella burnetii* is a gram negative obligate intracellular bacteria that causes the zoonotic disease Q Fever. Human disease typically occurs via bacterial inhalation. After entry, *C. burnetii* infects host monocytes/macrophages where it utilizes a functional Type IVB Secretion System (T4BSS) to modulate the host eukaryotic transcription factor Nuclear Factor- $\kappa$ B (NF- $\kappa$ B) signaling, an essential regulator of host innate immune response. Experiments in our laboratory show that *C. burnetii* T4BSS effector protein ankK 1) significantly contributes to *C. burnetii*'s ability to inhibit host cell NF- $\kappa$ B activation and 2) ectopic expression of AnkK in HEK293/hTLR4-MD2-CD14 cells blocks accumulation of NF- $\kappa$ B in the nucleus. In this study, we have 1) generated a polyclonal chicken antibody against *C. burnetii* ankK, 2) used immunoblotting to demonstrate that *C. burnetii* Nine Mile II express ankK in PMA-treated THP-1 cells by 6-hours post infection (hpi) and this expression continues throughout its infection cycle. Additionally, we have not detected the expression of ankK in *C. burnetii* infected Hela cells and Vero cells. Finally, we have used confocal microscopy to study the subcellular localization of *C. burnetii* ankK in PMA-treated THP-1 cells. Overall, these studies show that *C. burnetii* express ankK in a macrophage-specific manner to modulate host NF- $\kappa$ B signaling.

**Effects of Host/Graft Sex Mismatch on Neural Progenitor Grafts for Spinal Cord Injury**

Mr Michael Pitonak

Spinal cord injury (SCI) is an extremely devastating injury that can result in complete loss of all motor and sensory functions. Numerous studies have shown cellular transplantation of neural progenitor cells (NPCs) has great promise in restoring lost neural circuitry following SCI. Unfortunately, little is understood of the biological factors that determine the success of the transplanted graft. One of these is the role of sex as a biological variable. We sought to determine whether sex mismatch between graft and host tissue influences the survival, differentiation, and integration of transplanted NPCs in a mouse model of SCI. Donor sex was determined for individual GFP<sup>+</sup> mouse embryos through rapid genotyping of the X chromosome gene *Rbm31x* and its divergent Y chromosome gametolog *Rbm31y*. Either male or female NPCs were then isolated and acutely transplanted into lesion sites of either male or female adult mice. Four weeks following the transplantation, we analyzed neuron and astrocyte differentiation, glial scar formation, and extension of graft-derived axons. Although, we did not detect any significant differences in these areas, we observed significant hypervascularization in grafts derived from male NPCs within female host animals. This observed vasculature was also associated with abnormally high levels of perivascular density only in this treatment group. Immunohistochemical analysis revealed increased levels of infiltrating immune cells, including leukocytes and other types of macrophages, in and around the male-to-female grafts. Altogether, these findings suggest that expression of sex-specific antigens on male donor cells may provoke an inflammatory response in female host animals. Current work involves identifying the specific cell types of infiltrating immune cells and quantifying the extent of the perivascular density along with the diameters of blood vessels seen in the grafts.

Oral # 108\_Molecular and Cell Biology (1)- Undergraduate

**The binding behaviors of the S protein and the RBD of SARS-CoV-2 virus under different conditions**

Ms Meiyi Zhang

Since the outbreak of COVID-19, the binding characteristics of the SARS-CoV-2 virus are of great interest as it is an important factor to understand the virus and provide solutions to the current pandemic. This research used Bio-layer interferometry (BLI) to obtain the basic kinetics of the S protein and the RBD of SARS-CoV-2 virus under different conditions, including dilutions, mixing with lipids, and at various temperatures.



**Serotonin Modulates the Lymphatic Endothelium to Activate Inflammatory Signaling and Lymphangiogenic Mechanisms**

Ms Catherine Seelig

Serotonin or 5-hydroxytryptamine (5-HT) is a neuromodulator, with both neuroendocrine and neurotransmitter functions, which is synthesized in serotonergic neurons in the central nervous system and enterochromaffin cells throughout the gastrointestinal tract. The lymphatics play a central role in inflammatory and immune response and lymphatic endothelial cells (LECs) are active participants in these processes. Several immune cells store or respond to 5-HT thereby implicating it in inflammatory pathways and it is also known as a growth factor for several types of non-tumoral cells. Lymphatic muscle has been shown to be significantly responsive to 5-HT however the effects of 5-HT on modulation of lymphatic endothelial phenotype or inflammatory function is not well understood. In this study, we hypothesized that increased levels of 5-HT modulate LEC morphological and phenotypic behavior and also induces cytokine and chemokine production that contribute to inflammation. LECs were initially evaluated for the expression of specific receptors by real time PCR. HDLECs were treated with 5-HT and its receptor antagonist and the effects of 5-HT on LEC proliferation, migration and tube formation was evaluated. Real time PCR was carried out to evaluate the alterations in specific cytokines, chemokines and growth factors produced by LECs in response to 5-HT treatment. In addition, conditioned medium was collected from LECs treated with 5-HT and/or its receptor inhibitor and subjected to cytokine and chemokine array analysis. Our real time PCR analysis show that LECs show varying basal level expression of the 5-HT receptors (5-HTR1-7) with 5-HTR7 showing the highest level of expression. Serotonin treatment of the LECs significantly induces LEC proliferation and migration shown by XTT and Boyden chamber assays. Further, LECs treated with 5-HT for 24hrs show significant induction of several growth factors, inflammatory and lymphangiogenic molecules including angiogenin, endoglin and IL23 indicating the activation of key inflammatory or lymphangiogenic pathways. In keeping with these findings, our results also show that 5-HT treatment enhances lymphatic tube formation that is abrogated by 5-HTR inhibition. Further, 5-HT also activates the PI3K/AKT and ERK MAPK key lymphangiogenic and growth promoting pathways in the LECs. Taken together, we show that 5-HT alters phenotypic and morphological behavior of LECs and activate several growth factors and signaling molecules that are pro-lymphangiogenic and thus can be a viable therapeutic strategy for modulation of lymphangiogenesis and LEC function during inflammation.

**Determining the Protein Corona of Gold Nanoparticles under Branched Flow Conditions**  
Mr Ryan Blanchard

Nanoparticles (NP) adsorb layers of proteins onto their surface after systemic administration that imparts a unique identity. The protein corona formed on the NPs influences their pharmacokinetics and biodistribution, and ultimately, their drug delivery effectiveness. Thus, understanding the protein corona's role on NP in vivo behavior is necessary to improve their efficiency as a drug delivery platform. Previous studies have indicated a difference between the protein coronas formed on NPs in static and dynamic conditions. However, the effects of the complex vascular geometry of the systemic circulation on the protein corona remain unexplored. In this study, PEGylated gold NPs (AuNP) were synthesized and the effect of different vessel geometries on the protein corona was evaluated. The AuNPs were characterized for their size (dynamic light scattering, transmission electron microscopy) and charge (zeta potential). AuNPs were exposed to plasma in loop and branched vessel configurations of a custom-built dynamic flow system, and the composition of its protein corona was compared to the protein corona on NPs under static conditions by gel electrophoresis. The NPs exposed to dynamic flow showed a significantly different composition of proteins to those exposed to static conditions. Interestingly, the amount and composition of protein on AuNPs varied between the looped and branched vessel configurations. These studies show that the geometry of the systemic circulation impacts the protein corona formed on NPs and could affect their in vivo behavior. Future studies will experimentally determine how the changes in protein corona due to geometry affects NP interaction with cells.

**Case Study: relapsing urinary tract infection and subclinical bacteriuria due to  
*Corynebacterium amycolatum* in a cat**

Ms Lindsey Katelyn Bailey

**Introduction**

Over a year, numerous clinical isolates of *Corynebacterium amycolatum* were recovered from a male cat with a history of chronic kidney disease, perineal urethrostomy, subcutaneous ureteral bypass (SUB), urolithiasis, and recurring urinary tract infection (UTI). Despite brief clearance of UTI after each treatment with  $\beta$ -lactams and SUB flush, *C. amycolatum* was repeatedly isolated from the patient's urine. *C. amycolatum* is rarely recorded as a cause of infection in animals and has not been reported in feline UTI to date.

**Methods**

The 5 isolates were subjected to MALDI-TOF mass spectrometry and RapID CB Plus system. In addition to sequencing the 16S rRNA and rpoB genes, the lipophilia of the isolates was evaluated by using Brain Heart Infusion (BHI) media with (and without) Tween 80. The isolates were also tested for antimicrobial susceptibility by broth microdilution.

**Results**

All isolates were identified by MALDI-TOF as *C. amycolatum*. In contrast, the RapID CB Plus system identified the isolates as *Corynebacterium jeikeium* with =99.9% probability. Partial 16S rRNA sequences showed 100% nucleotide (nt) similarity to numerous *Corynebacterium* spp. A hypervariable region of the rpoB gene had =98% nt identity with *C. amycolatum* and *C. jeikeium*, with all others being =91%. The identification of *C. amycolatum* was ultimately confirmed by using BHI agar, whose supplementation with Tween 80 did not enlarge bacterial colonies of the isolates. Over the several months of treatment, *C. amycolatum* developed increasing resistance to  $\beta$ -lactams. However, the most recent isolate was surprisingly susceptible, which could be suggestive of an internal (e.g., biofilm) or external source of reinfection.

**Conclusions**

To the best of our knowledge, this is the first report of *C. amycolatum* associated with feline UTI. In contrast to the mass spectrometry, the genotypic testing and commercially available biochemical system were insufficient to speciate *C. amycolatum*. If MALDI-TOF is unavailable, it is recommended that lipophilia be assessed to differentiate *C. amycolatum* from *C. jeikeium*.

