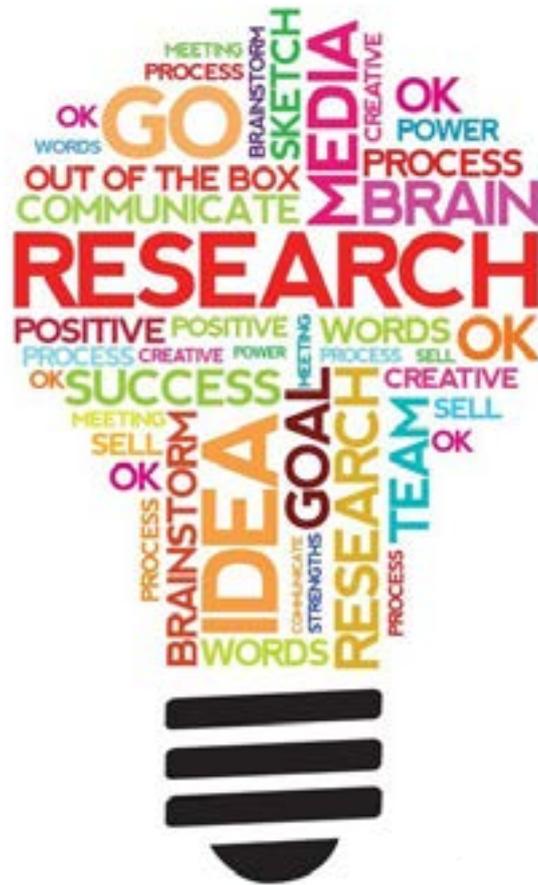


The University of Texas at Tyler Honors Program and the  
Center for Excellence in Teaching and Learning  
present:

6th Annual  
**Lyceum**

**Student Research Showcase**



April 16th, 2021

For day of  
information:



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Participants: 235

Projects Presented: 132



# Welcome Letter

Dear UT Tyler Community,

Welcome to the sixth annual Lyceum Student Research Showcase, cohosted by the Honors Program and the Center for Excellence in Teaching and Learning, as a part of the University of Texas at Tyler's Research Month. This year's Lyceum comes at the end of a challenging and remarkable academic year. Our students and their faculty and staff mentors have demonstrated tremendous vision, flexibility, and tenacity in conducting their research during the pandemic. They have navigated the difficult waters of closed labs, limited resources, and working remotely rather than in person. This year's over 130 Lyceum presentations—the most in our history—are a testament to UT Tyler's resilience and creativity.

The Lyceum brings our community together in a unique way, as both undergraduate and graduate students present posters and oral presentations to audiences of fellow students, staff, administrators, and faculty. To our presenters this year, thank you for your hard work and dedication. If this research presentation is your first, we hope you find it challenging and stimulating as you grow in your expertise of your field. To our audience members, thank you for your time and focus as you explore our students' research posters and hear their oral presentations. Few things are more valuable to a scholar than a supportive and engaged audience, and your insightful comments play a major role in the success of the Lyceum.

Again, many thanks for your presence at the 2021 Lyceum. We hope you have a great experience and enjoy the questions, ideas, and solutions raised by UT Tyler's student scholars!

Sincerely,

The Lyceum Committee;  
Kassie Archer  
Katie Stone  
Paul Streufert  
Chris Thomas



# Faculty Judges

## Alphabetical: Last name

Dr. May Abdelaziz	Ms. Ericka Freeman	Dr. Amir Mirmiran
Dr. Gisele Abron	Dr. Nelson Fumo	Ms. Jennifer Moore
Dr. May Abdelaziz	Dr. Mike Gangone	Dr. Torey Nalbone
Dr. Mohammed Ali	Dr. Andres Garcia	Dr. Kim Nimon
Ms. Kristie Allen	Dr. Janet Gehring	Ms. Sarah Norrell
Dr. Katie Anders	Dr. William Geiger	Dr. Ellen Fineout-Overholt
Dr. Danielle Bailey	Dr. Christy Gipson	Dr. Mark Owens
Dr. Josh Banta	Dr. Matthew Greenwold	Dr. Vivek Pandey
Dr. Alex Bearden	Dr. Danice Greer	Dr. Cheryl Parker
Dr. Ann Beebe	Dr. Tom Guderjan	Dr. Hussain Rizvi
Dr. Clayton Benjamin	Dr. Kyle Gullings	Ms. Dixie Rose
Dr. Mohammad Biswas	Ms. Terra Gullings	Dr. Miriam Rowntree
Ms. Sydni Blundell	Dr. Barbara Haas	Ms. Melissa Salgado
Dr. Don Bradley	Dr. Ayman Hamouda	Dr. Sarah Sass
Dr. Kenneth Bryant	Ms. Colleen Hanratty	Dr. Muthukrishnan Sathyamoorthy
Ms. Gracy Buentello	Ms. Anna Hanson	Dr. Meryem Saygili
Dr. Sean Butler	Dr. Amy Hayes	Dr. David Scott
Dr. Kerri Camp	Dr. Julie Hebert	Ms. Natalie Serrano
Dr. Jenifer Chilton	Mr. David Hill	Ms. Kim Sheets
Dr. Yonjoo Cho	Ms. Kay Jenkins	Mr. Mark Sidey
Dr. Katheryn Courville	Dr. Lauri John	Dr. Elizabeth Sills
Ms. Dee Crabtree	Dr. Forrest Kaiser	Mr. Donald Simmons
Dr. Deborah Crumpler	Dr. Lauren Kirby	Dr. Beth Mastel-Smith
Ms. Ashley Davis	Ms. Sarah Meisch-Lacombe	Dr. Bob Sterken
Dr. Belinda Deal	Dr. Mary Linehan	Dr. Woonhee Sung
Mr. Mike Donley	Dr. Mandy Link	Ms. Lauren Thomas
Ms. Margo Duncan	Dr. Eric Lopez	Dr. Milon Uddin
Ms. Samantha Dwight	Dr. Kaia Magnusen	Dr. Gregory Utley
Dr. Jeffrey Emge	Dr. Jaclyn Marsh	Dr. Michael Veronin
Dr. Samantha Estrada	Ms. Jennifer Martinez	Ms. Shanese Williams
Dr. Justine Faghihifar	Dr. Colleen Marzilli	Dr. Veronda Willis
Ms. Halima Farooq	Dr. Rachel Mason	Dr. Alecia Wolf
Ms. Kristian Fischer	Dr. Rochell McWhorter	Dr. Tianrui Yang
Dr. Mary Fischer	Ms. Brandy Meadows	Dr. Marilyn Young



# Oral Presentation Schedule

9:00am Oral Presentations	
<b>Panel A - Machines and Graphs</b>	Mentor: Amir Mirmiran
Titles	Student Names
Literature review and validating of Composite driveshaft designs	Mahmoud Abdalmola
Correlation between CSF biomarkers of Alzheimer's disease and cognitive decline toward a machine learning based predictive model	Vivek Kumar Tiwari
Finding a Uniformly Most Reliable Graph	Daniel du Preez

9:00am Oral Presentations	
<b>Panel B - Sensing and Healing</b>	Mentor: Josh Banta
Titles	Student Names
A Wearable Plant Biosensor for Real-time Detection of Salinity Stress	Nafize Ishtiaque Hossain
Electrospun Drug-Loaded PLA fibers for Wound Dressings	Alexandra Craig
Continuous monitoring of wound healing with a novel four-in-one smart wound patch	Alina Nietzsche Pereira
Chemiluminescent Probe for In Vivo Imaging of Triple-Negative Breast Cancer	Katherine Binkley



# Oral Presentation Schedule

10:00am Oral Presentations	
<b>Panel A - Biology &amp; Biochemistry</b>	Mentor: Rachel Mason
Titles	Student Names
Progress Toward the Design, Synthesis, and Analysis of Paired Coiled-Coil Peptidic Molecular Building Blocks	Jason DiStefano
Comparative Genomic Analysis of Cryptophyte Algae Plastid Genomes	Prabhat Kattel
Species features and genomic characterization of <i>Sphingobium yanoikuyae</i> JS1018	Stefanija Kinzy
The HK97 Virus-Like Particle and the RAFT Polymerization of Virus-Like Particles for Drug Delivery	Christopher Armstrong

10:00am Oral Presentations	
<b>Panel B - Health and Well-Being</b>	Mentor: Bob Sterken
Titles	Student Names
Effects of Family and Community Based Approaches in Nutrition Interventions	Ellie Youngblood
Not so dumb jocks? The effects of physical activity on test-related anxiety in college students	Ana Clara Zaidan et al.
Exploring Potential Risk and Protective Factors for Negative Cognitions and Emotions in Veterans with PTSD	Candice Hayden
Civil Rights Violations	Charles Taylor Haskell



# Oral Presentation Schedule

10:00am Oral Presentations	
<b>Panel C - Technologies</b>	Mentor: Mike Gangone
Titles	Student Names
An Expanded Approach to Stacking Sequence Optimization of Laminated Plates	Yoseph Mohmand
A miniature potentiostat for integration with wearable biosensors toward rapid and continuous monitoring of disease biomarkers	Claude Larrieux
Design and Optimization of Acoustic Metamaterial for Focusing and Noise Reduction	Monu Jaiswal

11:00am Oral Presentations	
<b>Panel A - Gender and Race</b>	Mentor: Samantha Dwight
Titles	Student Names
Radical Moderation: The Politics of Suffrage, Free Love, and Homosexuality under Wilhelm II	Bethany Collier
The Evaluation of Systemic Racism and its Present-Day Integration in Society	Natoya Inglis
The Political Agency of Women in Colonial Africa	Ruth Nwokora
Masculinity, Femininity, and Gender Roles: Character Analysis in The House of the Seven Gables and The Wide, Wide World	Megan Byrd



# Oral Presentation Schedule

11:00am Oral Presentations	
<b>Panel B - International Conflicts</b>	Mentor: Mike Donley
Titles	Student Names
How Can Restructuring Global Financial Institutions Assist in Decreasing Conflict and Instability?	Aaron Baksh
The Syrian Civil War: Power in Objectives	Abigail Marrs
Challenges to Combating Transnational Terrorism: A Benghazi Case Study	Aldyn Edwards
Why are other countries involving themselves in the Syrian Civil War?	Zac Burger

11:00am Oral Presentations	
<b>Panel C - Composite Structures</b>	Mentor: Sean Butler
Titles	Student Names
Weight minimization of blended composite structures under buckling lamination parameters layup design	Amr Mohamed
Analysis of Laminated Composite Plate Under Combined Loads at Various Lamination Angles	Divya Sree Anusuri
Weight minimization of fiber-reinforced composite materials	Mohammad Atmeh
Composite Laminate Design for Improved Open-Hole Compression Strength Using Non-Standard Ply Angles and Customized Stacking Sequences Characterized By [D] Matrix	Siyavash Ebrahimiyan



# Oral Presentation Schedule

12:00pm Oral Presentations	
<b>Panel A - Global Race &amp; Gender Issues</b>	Mentor: Ann Beebe
Titles	Student Names
Development in Southwest China	Ekaterina Menkina
Constantinople: The Value of Life in the Tectonic Succession of Empires	Jacob Williams
The Slavery Controversy in the United States During the Antebellum Period	Michael Graham
Perceived Differences: Twentieth Century Eugenics and Scientific Racism in the West	Ashlynn Beard
Women in Musical Theatre	Rebecca Richardson

12:00am Oral Presentations	
<b>Panel B - Engineering &amp; Business Reviews</b>	Mentor: Torey Nalbone
Titles	Student Names
Optimum design of axially loaded fiber-reinforced composites by targeting micro- and macro-mechanical properties	Robert Ray
Optimization of laminated composite grid plates for maximum buckling load	Manoj Bhandari
Simulated Double Pipe Heat Exchanger Using Simulink Modeling	Kiril Nikolov
Sentiment Analysis of Business Reviews	Merisha Subedi



# Oral Presentation Schedule

12:00pm Oral Presentations	
<b>Panel C - COVID-19 and Inflammation</b>	Mentor: Sean Butler
Titles	Student Names
Relationship Between Traumatic Stress and the COVID-19 Pandemic	Bridget R. Kennedy
COVID-19 Guideline Compliance and Mental Health in Texas	Grant Paul
Real-time monitoring of a panel of inflammation biomarkers by a point-of-care sensor	Tanzila Noushin



# Undergraduate Presentations

Alphabetical: Author Last name

## Public Auditing in the Pandemic Era

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Author: Ann Abernathy

Mentor: Dr. Veronda Willis

Public auditing is the branch of accounting wherein an independent accounting firm examines an organization's financial records, and provides the highest level of assurance that they are in accordance with generally accepted accounting principles. This is crucial to business in order to make a company's financial records and, therefore, its economic condition clear and understandable to its managers and to potential investors. The COVID-19 pandemic has significantly affected the public audit process, and the innovative use of accounting technology has been implemented to mitigate the negative impacts of the pandemic. There have been positive implications of this shift as it has forced businesses to update their technology and methodology in ways that will have lasting repercussions. I will begin with a short history of audit to provide the reader with the context of public auditing prior to the COVID-19 pandemic. Next, I will discuss the development and use of accounting technology in the auditing field. Finally, I will examine how approaches have changed to accomplish audit objectives in the present day.

## A Comparison of Macroinvertebrate Sampling Methods on a Stream System in Tyler, Texas

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Author: Brianna Aguilar

Mentor: Dr. Lance Williams

East Texas is composed of hardwood and pine forests that contain multiple spring-fed streams with dense canopies. This leads to an abundance and diverse population of macroinvertebrates in stream systems which are utilized to indicate the health of a stream. Analyzing the health of streams is important because they influence the dynamic of downstream systems, like rivers and lakes, which supply clean water for drinking, recreation, and agriculture. This study compares three macroinvertebrate sampling methods which are the Dip net, Surber sampler, and Hester-Dendy. The samples were collected from Quail Creek at TPWD The Nature Center in Tyler, Texas to determine the conditions of the stream. The macroinvertebrate communities collected by each method were evaluated by curating a Benthic Index of Biotic Integrity (B-IBI) and an Invertebrate Community Index (ICI). An aquatic life score was calculated ranging from limited to intermediate for each method. Past data collected on Quail Creek was used to determine if our samples were accurate. Our work demonstrates that the samples are inconsistent with past data on Quail Creek. Overall, this means that factors like the season the samples were collected, the water flow, and the geology of the stream, caused the data to reflect low macroinvertebrate diversity.



# Undergraduate Presentations

Alphabetical: Author Last name

## **Ventilator Communication Interface Attachment**

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Authors: Eduard Akhmedov, Lucas Santos, Fernando Rodriguez, Sandy Ghaly, & Jules Kenmoe

Mentor: Dr. Andres Garcia

Modern ventilators are costly and can unexpectedly malfunction due to software issues or outdated operating systems. These issues put patients at severe risk if the ventilators are not switched off on time. As such, an economical standalone data management device has been designed and developed to monitor pressure, airflow, and temperature of the ventilator to mitigate potential risks. To achieve this, an Arduino will be used to communicate with pressure, temperature, and air flow sensors. Sensors will be placed on top of a PVC pipe that intercepts with an inspiratory line from the ventilator to the patient. The information will then be displayed onto an LCD screen for physicians to observe patients accordingly. The device failure will not put patients at risk.

## **Studies on the Self-Assembly of Dipeptides**

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Authors: Vadeah Akmel & Colton Lybarger

Mentor: Dr. Sean Butler

Understanding the structure of amino acids and peptides is a major part of biochemistry courses. The research project discussed here will focus on the development of an experiment showcasing the construction of dipeptides that allows biochemistry students to synthesize and analyze dipeptides. This research will focus on creating the following dipeptides: phenylalanine-phenylalanine (Phe-Phe), tyrosine-tyrosine (Tyr-Tyr), phenylalanine-tyrosine (Phe-Tyr), and tyrosine-phenylalanine (Tyr-Phe). Research has shown that the dipeptide, Phe-Phe, self-assembles into an alpha helix. During this project, the remaining three dipeptides will be compared to Phe-Phe to see if they also form alpha helices. The following two dipeptides were successfully synthesized via a Biotage Peptide synthesizer: tyrosine-tyrosine and tyrosine-phenylalanine. Structural properties of the dipeptides will also be explored via dynamic light scattering analysis.



# Undergraduate Presentations

Alphabetical: Author Last name

## **Understanding the Internal Forces on Post Operation Hip Implants Using the Hip Joint Motion Simulator**

Authors: Dawson Barker, Austin English, James Barron, & Amit Pokharel

Mentor: Dr. Chung Hyun Goh

In the United States, 18 of every 100 patients that receive hip replacement surgery need a secondary procedure due to implant wear or total hip displacement. This number remains high due to the lack of a good way for doctors to fully understand what is happening to their patient's prosthetics during their lives after surgery. Our machine will fill this need as a more reliable source of data collection for the forces acting on a hip implant after surgery. The hip joint simulator will apply cyclical loading and motion profiles that can mimic the actions of walking, jogging, and running providing a clear picture of the effects of everyday life on a prosthetic. The team's focus will be on developing and testing the simulation machine while the sponsor of the project will take the final prototype and implement an energy harvesting device of his own design into the loading apparatus of the simulator. This device will be used to understand the relationship between the loading applied by the machine and the electrical output the loading can produce. The team expects to gather the loading and motion data for multiple gait cycles and produce graphs depicting the forces and moments acting on an actual hip implant. Supplying a more complete understanding of the day-to-day life of a hip replacement patient post-op. This data will be used to prove the design's use and functionality while also providing greater insight into the biomechanical understanding of the hip joint.

## **SMARTP3M: Smart Pavement Monitoring, Management, and Maintenance**

Author: Samantha Bast

Mentor: Dr. Matthew Vechione

Performance of a daily survey to verify pavement roughness and the presence of potholes/distresses is an ideal practice for efficient pavement management. However, utilizing traditional testing methods for this purpose is extremely expensive and beyond the technical and financial capabilities of different state Departments of Transportation. On the other hand, smartphones and advanced on-board computers recording information related to pavement condition, traffic data, and weather utilizing advanced sensors and stereo cameras are present in almost every vehicle traveling on the roads. This technology is reliable, affordable, and experiencing a fast and continuous development, and much more can be expected in the future. The data is automatically collected on a daily or real-time basis utilizing the accelerometer and GPS sensors existing on drivers' smartphones and vehicles' on-board computers. This case study uses two identical Android smartphones with the same hardware characteristics and performance, software (operating system), accelerometers, GPS characteristics, and accuracy. In addition, this case study uses one driver using the same vehicle to collect all the data. The data is collected, consolidated, analyzed, and translated into roughness for pavement monitoring and management. With the geolocation of pavement in poor condition, a map has been created using geographic information software (GIS) to show DOT's where funding should be allocated, and which roadway segments require attention.



# Undergraduate Presentations

Alphabetical: Author Last name

## **Relationship of Type of Sex Education on Sexual Behavior**

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Author: Natalie Batton

Mentor: Dr. Jenifer Chilton

The purpose was to examine the influence of type of sex education on sexual behavior and perceptions of shame and guilt in young adults. This study asked, what is the extent of the relationship, if any, between gender, religious affiliation, type of sex education, personal knowledge gained through sex education, sexual behavior and perceptions of shame and guilt in young adult college students? Convenience sampling was used to target young adults ages 18-24 years in the correlational design. A total sample of 93 complete surveys were collected. Multiple regression with 5 predictors was the planned analysis. An anonymous electronic survey was distributed through various social media platforms. Mean of scale was used to replace data in participants missing less than two answers. However, participants with large amounts of missing data were excluded in the analysis. Bivariate analysis of the between the predictors and shame and guilt scales were not significant in four predictors. The only significant relationship was between risky sexual behavior and shame and guilt. Results indicated that gender, religious affiliation, type of sex education, personal knowledge gained through sex education did not predict perceptions of shame and guilt. However, risky sexual behavior and shame and guilt demonstrated a positive correlation. Limitation included length of survey, inability to clearly distinguish between shame and guilt, and sexual behavior questions were focused on condom use.

## **Utilization of Round One of The Paycheck Protection Program**

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Authors: Alex Brandt & Jeff Murphy

Mentor: Dr. Veronda Willis

The Paycheck Protection Program (PPP) was created when the H.R Bill 758 (Cares Act) was signed into U.S law on March 27, 2020. With the bill, small businesses that were struggling due to the COVID-19 pandemic were able to apply for loans that were forgivable. For this study, we focused solely on the first round of loans that were sent out. We understand that with the ever-changing situation of COVID-19 businesses could receive more loan forgiveness, but we focused on just the first round of loans. This study consisted of email surveys that were sent to small businesses in Texas and Wisconsin to learn about how small businesses utilized the loans they received. The purpose of this study was to see how a small sample of roughly 15-20 small businesses used the loans it received and to formulate trends on the questions that we asked. Our major findings were that one third of the businesses had to lay off employees, most of the businesses used the loans primarily for payroll costs, almost all the businesses are applying for loan forgiveness, and a good number of businesses saw a substantial downturn in revenue compared to other years due to COVID-19.



# Undergraduate Presentations

Alphabetical: Author Last name

## **The Partisan Divide: Religion, Secularism, and Geographical Segregation in the United States**

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Author: Morgan Carter

Mentor: Dr. Mark Owens

The research topic I will be focusing on will be to understand how the association of the increasing secularism and religious identity of adults positively correlate to the partisan divide in the U.S. This research is significant as it would allow us to understand if those who identify with a religious ideology can determine the political environment in which they vote. Using descriptive qualitative secondary data provided by the Wheatley Institution, a non-partisan study center at Brigham Young University, to analyze adults of different ages in the United States through structured surveys. The results indicate that religion is fading consistently, with just one third of the U.S. population being deeply religious and the other third being strictly secular. As a result, the secularization hypothesis is supported by the fact that more explicitly moderate religion is decreasing in the United States.

## **Presidential Rhetoric and Influence on Policy and Voters**

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Author: Kathryn Chamberlain

Mentor: Dr. Mark Owens

Presidential rhetoric is important. It can be used to influence voters' opinions. The question going to be explored is how do presidents use their rhetoric to influence voters? In doing research, I am looking at presidential speeches to see how presidential rhetoric, changes throughout their presidencies, and how it influences voters. I have found that at the beginning of their presidencies, they use words to inspire confidence from the American people. Especially in times of hardships such as the Cold war. Towards the end of their presidencies, they usually try to use words to instill confidence in their successors. The work I have done helps to understand how presidents use different words to convey to the American people that they know what their doing.



# Undergraduate Presentations

Alphabetical: Author Last name

## Optimal Risky Strategies in Tennis—Preliminary Research

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Author: Caitlyn Cox

Mentor: Dr. Marco Castaneda

In the game of tennis, players must make risk-reward calculations in order to determine the optimal risk level for a given strategy. Low-risk strategies come with few unforced errors but allow the opponent to capitalize on weaknesses. High-risk strategies, however, minimize these weaknesses but lead to a greater number of unforced errors which can offset the gains of a higher risk strategy. From the standard game theory analysis, the optimal strategy for a player should not vary across points within a game against a given opponent. That is, the Nash Equilibrium does not change depending on the score within the game. However, in practice players are often observed adopting lower risk strategies when behind in a game. Conversely, players tend to play more aggressively when ahead. In this research paper, I will evaluate how professional tennis players change their strategy in reference to the score within a game. I use service speed as a measure of risk. I compare it to the player's average for a given match to determine if differences are correlated to the players game score. In addition, I will evaluate the efficacy of changing strategies across scores within a game. Lastly, I will discuss the psychological factors and motivations that may explain this deviation from the predictions of the standard analysis.

## Evaluation of the Efficacy of Various Hydrophobic Degrons for PROTAC-Mediated Degradation of the Androgen Receptor

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Authors: Justin Crowe & Connor Crowe

Mentor: Dr. Jiyong Lee

The androgen receptor (AR) pathway is a major contributor to prostate cancer (PC) & tumor growth. Because of this, many therapeutic strategies and drugs attempt to disrupt this pathway to slow or stop tumor growth. The typical solution has been to use an inhibitor, known as an AR antagonist, that binds to the AR to inhibit its function. However, PC cells can often develop resistance to this method of treatment, ignoring the AR antagonists or reversing their role, causing the inhibitor to activate their pathway. Targeted protein degradation is a rapidly growing area in drug design, & has been suggested as another treatment strategy for cancers that become resistant to traditional strategies. One method of targeted protein degradation is hydrophobic tagging: binding the protein to a hydrophobic molecule. This resembles a partially unfolded protein, leading to ubiquitination & activation of cellular protein degradation machinery. One novel method is to use heterobifunctional molecules known as proteolysis targeting chimeras (PROTACs). A PROTAC contains a ligand for the protein of interest (POI) on one side, connected by a linker to a group known to induce degradation, also known as a degron. These PROTACs are highly effective in theory, because they are highly selective, small molecules, & should be capable of eliminating POIs rather than attempting to alter their function. Our research aims to treat PC cells with PROTACs containing an AR antagonist that will selectively bind the AR, attached to various hydrophobic moieties to test their relative effectiveness as degrons. If these hydrophobic moieties are effective degrons, a chemical library of degrons can be established, making it possible to use them in future designs targeting other proteins.



# Undergraduate Presentations

Alphabetical: Author Last name

## **Virtual Reality-Robotic Walking Training Device**

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Authors: Ralph Reyes, Guerrero, Oscar Ferrero, & Shawn Fox

Mentor: Dr. Wathiq Ibrahim

Stroke victims and SCI patients are usually prescribed with gait rehabilitation programs to avoid further health conditions, recover their gait cycle, and increase walking speed. The purpose of the project is to improve the inherited RWTD in order to improve its knee and ankle gait cycle accuracy as well as to increase patients speed, balance, and mobility with the implementation of a VR system.

## **Effect of COVID-19 in the 2020 MLB Playoffs**

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Author: Jose Currea

Mentor: Dr. Robert Schumaker

Several studies have been performed to explore how the most recent pandemic, COVID-19, has affected the different sports in aspects such as player performance, team performance, player motivation, and franchise performance. In this paper we focus on player and team performance, and how they were affected by this pandemic. In our research, we take into account Sabermetrics which are statistics that measure both individual and collective in-game activity in baseball. Due to the fact that there was a format change for the 2020 MLB Playoffs, in this research, we compare the ALCS, NLCS, and World Series which are 7-game series, and this has not changed since 1994. For this research, we use statistical and analytical topics discussed in our Sports Data Analytics course such as the use of Sabermetrics, and also, some computer science tools such as web scraping in python and data modeling in R. This research is still undergoing; therefore, results will not be posted in the abstract.

# Undergraduate Presentations

Alphabetical: Author Last name

## **Pavement Analysis and Rehabilitation Strategies on University Road**

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Author: Zachariah Dare

Mentor: Dr. Mena Souliman

This study investigates the roadway from the corner of Varsity and to the entrance of University of Texas at Tyler Alumni House. The severity and extent of the distresses on this section of roadway are identified, along with a calculated pavement condition index suggesting road roughness. Then using this information different rehabilitation strategies are recommended to raise poor or worse conditions to fair or better. Additionally, the rehabilitation strategies will be ranked in estimated costs and scope of construction required.

## **Application of Virus-Like Particles for Cell-Specific Drug Delivery In Vitro**

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Author: Mercedes Delgado

Mentor: Dr. Ali Azghani

Muscle atrophy is a prevalent condition that affects millions of individuals with an array of systemic and chronic diseases. As of today, there is no specific treatment to mitigate the effects of muscle atrophy. During this experiment, we utilized human cell lines obtained from the American Type Culture Collection (ATCC), home-constructed virus like particles (VLPs), and fluorescence imaging. The goal of this proposal is to examine the utility of muscle cell receptor-specific VLPs in delivering fluorescein isothiocyanate (FITC) to skeletal muscle cells in vitro. Our working hypothesis is that the specific constructs of VLP can be used to selectively target skeletal muscle tissue for therapeutic delivery.

# Undergraduate Presentations

Alphabetical: Author Last name

## **Investigating Chronic Pain Treatment: Is Kratom Worthy?**

---

Author: Rachael Denny

Mentor: Ms. Kleanthe Caruso

Chronic pain is a burden millions of Americans live with daily. Insufficient pain management has led to poor quality of life, abuse potential, and increased suicides among chronic pain clients. With fear of abuse potential and decreased ability to complete activities of daily living using current approved opioids, Americans seek out alternative treatment modalities. For generations people have sought out alternative, herbal, and medicinal substances to assist in healthcare management. A tropical plant in Southeast Asia, Kratom or *Mitragyna speciosa*, has increasingly become a substance of investigation for its pain relief properties and benefits. There is substantial evidence that Kratom has therapeutic properties in pain treatment without the many adverse effects associated with prescription opioid use. This article aims to provide evidence supporting the need for change in chronic pain management by understanding current treatment options, medical providers and client's preferences, and a plan to integrate into practice a viable alternative therapy for client's using Kratom to promote quality of life and safely manage chronic pain.

## **The Role of Social Isolation in Anxiety Symptoms and Disorder Development: A Literature Review**

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Author: Colby Elmore

Mentor: Dr. Adam McGuire

As a result of the COVID-19 pandemic, there is significant interest in the effects of social isolation on anxiety. To date, several studies have addressed these issues, separately; however, there is a gap in our understanding of social isolation as a risk factor for the prevalence of anxiety symptom severity. Further, it is unknown if these individuals go on to develop anxiety disorders as a result of their experiences that are unique and far-reaching, such as the current pandemic. This is important for public health efforts to prevent and treat anxiety during this pandemic and beyond. This literature review aimed to examine the known links between social isolation and anxiety disorders, and identify what additional work is needed. Results indicate that many studies found social isolation to be a cause of anxiety symptoms as well as depressive symptoms; however, most of these studies lack specific data identifying anxiety disorder risk. Thus, we do not know if these acute symptoms due to social isolation could cause the development of disorders (e.g., social anxiety disorder). Future studies should aim to address these gaps by conducting longitudinal research on individuals that experience social isolation and assess the rate at which individuals suffering from social isolation and subsequent acute anxiety symptoms go on to develop anxiety disorders.

# Undergraduate Presentations

Alphabetical: Author Last name

## Design and Stability Analysis of 6T and 7T SRAM Cells

Author: Conrad Fjetland

Mentor: Dr. Prabha Sundaravadivel

Random Access Memory (RAM) is a critical component of modern computing systems. RAM allows the Central Processing Unit (CPU) of a computer to temporarily store data in such a way that it is immediately available to the processor. This drastically decreases computing time as well as increases program performance, as the CPU has the information it requires immediately and does not have to access the hard drive, a very time-consuming process. All RAM is volatile, meaning it loses all information stored when it loses power. Static Random-Access Memory, termed SRAM for short, is a critical component of modern computing systems. While many people are familiar with Dynamic RAM, the infamous sticks that all modern computers require, many don't realize the critical role the S variant plays. SRAM is found in almost all modern computing systems that have a user interface, being found in devices as simple as a children's toy to systems as complex as a driverless car. Many SRAM designs have been constructed over the years, however the 6Transistor (6T) and 7Transistor (7T) variants have prevailed as the most popular designs, due to them being constructed purely out of CMOS Transistors. The stability of these memory components are analyzed using Static Noise Margin (SNM). The 7T historically has a larger margin than the 6T in both categories, as it possesses an additional transistor that controls the read and write process. However, with SNM graphs, its observed that while the 7T cell holds an advantage, it appears to be decreasing at an ever faster rate the smaller it becomes. As consumer demand for smaller and more powerful devices grows, this research aims to compare the stability of 6T or 7T architectures for long term use in consumer electronic devices.

## “There’s Nothing Wrong with You”: Associated & Structural Stigma Related to Parkinson’s Disease

Author: Kailynn Fong

Mentor: Dr. Beth Mastel-Smith, & Dr. Melinda Hermanns

Parkinson’s Disease (PD) is a neurodegenerative disease caused by deficient levels of dopamine and characterized by slow movement, tremors, stiffness, difficulty walking and talking, and visual hallucinations. There is no cure; PD is a chronic disabling condition. Stigma Theory suggests that people categorize individuals toward a rejected stereotype. Theory constructs include: self, public, structural, and associated-stigma. Stigma is experienced by people with Parkinson’s Disease (PWPD) negatively affecting physical, mental, and emotional health. The purpose of this study is to examine current literature and stigma experiences of care partners of people with PD and evaluate Stigma Theory’s usefulness. In Phase I, we examined current literature that described care partners’ stigma experience for evidence of Stigma Theory constructs with a focus on associated and structural stigma. Evidence suggested that stigma was evident in the lives of care partners of PWPD. Structural stigma was demonstrated in the lack of professional resources and knowledge of PD, and associated stigma was illustrated by care partners’ feelings of embarrassment, isolation, and guilt. Phase II will include interviews with care partners of PWPD. Data will be collected and analyzed across participants, compared with literature findings and examined in the context of Stigma Theory.



# Undergraduate Presentations

Alphabetical: Author Last name

## **Hey, Siri, Am I Sexist?: An Examination of Gendered AI Voice Assistants on Perceived Usefulness**

Authors: Katelyn Garza, Katrina Henley, & Cameron Long

Mentor: Dr. Amy Hayes

Since Apple first introduced Siri in 2011, artificial intelligence (AI) powered voice assistants (VA's) have become well-established features of mobile devices (Guzman, 2019). Following Siri, additional prominently used voice assistants include Amazon's Alexa, Google's Google Assistant, and Microsoft's Cortana. Recently, there has been a growth in voice-based technology, and many people are now communicating with voice assistants daily in the same way they would with other humans (Sundar et al., 2017). Additionally, though consumer research has shown that people generally prefer female voices over male ones (Griggs, 2011), the context in which the users experience these voices matters. For instance, female voiced computers created to perform a dominant role, such as giving commands or rating performance, were evaluated more negatively by users than male-voiced computers performing the same role (Nass et al., 2006). Thus, we aimed to investigate two relevant hypotheses tested in the present study: First, we hypothesized that listening to a female AI voice assistant would increase sexism ratings, specifically benevolent sexism, compared to listening to a male AI voice assistant. And secondly, we hypothesized that listening to a female AI voice assistant would increase traditional attitudes towards women compared to listening to a male AI voice assistant. We created an online instrument that allows participants to interact with two versions of a digital AI helper (one male, one female) while completing a quiz, and then rate how helpful and accurate the AI helper was. Data collection in the project is ongoing.

## **“Steal the Vote”: Unpacking the Myth of Voter Integrity**

Author: Kierra Green

Mentor: Dr. Mark Owens

This research paper focuses on issues related to voter fraud and integrity. Voter fraud and integrity have been consistent topics amongst citizens, especially in regards to voter identification and it's prevalence. Ultimately, this research explores the voter fraud numbers to examine the percentage of voter fraud and the likelihood of someone committing voter fraud. Data findings demonstrate that election integrity not being a prominent issue as the media reflects. The research presented will be a key aspect in addressing the issue so that we can move towards implementing more confidence in citizens to increase higher voter turn out rates. Following our most recent election, this will be an interesting project that can shine a light on the allegations brought up during the 2020 November election.



# Undergraduate Presentations

## Alphabetical: Author Last name

### **Exploring the Utility of Intentional Relationship Model Principals to Build Relationships within Classroom Communities**

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Author: Shaelyn Harris

Mentor: Dr. Justine Faghihifar

This research encompasses analyzing the effects of a self-reflection class assignment with the help of Dr. Justine Faghihifar. The purpose of this research is to unveil the importance of human connection and its impact on classroom community. For an assignment, students were instructed to share a serious topic about their life. Personal stories from all walks of life were shared with the class. The class was then instructed to fill out an anonymous survey that answered questions about the assignment and how it impacted their class experience, relationships between their classmates, and how their outlooks changed. The results of this research were intangible rather than numerical like other research types. Results included a better perspective of how experiences shape a person, gaining friendship and commonality among classmates, and working personal through difficulties. The results also showed a greater sense of empathy toward one another. Classmates who thought they didn't have anything in common with each other became friends. A stronger bond was also built that led to a more helpful attitude toward one another. Students asked for/received help from one another more readily as well. The results of this research reveal the value of developing relationships and understanding each other in the classroom. The act of understanding who someone is gives a person the ability to better interact and connect with them. Human connection and relatability are highly sought after, and what better way to find it than to help someone else find it too.

### **Reversing A Red State to Blue**

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Author: Stacy Duff

Mentor: Dr. Mark Owens

A view of the 2020 election map provides a vivid picture of the intense level of polarization existing in the United States today. The primary color red represents Republicans while blue signifies Democrats. Like the political parties, the primary colors sit opposite from one another on the color wheel. Historically Texas has voted red, but so did California in a 20-year stretch. What would it take to turn Texas blue and are their specific policy's or a crisis that could hinder the possibility of this occurring within the next 10 years? California is widely diverse, and Texas is increasingly more diverse while making gains in young voters. A likely combination needed to turn a red state blue. We will explore the determining demographics that had the most influence in transitioning California to blue after voting red from 1968-1988. Will polarization continue to be the trend, or is there hope in having purple states, as we have seen in the past with Florida? While there is no indication either party is interested in unifying the country, there is still hope that voters might not feel the same way.

# Undergraduate Presentations

Alphabetical: Author Last name

## **Pavement Analysis**

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Author: Nathaniel Honea

Mentor: Dr. Mena Souliman

For the Pavement Analysis research, my goal was to find the deformations that occur along a road and then to determine the appropriate methods to fix the deformations along the road. During the Pavement Analysis research, I observed the types of deformations that occurred on parts of Varsity Dr by walking up and down the road and taking pictures of the deformation. After determining all the types of deformations, I graded the road on a PCI scale (Pavement Condition Index). Using this index, I determined if the road was in good, fair, poor, or failed condition. After looking at the severity of the entire road based on the PCI and the types of deformations that occurred, I decided if the road needed to be completely remade or if simple rehabilitation methods were needed. At the end of my research, I determined the deformations that occurred on Varsity Dr, how severe the damage to the road was and the correct methods to fix the road.

## **Designing a Functional Electrospinning Machine**

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Authors: Zachary Huggins, Ruberto Saenz, Johan Johnson, & Abdul Gaddi

Mentor: Dr. Soren Maloney

Electrospinning is a technique for making nanofibers that involves charging and ejecting a polymer solution through a spinneret under a high-voltage electric field, then solidifying the solution to form a filament. The group plans to design and manufacture an electrospinning device controlled through LABVIEW software to electronically vary the flow rate of polymer, voltage from 0-20 kV, and distance between the needle and collector. The methodology includes concept selection process, detailed 3D CAD designing, design verification through hand calculations, manufacturing, testing and LABVIEW programming for electronic interaction between prototype and computer. With a budget of \$1,500 given by the UT Tyler mechanical engineering department, the electrospinning device will be used by the university for education and research purposes. The group expects to have a functional machine that varies morphologies of nanofibers by applying a lifting mechanism that changes the orientation for nanofiber production from horizontal to vertical.

# Undergraduate Presentations

Alphabetical: Author Last name

## **Plastic Extruder**

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Authors: Thang Huynh, Mahibullah Maqsat, & Rohit Kanade

Mentor: Dr. Andres Garcia

The purpose of this project is to design, build, and test a plastic extruder that is capable of extruding composite extrudate. The design can handle a variety of thermoplastics with melting temperatures less than 350°C. The primary working variables of the extruder, are the zone temperatures and throughput, which are controlled using LabView by manipulating on/off cycles of the heating bands and by manipulating the rotating speed by adjusting the pulse rate of the stepper motor.

## **A Survey of Fish and Assessment of Aquatic Habitat on Camp Maxie and Camp Bowie Bases**

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Author: Virginia G. Jeske

Mentor: Dr. Lance Williams

The Texas Military Department has the goal of establishing a recreational and sustainable fishery for the ponds located on Camp Maxie, a Texas Army National Guard Training Site located near Paris, Texas, and Camp Bowie, a training center for the Texas Military Forces located near Brownwood, Texas. In order to understand the aquatic community and habitat, this study seeks to survey fish and assess the habitat on 9 ponds found on the bases along with perennial streams to identify changes in activity and actions required to prevent and reverse impacts of the aquatic community. This presentation will overview the study and the data analysis and key deliverables required to complete the study.

# Undergraduate Presentations

Alphabetical: Author Last name

## **Encapsulation of Proteins Inside the HK97 Virus Like Particle**

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Author: Suefian Kandeel

Mentor: Dr. Dustin Patterson

Enzymes are protein catalysts that have many useful functions in industrial and technological applications, however the stability of enzymes is often a major barrier for greater utilization in many advanced applications. One approach toward enhancing the stability of enzymes is to encapsulate them in a biological protein cage derived from viruses, called a virus-like particle (VLP), which can provide a protective structure around the enzymes that is predicted to enhance overall stability and provide a molecular scaffold that can be chemically modified without direct modification of the enzymes entrapped inside. For our studies, we investigate the encapsulation of enzymes inside the Hong Kong 97 (HK-97) bacteriophage derived VLP, which forms a unique molecular chain mail catenane protein cage structure in its mature head form. The research presented focuses on encapsulation of GFP to determine optimal methods for enzyme encapsulation inside the HK-97 VLP and the investigation of encapsulation of the CelB enzyme. The enzyme CelB is a beta-galactosidase that is of interest for biofuels and synthesis of pharmaceuticals due to properties that make it a useful "model" enzyme for initial studies, such as its robust nature against high temperatures and chemical denaturation.

## **Influence of the Latino Vote in Texas.**

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Author: Micheal Kollman

Mentor: Dr. Mark Owens

Over the past twenty years or so, the State of Texas has been slowly developing from a ruby-red state where Republicans win up and down the ballot to a near-swing state in the last couple of elections. Every election cycle there is now a lot of conjecture as to whether or not Texas will finally go blue at the national level and the reasons listed are seemingly endless. However, when boiled down, what factors are going on inside and outside the State of Texas that seem to be bringing a blue Texas to fruition? By looking through information and analyses of data such as voter polling data, immigration figures, turnout demographics, and/or population growth changes, among many factors considered, a pattern may emerge as to whether or not there is a specific driving factor that can be pointed to or a culmination of factors that have contributed to Texas once again becoming a purple state. By figuring out what exactly is going on with Texas' changing voter dynamic, important lessons can be gleaned from learning what is happening. Texas can serve as a guidepost to figuring out why other states may be shifting left as well, it may be useful to either party to take note of possible changes they need to make if they seek to keep winning elections or stem their losses, it would likely cause a huge electoral power shift to one party over the other, and many other consequences yet to be considered would likely follow.

# Undergraduate Presentations

Alphabetical: Author Last name

## **Pre and Posttest Assessment of Ankle Mobility and Strength for Collegiate Women Soccer Players**

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Author: Danielle Lacasse

Mentor: Dr. Wycliffe W. Njororai

Data collected during the 2019 soccer season at the University of Texas at Tyler showed women were susceptible to ankle injuries. A deficiency in ankle strength and mobility were suspected to be injury contributors. Hence, twenty-eight female soccer players were selected to undergo a pretest, a 13-week specialized ankle strengthening and mobility regimen via a warmup and cool down, and then a post-test to assess improvements. Ankle strength was tested with the manual muscle test (MMT) scale ranging from 1 to 5. Stationary range of motion was tested with a goniometer to measure the full range of motion in both ankles. For functional range of motion, the squat, inline lunge, and hurdle step were evaluated with a MMT test ranging from a 1 to 3. Data was then analyzed using the dependent t-test. Results showed that strength in the ankles did improve in inversion, eversion, plantarflexion, and dorsiflexion. However, only the right foot inversion and left foot eversion were statistically significant with a p-value of .075 and .019. For the stationary range of motion there was an increase in dorsiflexion, inversion, and eversion, but a decrease in plantarflexion. The only statistically significant value was the right ankle dorsiflexion with a p-value of .054. For functional range of motion, the squat, inline lunge, and hurdle step all showed improvements. However, the squat was the only statistically significant value with a .075 p-value. While not all values proved statistically significant, there were improvements between pre and post-test assessments after the 13-week program. More research to establish whether they have any correlation with injury occurrence is recommended.

## **Development and Improvement of Fluorescent OLED Structures**

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Author: Claire Lamberti

OLEDs (organic light-emitting diodes) typically suffer energy loss when the drive or current voltage is increased, leading to decreased external quantum efficiencies (EQE) at higher voltages, which are required to attain high brightness levels. This drop is fundamental due to the molecular excited and relaxed (light emission) states. When potential, or current, is increased, a large amount of the emitting molecules in the emissive layer (EML) are excited. When the excitation migrates across the layer there is the chance it could collide with another exciton already on the molecule, or on an electron or hole that is transiting the EML. This collision results in the de-excitation of one or two of the excited states, resulting in the loss of efficiency - this is called "exciton annihilation" or "quenching" - and this process also leads to molecule degradation and a decrease in OLED lifetime. Therefore, it is important to develop structures that are resistant to exciton annihilation and substance degradation. The goal of this specific research project was to develop and test fluorescent OLEDs. This poster will discuss several device structure types that were researched to look at their effect on the exciton flow through doping concentrations and thickness gradients.



# Undergraduate Presentations

Alphabetical: Author Last name

## Road Reconstruction

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Author: Justin Levels

Mentor: Dr. Mena Souliman

The research project is based on how the city of Tyler can improve a section of roadway. The goal of the project will be identifying the severity and extent of all kinds of distresses in the roadway, calculating the pavement cracking index (PCI) and eventually coming up with two to three recommended rehabilitation strategies. The data collection is done by surveying the roadway for what damage the roadway has sustained. The results show that most of the road is in good health and just needs routine maintenance but there is a single pothole that needs to be fixed. After the survey was completed the recommended plan for the roadway would be to either temporarily fix the problem by filling the pothole with hot mix asphalt (HMA), or permanently fixing the pothole by doing a full depth removal and replacement patch of the asphalt around the pothole.

## Wind Tunnel & Vacuum Chamber System

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Authors: Sean Lowe, Omar Buentello, Carlos Chic, Geovani Chico, & Brittany Fink

Mentor: Dr. Soren Maloney

Testing of components in adverse conditions is an important part of the design process. A significant amount of cost can be reduced if the testing prototype is optimized in the simulated environment. As such, a wind tunnel with thermal vacuum capabilities is designed and built to improve the quality of testing data in an educational laboratory setting. To achieve this, the laws of thermodynamics, fluid mechanics, and heat transfer were used to design the full-scale closed-loop wind tunnel. Compared to simulated testing, the system can manipulate the vacuum pressure, temperature, and airflow of the system which will improve data quality.



# Undergraduate Presentations

Alphabetical: Author Last name

## **Developing the HK97 VLP Nanoplatfrom for Selective Chemical Labeling and Modification**

Author: Dakota Lucas

Mentor: Dr. Patterson

The HK-97 virus-like particle (VLP) is a non-infectious protein cage structure derived from the bacteriophage HK-97 that has potential for constructing advanced bionanomaterials. In order to further develop the HK97 VLP as a nanoplatfrom, methods for selective modification of the different morphological forms of the VLP are desired. The HK-97 VLP undergoes a transition between a procapsid structure, being 54 nm in diameter, to a 60 nm in diameter head structure, which can be induce with a change in solution pH. The research presented here looks at the design strategy for selectively labeling the procapsid, and then to have the ability to selectively tag it with another molecule in the head structure. Based on the crystallographic structure of HK-97 the amino acid methionine at position 202 (M202) in the sequence was found to be hidden in the prohead conformation, but becomes exposed in the head morphological structure. This amino acid was therefore identified as a potential sight for selective labeling of the head structure versus the prohead structure. The results presented here are for investigating HK-97 VLP M202 mutants and examining the ability to selectively label it in its different forms.

## **Do Changing Demographics Affect Election Outcomes and Different Immigration Public Policy in Texas and California from 1990 to Now?**

Author: David Lutmer

Mentor: Dr. Mark Owens

This presentation will explore whether changing demographics have affected California and Texas's election outcomes from 1990 to the present and whether changing demographics have affected different immigration policies in Texas and California from 1990 to the present. Also, both states took similar paths when it came to their immigration policy in the past; in 1994, California passed Prop 187, which banned all services for undocumented immigrants, whereas the Texas Sanctuary City ban allowed police officers to pull people over to question their immigration status (Nowrasteh, 2016; Patton, 2017). I will explain the Demographic breakdown over different time periods, election outcomes and different immigration policies between California and Texas. Immigration policy is important because it changes what policies are implemented in state capitals around America. Moreover, I will discuss how California and Texas are different culturally. A takeaway from this project were the similarities between the election results in California and Texas as when elections got closer in both states, candidates, such as Gov. Wilson, Schwarzenegger, and Abbott, all had to readjust their positions on illegal immigration in order to be re-elected and politically relevant. Another takeaway is that because of the election results that started in 1998 for California and Texas, both states' voting and immigration laws, for the most part, went in very different directions.



# Undergraduate Presentations

Alphabetical: Author Last name

## **The Intellectually Disabled and the Death Penalty**

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Author: Michelle Mata

Mentor: Dr. Mark Owens

The Supreme Court Case of *Atkin v. Virginia* leaves State that ability to interpret the intellectually disabled. The ruling of *Atkin v. Virginia* ruled the death penalty for the intellectually disabled is unconstitutional because it is "cruel and unusual punishment" as written in the 8th Amendment of the U.S. Constitution. Leaving states with the ability to practice their own interpretation of how to identify the intellectually disabled varies from state to state. Southern states have a record of toughness as suggest with the high number of executions year to year. Texas, Georgia, Virginia, and Florida each have different methods of conducting whether a defendant is intellectually disabled. The methods of each state determine the effectiveness to determine if the defendant is in fact intellectually disabled. The research I propose will break down the process each state uses when determining the intellectually disabled and determine its effectiveness to the number of executions year to year. The States methods have similar characteristics but lack few procedures that help defendant bring in more evidence. States can process how they determine the intellectual disabled; therefore, each state procedure varies. The research will allow the reader to conclude on how they choose to view the intellectually disabled procedure. The reader will be able to formulate their own opinion rather than the research moving them to one direction. The ruling of *Atkin v. Virginia* allowed States to determine the procedure to determining the Intellectually disable however, readers could conclude different ideas such as whether there should be a procedure for all states to follow.

## **xEMU Space Suit Quick Release and Catch System**

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Authors: Antonio Mejia, Zachary Butterfras, Amin Marashi, Antonio Benedicto Mejia Jr., Michael Mira, & Monica Louise Monconduit

Mentor: Dr. Aws Al-Shalash

Astronauts exploring the lunar surface will perform a series of Extravehicular Activities (EVA), which require repeated access to various tools and equipment installed on the Exploration Extravehicular Mobility Unit (xEMU). Carrying tools on the xEMU will improve spacewalk efficiency during end-to-end sampling missions. Tools must interface with the spacesuit through a manually operated and lunar dust-tolerant mechanical subsystem. Therefore, two interlocking components with an integrated double roller catch are designed out of Teflon, Aluminum 6061, and AISI-316L steel to facilitate removal and reattachment of fit-for-purpose tools. Compared to NASA's previous bayonet probe design, the Vanguard xEMU subsystem safely stows and secures various tools required for lunar surface exploration and provides adequate lunar dust mitigation for proper functionality. The design will be part of several student-inspired solutions to NASA's present-day challenges for the upcoming 2024 Artemis Mission to the Moon and beyond to Mars.

# Undergraduate Presentations

Alphabetical: Author Last name

## **Pavement Management**

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Author: Shayla Mendiola

Mentor: Dr. Mena Souliman

Pavement management is the process to maintain and repair the network of roads or other paved facilities, such as airports runways. I conducted pavement studies on a road here in the UT Tyler campus, the road is Patriot Dr. next to the living field. For this road I looked of all kinds of distresses and calculate the PCI (Pavement Condition index). The goal for this project is to recommend rehabilitation strategies in accordance with pavement management.

## **Preservation Technology: Comparing and Contrasting 3D Laser Scanning and Photogrammetry**

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Authors: Ekaterina Menkina & Robbie Wallace

Mentors: Dr. Cory Sills, Dr. Thomas Guderjan

The increased use of preservation technology allows archaeologists and other researchers to examine, analyze, and share data from digital records without harming fragile originals of artifacts. This poster reports the results of comparing and contrasting 3D imaging methods using a NextEngine 3D Laser Scanner verses Photogrammetry using Agisoft Metashape. We choose to use a woolly mammoth tooth, excavated in the Nizhny Novgorod region of Russia that dates from at least 10,000 years ago to compare the two different methods. The tooth was chosen over other materials because the variation present, with multiple, complex layers, planes, and ridges allow the technology to display the full range of their abilities. The methods and associated programs are assessed to establish the accuracy of color, design, and shape. In this poster we will discuss the techniques used as well as the advantages and disadvantages between photogrammetry and 3D Laser Scanning. This study will assess and contribute to the existing knowledge of preservation technology by presenting insight on the credibility and efficiency of the software programs. This project reinforces the significance of preserving and documenting artifacts for public accessibility.



# Undergraduate Presentations

Alphabetical: Author Last name

## **Pavement Analysis**

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Author: Arnaud Muhire

Mentor: Dr. Mena Souliman

The purpose of the project is to determine what sections of roadway in the city of Tyler that need to be improved. The condition of a roadway will be determined and by calculating the Pavement Cracking Index (PCI), we will be able to come up with two or three possible solutions to mend that section. To determine where the attention is needed, data will have to be collected by surveying a specific section of a roadway and taking note of where the damage is. The results that came from the data collection and observation, show that the roadway is in good condition and the needs a maintenance to repair the minor cracks present. The recommended method to temporarily fix this issue would be to fill those cracks with hot rubberized asphalt. This will allow the pavement to be protected from rain and moisture that would otherwise flow through and erode the base materials and eventually cause potholes and pavement failure.

## **Experimental Apparatus for Testing Noise Reduction Levels of Different Metamaterials in HVAC Ducts**

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Authors: Mason Paddie, Matt Bryson, Jasline Chandler, & Jordy Castaneda

Mentor: Dr. Chung Hyun Goh

A Heating Ventilation and Air Condition (HVAC) system is used to control and regulate the indoor environment of a facility. Fixtures and turbulence within the duct cause unwanted noise and can prevent an HVAC system from performing optimally. Excessive noise in HVAC ducts can become dissatisfactory for users. The purpose of this project is to design and build an experimental apparatus that can repeatedly produce a three-dimensional acoustic pressure plot in MATLAB to experimentally determine noise reduction levels of different metamaterials. The pressure plot is built by determining the frequencies at each node through a Fourier transform. Linear actuators control the three-dimensional movement of an omnidirectional microphone, while a directional speaker is used for sound wave generation through the ducts. Current results produce a two-dimensional pressure plot in a manual coding process, but a three-dimensional acoustic pressure plot can automatically be produced once a new data acquisition system is acquired.

# Undergraduate Presentations

Alphabetical: Author Last name

## **Logit Regression Model to Predict Driver Left Turn Destination Lane Choice Behavior at Urban Intersections**

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Author: Eric Proffer

Mentor: Dr. Matthew Vechione

As autonomous vehicles become more prevalent during daily commutes, there will be an increased need to predict the driving behavior of humans behind the wheel. As this increase in prevalence will not be immediate, this human behavior prediction will be vital to minimize the number of traffic incidents between human-controlled and autonomous vehicles. One of the most unpredictable driving behaviors that can be observed is the destination lane choice of a driver turning left at an intersection. If this destination lane choice behavior can be predicted, then the introduction of autonomous vehicles can occur in a safer, more controlled manner. This research builds off of previous research by making use of two Next Generation Simulation (NGSIM) arterial street data sets in order to attempt to predict the turning behavior of human-controlled vehicles using real-world field data. This prediction can then be used in addition to the technology already in place in autonomous vehicles to decrease the risk of a collision at an intersection with a concurrently turning human-driven vehicle. Currently, there is no existing model that can accurately predict driver behavior due to the unpredictability of human-controlled vehicles. The resulting model will allow for a safer transition from human-controlled vehicles to autonomous vehicles. In addition to the safety benefits, this model could also be incorporated into popular microscopic traffic simulation tools, in order to improve the overall accuracy and efficiency of these tools.

## **The Balance Zone**

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Authors: Justin Abihabib, Rachel Ramon, David Roman, & Cristian Mandujano

Mentor: Dr. Nelson Fumo

The diverting apparatus was designed to be used in residential applications to balance two thermal zones, which are spaces sharing the same thermostat to control room temperature. As a typical day goes on, thermal loading from the sun creates an imbalance between the indoor thermal zone temperatures within a home. The homeowner would select the desired setpoint temperature and the apparatus would divert more supply airflow to the thermal zone within the largest temperature swing. The apparatus has been designed to modulate a diverting mechanism to balance the two thermal zones, improving the thermal comfort for the homeowners. The apparatus is constructed of sheet metal ductwork with the modulating diverting mechanism that is driven by a 24VAC actuator. The design constraints and requirements set by the sponsor, TRANE Technologies, have been adequately addressed and approved in the design and functionality of the apparatus.

# Undergraduate Presentations

Alphabetical: Author Last name

## Martian Aquaponic Module

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Author: Edgar Reyes, Christopher Nobinger, Christian Puckett, & Aaron Sithideth

Mentor: Dr. Mohammad Biswas

The idea of Mars exploration has existed as a strong ambition in society since the 1960s. However, the greatest challenge to exploration would be the Martian conditions which make it impossible to sustain life through natural methods. To combat this, a base implemented will need to artificially create an Earth-like environment in which life can thrive. This base would need to include a food production system for astronauts during their time of deployment to increase the quality of life and increase chances of survival. Though simulation and a small-scale build of an Earth-based aquaponics system, the characteristics of implementation can be predicted to meet the demand of continuous, sustainable, fresh food production for the Mars mission. This work showcases how an aquaponics module could ideally be implemented, in which 75 plants and 224 fish can thrive while keeping the power consumption of the module under 10 kW.

## Closed Loop Wind Tunnel

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Authors: Demetri Rhodes & Alan Nguyen    Mentor: Dr. Tyler Hall

A subsonic wind tunnel was designed and built for the University of Texas at Tyler laboratories as a senior design project. The students tested different models and matched their theoretical calculations to the experimental wind tunnel values. The wind tunnels components are made from half inch Birch Plywood because of its accessibility and durability. The test section has a plexiglass door for a clear visual of the test model. The tunnel is 106 inches long with supports that allow us to connect a return section made by another senior design group (HEC24) making it a closed loop tunnel. The design consists of four major sections connected by removable bolts for ease of assembly, disassembly, and transport. The fan is exhaust and is 2418 CFM, 400W, and has a speed controller. Load cells and a DAQ (Data acquisition tool) are used to measure the drag and lift force in LabVIEW. Load cells are mounted on a 3D printed slider mechanism allowing movement in the x direction for drag. Both load cells rated to measure force between 0 and 5 kgf in tension and the vertical tension rod measuring lift force is also the airfoil mount. According to computational fluid dynamic simulations, wind velocities of at least 50 MPH occur in the test chamber. From testing, the max wind speed in the test chamber is 22 mph. More experimental data coming soon when purchase orders arrive (manometer) and the LabVIEW is fully functional. Although the final assembly is complete, further testing needs to be done to calculate for different testing models. Computational fluid dynamics simulations were performed to reenact what the test model should be experiencing in the wind tunnel. These simulations provide theoretical data that can be compared to the actual data once testing is complete.

# Undergraduate Presentations

Alphabetical: Author Last name

## **Furnace Pressure Switch Tester**

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Authors: Zane Riddlesperger, Ben McFadden, Seyi Akiode, & Scott Tatum

Mentor: Dr. Nelson Fumo

A furnace pressure switch is a safety device located near the draft inducer motor of a gas forced-air furnace. The switch is there to prevent the furnace from running unless the correct venting air pressure is present. Therefore, it is necessary to test each switch prior to installation in order to prevent failure. When compared to existing technology used to manually test each switch, Trane requested a device that would automate this process to reduce the time required to perform each test while simultaneously increasing data quality. For each test performed a pressure switch is connected to the device using a simple hose-to-barb connection that feeds directly into the apparatus. Our system is comprised primarily of two fans which can create positive or negative pressure as selected. We use PWM control to guarantee that the fans will steadily modulate at the desired rate. The pressure generated is monitored by using a high precision pressure sensor between the two fans. Whenever a test is completed, the exact value of each make and break point of the switch will be displayed for each cycle (up to three cycles). The make point is the pressure at which the switch closes (complete circuit) and the break point is the pressure that causes it to open. The hysteresis, defined as the difference between the values of the make and break pressure points, will also be calculated and displayed. The device will also determine and display whether the switch has passed or failed a tolerance test of its make and break points and a tolerance test of its hysteresis based on its trigger set point. The system components are protected by a 3D-printed PLA housing.

## **Design of an Integrated PEM Fuel Cell System**

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Authors: Shrawan Rizal, Robert Mah, Marco Ponce, Oscar Palencia, & Daniel Jordan

Mentor: Dr. Hussain Rizvi

Fuel cell technology has been playing a vital role in space exploration since the 1900s. Fuel cell serves as a reliable backup energy source whenever sunlight cannot power the space shuttles and other space mission appliances. A regenerative fuel cell system can continuously generate power by utilizing the electrolysis process to breakdown the bi-product water into the fuel. Hence, it is crucial to building an integrated Balance of plant for the fuel cell to generate continuous power for a more extended period. Balance of Plant for the 100W Regenerative PEM fuel cell system that serves as a backup energy source for the lunar mission was modeled and simulated in the MATLAB® and Simulink®. Simulation of the integrated system results in an efficiency of 57%. The system's anode side was built for the 100W PEM fuel cell and tested on the earth-based environment. Multiple parameters were optimized, including Hydrogen generation, flow rate, pressure, and temperature of the system to gain the fuel cell's power's optimal efficiency. Results show the system was able to produce 97% pure Hydrogen that fueled the fuel cell, resulting in up to 70% overall power efficiency.

# Undergraduate Presentations

Alphabetical: Author Last name

## **Polymer Exchange Membrane Fuel Cell for Power Generation**

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Author: Marco Rodriguez

Mentor: Dr. Fredericka Brown

This study provides an ANSYS Fluent Polymer Exchange Membrane (PEM) fuel cell capable of generating 1 kW of power for hurricane struck gulf coastal regions. The objective is to be able to provide a portable compact source of power distribution to flooded areas around the Houston and Galveston area. A numerical computational fluid dynamics (CFD) model was constructed for a 72x71 mm serpentine PEM fuel cell to examine the validity of the numerical results. The model is divided in half where one side is the anode, and the other half consists of the cathode section. The model is evaluated based on the current to voltage (polarization) curves obtained by specifying the voltage at the cathode and calculating the current density at the cathode wall. Some parameters which are known to decrease the current density are used as a way to achieve a closer fit with experimental results. Furthermore, the polarization curves obtained similar trends with maximum current densities of 200 mA/cm<sup>2</sup> –at operating pressure and temperature of 4 bar and 333 kelvins, respectively. The main parameters governing voltage drops were found to be due to contact resistance and water formation. A discussion is provided on managing the previously mentioned parameters and inlet flow rates to obtain closer fit of data using a systematic approach as provided in literature. Inaccuracies in data were attributed to experimental inconsistencies such as modelling of cooling channels, catalyst degradation, and high pressures throughout the fuel cell assembly.

## **Exploring Stigma Experienced by People with Parkinson's Disease, in Literature and Social Media**

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Authors: Zoe Mikaela Santos, Arianna Bowlin, Danitza Castillo, Lacey Hester, Justin

Melendez, Beckett Preston, Briseida Ramirez, Carlos Reyes, Alyssa Rojas, & Jarrizze Santos

Mentors: Dr. Beth Mastel-Smith and Dr. Melinda Hermanns

Parkinson's disease (PD) is an incurable progressive disorder that affects the nervous system and results in changes in a person's speech, movement, balance, and coordination. Stigma is associated with poorer patient outcomes and affects a person's physical, mental, and emotional health. Stigma Theory defines stigma as four separate and interconnected concepts: public, self, stigma by association, and structural stigma. Purpose: To explore how stigma is experienced by people with PD, how current literature and social media portray stigma for people with PD, and if this portrayal supports Stigma Theory. Research questions: 1) how is stigma represented in the literature and social media? 2) how do people with PD describe the stigma they experience? 3) do findings support stigma theory? A multi-case qualitative study will compare the experiences of people with PD, literature and social media representations of stigma and determine if findings support Stigma Theory. Ethics approval and consent will be obtained for individual Zoom video chats or phone calls with six adults with PD. Interviews will be audio-taped, transcribed, then coded and analyzed individually. Interviews will be compared and examined for patterns and explanations. Current literature findings support how stigma causes embarrassment, anger, and frustration for people with PD and how the motor symptoms and difficulties that arise from PD can lead to increased stigma. Literature findings support Stigma Theory. Interviews will determine how people with PD experience stigma and how social media portrays people with PD for evidence of stigma, and if findings support Stigma Theory.

# Undergraduate Presentations

Alphabetical: Author Last name

## **#ACAB: A Study of Student Perceptions of Police Behavior and Accountability**

Author: Hannah Sasser      Mentor: Dr. Rick Helfers

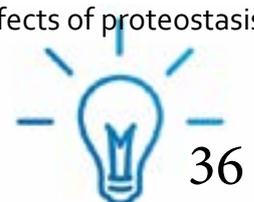
Police-community relations have been strained since the inception of policing in the United States. As incidents of misconduct and unjustified uses of force continue to be broadcast across social media platforms, student perceptions of trust and police legitimacy have continued to decrease, heightening negative perceptions of police officers. The dominant explanation for this trend contributes social media as an influencing factor on how community views the police. Previous research also predominately indicates gender as a prominent factor in predicting community perceptions of police. After the untimely deaths of Trayvon Martin, Michael Brown, George Floyd, and several others, there has been significant studies attempting to inspect police's role within society. With limited research specifically investigating student perceptions, this study attempts to gain insight into student impressions of police behavior and accountability. This quantitative study surveying a convenience sample of 160 college students addresses student's views of police legitimacy by examining their perspectives of police training/authority, feelings of safety, and ability to serve all members of the community. An anonymous survey was distributed as both an online and paper format to recruited students across the United States to determine current student perceptions of police officers. A statistical analysis indicates that student's perceptions of authority and feelings of safety directly contributed to overall confidence in police officers. Students surveyed before the death of George Floyd were found to have a higher confidence in police to adequately do their job. No relationships between social media, gender, or race and subsequent perceived confidence were found to be significant.

## **Optimization of LC/MS-MS Parameters for Shotgun Proteoanalysis**

Author: Wyatt Schaefer      Mentor: Dr. Kerfoot P. Walker, III

Human aging is increasingly recognized as both a chronological and biological process. Cell senescence, telomere attrition, and lack of proteostasis are just some of the factors that contribute to biological aging<sup>2</sup>. Additionally, recent literature suggests that the change in concentration of certain proteins in human serum correlates to biological aging<sup>3,4</sup>. Thus, this research aims to optimize LC/MS<sup>2</sup> parameters for shotgun proteoanalysis using a HeLa protein digest standard. We are performing micro-flow LC/MS<sup>2</sup>-based proteomics. We optimized our LC/MS<sup>2</sup> for proteome analysis using a Vanquish Horizon liquid chromatography system directly connected to a Q-Exactive HF-X with BioPharma option mass spectrometer using HeLa Protein Digest Standard. We investigated the effects of spray voltage, probe orientation, column length, protein load, flow rate, gradient time length, and gradient spread on total protein identifications (IDs). Proteins were identified using the UniProtKB Human Reference Proteome database via Proteome Discoverer 2.4 software. A max of 4631 proteins from 24000ng of HeLa digest were identified using a spray voltage of 3.50 kV, neutral/unaltered probe orientation, a gradient length of 180 minutes from 8% acetonitrile to 32% acetonitrile, and a 2.1mm x 150mm column at a 50Åµl/min flow rate. An optimal protein yield of 3729 was obtained with these parameters with a protein load of 4,000ng. Our data suggests that we are identifying an equal number of proteins with that of the literature<sup>1</sup>. Thus, we proceed by beginning human serum proteoanalysis. Further research is needed to optimize protein IDs and protein quantitation for human serum proteoanalysis and therefore measure the effects of proteostasis on aging.

Poster Presentations



# Undergraduate Presentations

Alphabetical: Author Last name

## 2020-2021 Baja SAE Vehicle

Authors: Benjamin Stewart, Rachel Emerine; Emmanuel Ojeda

Mentor: Dr. Tahsin Khajah

The purpose of this project was to design and build a fully functioning vehicle capable of racing competitively at the 2021 Baja SAE competition. The overall project consisted of two major designs; a completely new vehicle frame and the first four-wheel drive system ever implemented on a UT Tyler Baja SAE car. The new frame was designed to reduce the overall vehicle weight and accommodate the four-wheel drive system while increasing driver safety and ergonomics. Similarly, the four-wheel drive system was designed concurrently with the frame to allow for the required clearances and optimize weight distribution. In addition to these two major design projects, there were various sub-systems that required a redesign, such as the suspension, the brakes, and the electrical system. Furthermore, various racing conditions and optimization criteria were considered when designing and testing both the frame and the four-wheel drive system. As such, the new design will ensure driver's safety under various racing conditions while also being able to compete with other design teams at competition.

## Texture Classification Using Angular and Radial Bins in the Transformed Domain

Authors: Aavash Sthapit, Ashim Sedhain, Bishrut Bhattarai, & Saurav Panthee

Mentor: Dr. Arun Kulkarni

Texture is generally recognized as fundamental to perceptions. There is no precise definition or characterization available in practice. Texture recognition has many applications in areas such as medical image analysis, remote sensing, and robotic vision. Various approaches such as statistical, structural, and spectral have been suggested in the literature. In this paper, we propose a method for texture feature extraction. We transform the image into a two-dimensional Discrete Cosine Transform (DCT) and extract features using the ring and wedge bins in the DCT plane. These features are based on texture properties such as coarseness, smoothness, graininess, and directivity of the texture pattern in the image. We develop a model to classify texture images using extracted features. We use three classifier algorithms: the Decision Tree, Support Vector Machine (SVM), and Logarithmic Regression (LR). To test our approach, we use Brodatz texture image data set consisting of 111 images of different texture patterns. Classification results such as accuracy and F-score obtained from the three classifiers are presented in the paper.



# Undergraduate Presentations

Alphabetical: Author Last name

## **Pavement Review: Old Omen Rd - From University Blvd to Liberty Landing Apartments**

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Author: John Tinsley      Mentor: Dr. Mena Souliman

This presentation discusses the status of the pavement of Old Omen road from University Blvd to the Northernmost driveway of Liberty Landing Apartments. All of the distresses in the pavement are documented with their locations and categorized by extent and severity. This information is used to assign the stretch of road a Pavement Condition Index (PCI) score. Using this score and the tabulation of data of the distresses in the pavement several pavement rehabilitation strategies are recommended and evaluated by cost effectiveness relative to each other.

## **Synthesis of an End-Capping Agent for Use in the Co-Block Polymerization of Poly(styrene-*b*-methacrylonitrile): Designing an Undergraduate Experiment in Polymer Chemistry**

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Author: Zachary Tucker

Mentor: Dr. Sean Butler

Polymer synthesis education at the undergraduate level is essential. Here we report continued developments toward a new undergraduate experiment involving the synthesis of a macroinitiator and its use in the living synthesis of the diblock copolymer poly(styrene-*b*-methacrylonitrile). The experimental design will require students to use a variety of methods to synthesize a living polymer end-capping agent. This experiment is appropriate for an upper-level laboratory course in advanced organic or polymer chemistry. Students will gain experience in multi-step organic synthesis, product separation and purification, living polymerization, polymer modification, and advanced characterization techniques. Our current data yields the promise of successful reactions that can be reproduced by undergraduate students in the laboratory.



# Undergraduate Presentations

Alphabetical: Author Last name

## **Responsible Residential Development: An Overview of Tyler, Texas's Residential Building Permits**

Author: Autumn VanBuskirk

Mentor: Dr. Matthew Kelly

Residential housing is an important indicator of economic well-being, and informed residential development can prevent condensed pockets of impoverished or underserved communities. For Tyler, Texas, the divide in housing can be difficult to analyze, so this study aims to quantify the most recent residential development happening in Tyler. The goal of this study is to identify if there are concentrated areas of high- or low-end housing as well as if there are areas being developed over others. To accomplish this, the study examines the residential building permits issued in Tyler from 2017-2019, which include the permit location and the value of the property being built. The permit locations are plotted on an interactive map, and the pinpoints are color-categorized by the value of the property. Location is evaluated by zip code, and property value is categorized in groups, such as \$100,000-\$200,000 or \$300,000-\$500,000. After plotting the residential permits, the statistical evidence suggests that most of Tyler's new high-end housing is in the 75703 area while most of the new low-end housing is in the 75701 and 75702 area. In addition to having the majority of the high-end housing, the 75703 area also has significantly more permits issued. While these findings do not account for preexisting properties nor for the race, gender, education, or income of a property's homeowner, these observations can be focal when considering future residential development goals in Tyler.

## **Design and Analysis of Cross Flow Heat Exchanger**

Authors: Daniel Vasek, Gokay Ayyun, Joao Friguglietti, Anh Tran, Louie Urquieta Lopez, & Edwin Wande

Mentor: Dr. M. A. Rafe Biswas

Heat Exchangers are one of the most effective ways to test, analyze and calculate heat transfer for experimental purposes. The purpose of this project is to design and test a cross flow heat exchanger (CFHX) with filtered air flow to allow students to gain hands-on learning on Heat Transfer concepts. The air filter ensures virtually no fouling on the fin area and other areas of the heat exchanger. Additionally, the CFHX is expected to be an improvement on the current DLMX CFHX used in the laboratory allowing: the selection of desired water temperatures and flow regimes and the computational collection of data. The final design included temperature, pressure, flow rate, and differential pressure sensors that connect to a Data Acquisition (DAQ) system and NI LABVIEW software. After proper calibration of the sensors, experiments were conducted to test for pressure drop on the air side and overall heat transfer across the system with and without an air filter. The theoretical values showed a pressure drop of 70 Pa and 120 Pa for air flow velocities of 2.98 m/s and 4.86 m/s, respectively, which corresponded to the speed settings of the fan. These settings result in the overall heat transfer rates were 492.4 W and 707.6 W for corresponding laminar and turbulent flow regimes. The results indicate a pressure drop across the heat exchanger including an air filter and the theoretical values were consistent with experimental values. Overall, the CFHX can be an improvement since it allows for the automatic collection of data and the ability to experiment with different flow regimes and temperatures.

# Undergraduate Presentations

Alphabetical: Author Last name

## **Pavement Distresses and Rehabilitation for Circle Drive**

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Author: Jaide Williams

Mentor: Dr. Mena Souliman

Pavement Management is a decision-making process used to make cost-effective decisions about design, construction, maintenance and rehabilitation of pavements. Having a Pavement Management System in place allows for engineers to adequately examine the severity of pavements on freeways, interstates, parking lots, and local roads. To examine the severity of Circle Drive on The University of Texas at Tyler's campus, the presentation will provide calculations and procedures using the Pavement Condition Index (PCI). This PCI will ensure that pavement section coincides with the initial visual findings, which ranges from 0 (worst) to 100 (good condition). Upon using the PCI, I used the Network Level approach which addresses broad pavement maintenance and rehabilitation questions which then suggests a general idea on the amount of funding needed based on the level of treatment required for Circle Drive. The data gathered from physical field work revealed that the various pavement distresses observed for Asphalt were Alligator Cracking, Longitudinal Cracking, Transverse Cracking, Crack Seal, Block Cracking, Raveling, Reflective Cracking and Low-Grade Fatigue Cracking. Due to Poor Drainage Conditions, there were also distresses such as Water Bleeding and Pumping, Depression Due to Pumping, and Potholes. Since the Pavement distresses range from a low to high severity, the remedy for each case varies. For example, for Alligator cracking of Medium Severity with Low Extent, it will be suggested to patch that portion. In other instances, it will be wise to use solutions such as crack seal, scrub seal or mill & fill for Transverse Cracking. Block Cracking may require the same treatment course as well based on severity. For a typical lane-mile road, usually it is suggested to use rehabilitation measures in certain sections rather than using one method for all distresses, so this research presentation will follow the same suit.

## **Election Integrity: Jim Crow in a Suit and Tie?**

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Author: Justin Yaws

Mentor: Dr. Mark Owens

America is witnessing a crisis of democracy unseen since the times of the Civil Rights Era. In spite of unprecedented voter turnout in the South, the number of voters that express doubt in the 2020 election, mingled with fear of widespread, nonexistent, voter fraud has resulted in the introduction of new voting regulations across southern legislatures. These laws will only serve to suppress the vote in large swathes of the southern population. Researching these laws and tracing their history back to the Shelby County decision by the Supreme Court to gut the Voting Rights Act, helps to unravel the reason that voter suppression is seeing a new surge in the south.

# Undergraduate Presentations

## Alphabetical: Author Last name

### **The Effects of the COVID-19 Pandemic on Stress Levels of Homosexual and Heterosexual Couples**

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Authors: Ana Zaidan, Audrey Escamilla, Robert Pierce, & Chloe Gasper

Mentor: Dr. Amy Hayes

The rise of COVID-19 and the increasing social isolation has caused a cascade of changes for individuals in partnered relationships, in which a large number of couples were either around one another for a more extended period of time than their baseline or where apart from each other for a more extended period of time than their baseline. Relationship Science has been used to predict how such shifts in dynamics could impact the relationship during this stressful time. According to the vulnerability-stress-adaptation model (Karney & Bradbury, 1995) stressful situations tend to amplify underlying hardships of the relationship, leading researchers to predict that COVID-19 serving as a stressor would increase the problems between partners. As LGBTQ individuals in relationships have a set of underlying stressors that differs from their heterosexual counterparts (Meyer, 2013), our research question was: Is the added stress of isolation during the COVID-19 pandemic affecting these couples differently? The research has indicated that there is a considerable possibility that the COVID-19 pandemic has negatively affected the quality, sanctity, cohesiveness, and functionality of LGBT relationships more so than that of heterosexual couples. The goal of this research is to examine the situation on whether LGBT people are faring worse than their "straight" counterparts during the COVID-19 pandemic. Our study is comprised of mainly college-age individuals surveyed through an online source. The survey consists of two parts that focus on the relationship satisfaction pre-COVID (December 2019 "" February 2020) and now (March 2020 "" present).

### **Understanding Trait Gratitude and Potential Changes Following Stressors for International Students**

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Author: Ana Clara Zaidan

Mentor: Dr. Adam McGuire

Previous studies have established gratitude as a trait, a mood, an emotional response to interpersonal events, and a moral motive (McCullough et al., 2001; McCullough et al., 2004). Trait gratitude has been defined as a disposition to be aware of situations in which one is the benefactor of some positive outcome, and to feel grateful for that outcome. Compared to state-level gratitude, which can vary within-persons, trait gratitude is expected to remain relatively constant and stable during one's life (Emmons, & McCullough, 2003). However, there is evidence that trait gratitude can change following gratitude interventions. Additionally, major life stressors or traumatic experiences, such as receiving a cancer diagnosis, have shown to promote a change in trait gratitude as noted in the literature regarding post-traumatic growth (Ruini & Vescovelli, 2013). Separately, it is understood that international students can experience significant stress associated with the major life event of moving and studying in a foreign country. For example, some students experience a significant amount of loss and isolation (Hayes & Lin, 1994; Ng et al., 2018), which could be considered a major life stressor. To date, past work has separately examined 1) trait gratitude and the potential changes following stressful events, and 2) the stressful experiences of international students. However, it's unclear how these two areas overlap. This literature review aims to draw possible connections between post-traumatic growth and the experience of international students and the impact of such on trait gratitude level. Following a review of the literature, this poster will also describe gaps in the current research and identify directions for future studies.

# Graduate Presentations

Alphabetical: Author Last name

## **Evaluation of Paliperidone Palmitate Injection Site in an Acute Behavioral Unit**

Author: Gloria Adewola

Mentor: Dr. Brittany Parmentier

This is a quality improvement study on the administration location of paliperidone palmitate initiation doses given on an acute behavioral health unit at The University of Texas Health North Campus Tyler. Patients that received paliperidone palmitate from January 1, 2018 to June 15, 2020 were gathered from pharmacy records. Study included patients over 18 years of age who received paliperidone palmitate on the unit and received oral paliperidone palmitate prior to the injection dose. Excluded patients were those less than 18 years of age, those hospitalized on another unit, or did not receive oral paliperidone prior to injection. Using the visit number, researchers accessed the patients' electronic medical record. For all included patients, the location of injection for each paliperidone dose was collected and recorded as either gluteal or deltoid and either left or right side onto a deidentified excel document. A total of 25 patient were included in the study. 24 patients received the 234mg dose of paliperidone palmitate and 18 patients received the 156mg dose of paliperidone palmitate. Eight of the 234mg doses were given in the gluteal muscles (33%) and 12 of the 156mg doses were given in the gluteal muscle (66%). Although initiation doses of paliperidone palmitate should be administered in the deltoid muscle to achieve therapeutic concentrations rapidly, 33% of the 234mg doses and 66% of the 156mg doses were given in the gluteal muscle on this unit. The results of this study will be used to provide nursing education on appropriate administration of paliperidone palmitate initiation doses.

## **Performance Analysis of Triboelectric Energy Harvester Designs for Knee Implants**

Authors: Mohammad Atmel & Cody Athey

Mentor: Dr. Wathiq Ibrahim

Triboelectric energy harvesters continue to show promising and efficient performance in transferring mechanical energy into electrical energy, making them a prime candidate for biomedical implants. Total Knee Replacement (TKR) is a widely used surgery worldwide, even more so in the United States. In this paper, triboelectric performance in biomedical applications is evaluated, especially in TKR. Performance of two new configurations of triboelectric energy harvester in TKR is compared as self-powered implanted sensors for loads measurements. The first configuration is a full knee harvester, covering the whole area of the tibial tray. The second configuration consists of two harvesters at the lateral and medial locations. Both configurations to be fit in the knee implant. The two designs' performance was experimentally evaluated when subjected to an axial cyclic load applied by a dynamic tester at different frequencies. Also, the lateral and medial generators were tested for load imbalance detection producing promising results. Moreover, this study's findings would contribute to the improvement of TKR by transforming them from passive to smart TKR using these implants, which will lead to better health monitoring.

# Graduate Presentations

Alphabetical: Author Last name

## **Processing Speed Mediates Age Cohort and Prospective Memory Performance**

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Authors: Carmen Chek, Danielle R. Hardesty, Luke Childers, Trisha L. Glover, Ashley Van Dusen, Sydney S. Shorter, & Allyson M. Coldiron

Mentor: Dr. Michael D. Barnett

Age has been shown to negatively impact prospective memory (PM), the ability to carry out intentions in the future. However, many age-related cognitive changes may reflect underlying declines in processing speed (Salthouse et al., 2004). The purpose of this study was to investigate whether processing speed mediates the relationship between age cohort and prospective memory performance. Older ( $n = 52$ ) and younger adults ( $n = 40$ ) completed WAIS-IV Coding and the Virtual Kitchen Protocol, which includes PM tasks with both time-based and event-based cues both in and out of virtual reality. Processing speed mediated the relationship between age cohort and PM performance both in and out of virtual reality. Partial mediation was observed in the analog-based PM, whereas full mediation was observed in the virtual reality-based PM. Processing speed may explain age-related changes in PM as measured by both analog and virtual reality tasks.

## **Review of Factors Impacting Mental Health of LGBT Individuals Following Sexual Violence**

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Author: Priyanshi Chhabra

Mentor: Dr. Adam McGuire

Extensive research has been done on sexual violence and post-victimization experiences; however, little is known about its prevalence and impact on LGBT individuals. Studies have shown that individuals who tend to deviate from the acceptable heterosexual and cisgender norms are more likely to be victims of sexual violence as an attempt by the society to maintain unequal gender roles. This poster reviewed the literature to examine the impact of stigma and low social support on the mental health of LGBT individuals following sexual violence. It was found that social conditions—invisibility, isolation, and discrimination—significantly impact the experiences of LGBT sexual assault survivors. Fear of rejection and isolation from family and friends and being a potential target of homophobia by service providers, law enforcement, and health care professionals, are revealed to be some of the major barriers that LGBT individuals face when seeking help after sexual violence. Lack of social support was linked with higher levels of mental health problems, depression, suicidal ideation, drug use, and anxiety in LGBT adolescents. Results highlight an apparent gap in research in part because most of it is non-empirical in nature, thus calling for data-based research. Further, most studies assumed the participants to be heterosexual and did not assess for different sexual orientations. Measurement tools developed in recent years are likely to be low on reliability and require replication. Last, randomization is difficult within this population as data for participants who have not come out yet or are questioning their identity is lacking. Future research is needed in these areas to better understand the unique experiences of LGBT individuals.

# Graduate Presentations

Alphabetical: Author Last name

## **Effect of Warm Mix Asphalt on Pavement Performance**

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Author: Lisa Cui

Mentor: Dr. Mena Souliman

This project will summarize the effects of Warm Mix Asphalt (WMA) technologies in Texas. Texas Department of Transportation (TXDOT) has placed more than one million tons of WMA around the state, this research project will focus on evaluating WMA and its effects on asphalt mixture design performance. Asphalt offers environmental and energy advantages over other paving materials. However, in the midst of rising fuel costs and environmental awareness, this industry is always looking for ways to improve. WMA is fundamentally asphalt mixture with chemical additives to reduce viscosity, this translates to less heat usage when preparing the material while achieving the same product as Hot Mix Asphalt (HMA) would make. Collected Data shows that there are several benefits of WMA compared to conventional asphalt mixtures. Thus, implementing WMA has spread throughout the state over the recent years. This project will discuss results from laboratory and field tests of WMA completed by TxDOT that investigates how WMA technologies affect long term roadway performance. Results were collected from WMA and HMA sections and assessed and compared for surface deterioration. It is confirmed that WMA sections performed similar or better to the HMA sections in connection with pavement durability.

## **Influence Of Traffic Loading On Transverse Cracking On Asphalt Concrete Pavement Under Wet-Freeze Areas**

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Author: Zylene Carlyle P. Enciso

Mentor: Dr. Mena I. Souliman

Transverse cracking is pavement distress typically associated with low temperature. However, in a recent technical report from the Federal Highway Administration Publications: "Impact of Environmental Factors on Pavement Performance in the Absence of Heavy Loads" by Leslie Titus-Glover, Michael I. Darter, and Harold Von Quintus, one of the findings is that there is more transverse cracking on sections with higher truck-traffic. This poster focuses on investigating the effects of traffic loading on transverse cracking on asphalt concrete pavement under wet-freeze areas using LTPP data only. One climatic area was used to assure minimal variation of climate exposure, and sections from SPS-1, GPS-1 and SPS-8 were also utilized. This paper illustrates the relationship between traffic loading and transverse cracking through regression analysis.

# Graduate Presentations

Alphabetical: Author Last name

## **Exploring the Relationship Between Anxious and Depressive Symptoms, Engagement with Beauty, and Life Satisfaction**

Author: Joanna Fagan

Mentor: Dr. Adam McGuire

A dispositional tendency to “engage with beauty” involves perceiving and appreciating beauty in art, nature, and others’ virtuous behavior. While engagement with beauty has been associated with gratitude, spiritual transcendence, and life satisfaction, few studies have assessed engagement with beauty in clinical populations. This study explores the 1) link between engagement with beauty, anxiety, and depression, and 2) whether this trait influences the associations between anxiety/depression and life satisfaction. The sample included 930 participants, (55% male, Mage = 37.0, SD = 11.2). Self-report measures assessed depressive and anxiety symptoms and life satisfaction. The Engagement with Beauty Scale (Diessner et al., 2008) assessed three subscales of engagement with natural, artistic, and moral beauty. Moderation analyses examined whether engagement with beauty (M) impacted the relationship between depressive and anxiety symptoms (IVs) and life satisfaction (DV). Results showed a significant interaction with artistic beauty and depressive symptoms ( $B = 0.15, p = .002$ ). Specifically, the negative association between depressive symptoms and life satisfaction was buffered by higher levels of engagement with artistic beauty. All interaction effects with moral and natural beauty were nonsignificant. These findings suggest appreciation of artistic beauty may act as a buffer between lower life satisfaction and depression; therefore, future work should expand this research to replicate and understand the mechanisms at play and investigate whether clinical populations could benefit from using engagement with beauty in the context of treatment.

## **Motivating Factors for Pharmacy Student Leadership: A Literature Review**

Author: David Foote

Mentor: Dr. Shannon Rice

The goal of this project was to identify motivating factors for pharmacy students to pursue leadership positions during pharmacy school was performed to identify factors for schools and organizations to emphasize to increase student leadership development and participation. A literature search was conducted on PubMed and Google Scholar were searched for articles pertaining to pharmacy student and motivational factors for leadership. A review of five articles resulted in networking opportunities, creating a desirable image for employers, interest in the organization’s mission, and professional development opportunities as the most common motivating factors for student pharmacists to pursue leadership positions. The most prevalent motivating factors identified by these studies focused on an internal benefit of the pharmacy student, as opposed to external benefits of the community or the profession. Therefore, a potential way to increase leadership may be through offering increased networking opportunities and CV development opportunities through student organizations.

# Graduate Presentations

Alphabetical: Author Last name

## **Barriers to acceptance of the COVID-19 Vaccine: A Literature Review**

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Authors: David Foote, Julissa Gonzalez; Katie Gray; Casey Abernathy      Mentor: Dr. Michael Veronin

The goal of this research is to identify and address the most common misconceptions and hesitations against vaccines for COVID-19 as documented among the current literature and increase acceptance of COVID-19 vaccines. PubMed and Google Scholar were used to identify articles specifically stating factors of hesitancy or misconceptions about the COVID-19 vaccines from peer-reviewed and published manuscripts. Based on 29 included articles, the most common reasons respondents stated they were hesitant to receive the COVID-19 vaccine included concerns about long-term side effects and results, overall distrust of the manufacturer and the manufacturing process, and skepticism regarding the efficacy of the vaccine against COVID-19. Based on these statements of hesitancy, further research can be performed to find factual evidence to increase patient awareness and reception of the COVID-19 vaccine. Future studies can be performed to assess how the public conception of the vaccine has changed after increased vaccine administration and long-term evaluation from various vaccine manufacturers.

## **Prospective Memory in a Virtual Reality Environment in Relation to Adaptive Functioning Among Older Adult**

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Author: Danielle Hardesty, Carmen Chek, Nancy Tran, Michael Persin, Emma Barr, Jenna Moore

Mentor: Dr. Michael Barnett

Prospective memory, or memory to carry out future intentions, is involved in carrying out everyday activities of daily living. Many have proposed using virtual reality to increase ecological validity in measuring everyday abilities. The purpose of this study was to investigate relationships between performance on prospective memory tasks "" both in and out of virtual reality "" and a performance-based measure of adaptive functioning. Older adults (N = 60, 60-90, M = 73.30, SD = 5.73) completed the Virtual Kitchen Protocol: Prospective Memory tasks, which includes tasks with both time-based and event-based prospective memory cues in and out of virtual reality, and the Texas Functional Living Scale, a performance-based measure of adaptive functioning. Prospective memory, both in and out of virtual reality, was associated with higher adaptive functioning. This suggests that participants with a higher score on the prospective memory tests also succeed in adaptive functioning.

# Graduate Presentations

Alphabetical: Author Last name

## **Survey on the Knowledge, Perception and Use of CBD Among UT Tyler Students**

Author: Amy Hendrix

Mentor: Dr. Brittany Parmentier

A 2019 Gallup poll found that 14% of Americans say they use CBD products, with use being higher among younger individuals aged 18-29 at 20%. Local data on CBD use in East Texas and among university students has not been gathered. The objective of this study was to determine the knowledge, attitude, prevalence, and preference of CBD use among UT Tyler students. A Qualtrics survey was created and distributed via email to all UT Tyler students from November to December 2020. This study was approved by the UT Tyler IRB. 689 students completed the survey (7.2%) with 47.9% of respondents stating they have used CBD in the past. When asked to rate their knowledge of CBD on a scale from 1-10 (with 10 being expert), the median response was 5 for respondents. The top 2 most commonly used dosage forms were cream/lotion (n=161) and oral oil (n=151). The top 2 reasons for CBD use were general health/well-being (n=226) and a medical condition (n=135). The top 2 medical conditions treated with CBD were pain (n=91) and anxiety (n=88). Almost half of the respondents stated they previously used CBD, which is higher than past national surveys. Cream/lotion and oral oil were the most preferred products. However, the median self assessed knowledge level of CBD was only 5 on a scale from 1-10. Further studies should be done in larger populations and in other university settings.

## **Pharmacologic Management of Steroid-Induced Psychosis: A Review of Patient Cases**

Author: Grace Huynh

Mentor: Dr. Justin Reinert

Objective: To review the efficacy and safety of medications used in the management of steroid-induced psychosis. Methods: A comprehensive literature search was conducted using PubMed, MEDLINE, ProQuest, and Scopus between May and October 2020 using the following search terminology: "steroid-induced psychosis" OR "corticosteroid-induced psychosis." Definitive cases, as defined by the Diagnostic and Statistical Manual of Mental Disorders, 5th edition, were included in this review. Geriatric patients >65 years of age, those with a confounding neurological condition such as a traumatic brain or spinal cord injury, or those with active malignancy were excluded. Results: A total of 13 patient cases were included in this review, representing 8 male patients and 5 female patients. The mean age at symptom presentation was 42.5 years. Six patients presented with delusions, 5 presented with hallucinations, and 2 presented with both manifestations; 12 patients were managed with an antipsychotic, with haloperidol being the most commonly prescribed, followed by risperidone. One patient was managed with lithium and clonazepam alone. All patients returned to their psychological baseline upon the discontinuation or decreased dose of steroids in combination with Pharmacological intervention, though the time to resolution of symptoms varied significantly. No notable adverse drug events associated with treatments were reported. Conclusions: Steroid-induced psychosis is a serious adverse effect of corticosteroid therapy; however, management strategies that combine a dose reduction or elimination of steroids, in combination with an antipsychotic medication, are effective in resolving this syndrome.

# Graduate Presentations

Alphabetical: Author Last name

## Artificial Neural Network Model to predict the Fatigue Endurance limit for Asphalt Concrete Pavement

Author: Sameer Karki

Mentor: Dr. Mena Souliman

Artificial Neural Networks (ANN) are the highly interconnected structures which have strong computational and pattern recognition abilities utilizing simple processing units (artificial neurons) that have the ability to carry out multiple parallel computations. Fatigue is one of the major distresses occurring in asphalt concrete pavement caused by repeated traffic loading that results in escalated structural damage with the formation of cracks. These cracks allow the moisture to seep inside the pavement layer that results into potholes. Potholes and cracks results in damage of vehicles (tires, suspension, steering and body), increases the fuel consumption, increases vehicle delay cost and maintenance cost while lowering the quality of ride. Hence, this paper puts forward a model to predict endurance limit strain values by using ANN in MATLAB along with a standalone equation for predicting endurance limit strain value by using uniaxial tension-compression fatigue test results conducted under NCHRP Project 9-44 A.

## The Effects of eService-Learning on HRD Students

Author: Mandi Laurie

Mentor: Dr. Rochell McWhorter

The service-learning (SL) pedagogy has thrived over recent years. With the forced expansion of the online student population due to the Covid-19 pandemic, institutions of higher learning must develop programs with similar outcomes across both face-to-face and distance-learning applications. Before the influx of Covid-19, online educators turned to electronic service-learning (eSL) to address this divide. Little has been reported on the utilization of eSL during the covid-19 pandemic, thus the purpose of the present study was to investigate the effect of eSL on graduate students (N=24) enrolled in an online Business Leadership and Ethics course occurring during the covid-19 crisis with a significant eSL component. The submitted work is part of a larger, cross-case comparison of SL on campus and highlights the perceived student outcomes: increased student engagement, increased application of course knowledge to real-world scenarios, improved self-awareness, and connectedness to the community as a result of assisting the nonprofit organization. It bears noting that these results were consistent across students who performed their service in person (n=17) and those who completed their service via a distance format (n=7). With the Covid-19 crisis entering its second year, the present research presents an important first look into both the efficacy and the delivery methodology on SL during the pandemic.

# Graduate Presentations

Alphabetical: Author Last name

## **Is What We See What We Get? Rethinking Prototypical Leadership**

Authors: Amanda E. Legate & Nolan A. Sosa

Mentor: Dr. Greg Wang

The COVID-19 pandemic disrupted traditional workplace channels by restricting social interaction. This disruption exposed the vulnerability of boundary roles and forced leaders to confront extraordinary challenges under unfavorable conditions. The global crisis enriched organizational leadership scholarship and practice by challenging long-standing assumptions about leadership traits and behavior. We examine contemporary leadership theories using an integrative literature review. We synthesize diverse concepts of leader effectiveness through the lens of Implicit Leader Theories (ILTs), which depend upon the organizational culture and context, and present our findings as a conceptual model for use as a heuristic tool by scholar-practitioners. Our research identified a reciprocal relationship between ILTs and leadership traits. ILTs form through a three-step sensemaking process that shapes individual values, attitudes, work intentions, and behaviors. Such implicit leadership theories guide the collective evaluation of leader effectiveness by informing the archetypes of how a leader should behave and what a leader should be. When actual leader traits manifest, the sensemaking process evaluates effectiveness to rationalize such behaviors, thereby refining the collective ILT. Our research extends scholarly understanding of leadership theories by integrating multiple streams into a unified, contingency-oriented conceptual model for scholar-practitioners.

## **Development of prediction model for IRI utilizing traditional Regression analysis and Artificial Neural Network.**

Author: Zabi Ahmed Mohammed

Mentor: Dr Mena Souliman

Distresses occur in flexible pavements in various forms. As the age of the flexible pavement increases, the chances for occurrence of distress increase. In general, distresses occur in the pavement due to various factors. Structure, climate, traffic, performance are few of those factors which lead to distresses. In this paper, few factors were selected and related to the performance of International Roughness Index (IRI). Roughness of the roads can cause inconvenience to the people riding or driving a vehicle and it can also delay the journey time. So, study on how to overcome these issues and the main factors causing this distress is important. In this study, six various factors were chosen for the analysis of predicting a model for IRI using regression analysis and Artificial Neural Network.



# Graduate Presentations

Alphabetical: Author Last name

## **Development of Deep Learning based model to predict Dynamic Modulus in Matlab using Artificial Neural Networks (ANN)**

Author: Mohammed Moinuddin

Mentor: Dr. Mena Souliman

Dynamic modulus ( $|E^*|$ ) is a crucial engineering property used to determine the performance and stiffness characteristics of asphalt pavements. Various models have been developed to predict the Dynamic modulus like Original Witczak equation, Modified Witczak Equation, Hirsch model, Law of mixtures parallel model, ANN model and Resilient modulus-based model. All these models are predictive models used to estimate the Dynamic modulus as it is a cumbersome and considerably time-consuming process to measure the Dynamic modulus in lab due to various issues like preparation of samples, availability of expensive equipment, and skilled personnel to perform tests and to equilibrate temperature. In this study, we utilize the data which was used to develop Modified Witczak equation to develop an equation in Matlab using ANN. All the factors affecting the Dynamic modulus has been identified and regression analysis has been performed on the data points to generate best equation. In total, 7400 data points was used from 346 mix samples to generate the equation. The main aim of the study is to make an effort to overcome the shortcomings in the previous predictive models, which are known for being inaccurate and accuracy have been questioned by many researchers. Efforts are to develop a simple mathematical equation to determine Dynamic modulus, which requires to perform trial and error technique for development of optimized network structure.

## **Increase in Roughness due to Environmental Factors in Flexible Pavements**

Author: Victoria Morris

Mentor: Dr. Mena Souliman

This study concentrates on the increase in pavement roughness due to environmental factors. The objective of the study is to demonstrate a way to help predict pavement performance over time with respect to environmental factors. The International Roughness Index (IRI) is utilized to quantify the roughness of pavement. Changes in the IRI rating of different pavement sections were compared with respect to the climate, pavement structure, subsurface layers and drainage provisions. The data analysis is limited to flexible pavements in Texas. Data was collected for 7 different asphalt pavement sections in Texas from the Federal Highway Administration's (FHWA) Long-Term Pavement Performance (LTPP) program. The IRI values were obtained for the left and right wheel paths, as well as the center lane. They were then evaluated over time to determine the rate of change of the IRI. These rates were then related to the different subgrades, drainage provisions and climate present at each pavement section. The findings demonstrate a high effect of drainage on IRI, with better drainage provisions leading to a lower change in IRI over time. It can be inferred that a climate with less precipitation may also demonstrate less change in IRI due to that factor. The effect of different subgrade properties also had a large impact on the change in IRI, with the fine-grained soils leading to a higher roughness increase. Other factors were also related, though the differences that could be correlated resulted in negligible IRI changes. After comparing the various trends with respect to change in IRI, different math models were evaluated for their corresponding predictions. The efficacy of each prediction model was explored and potential improvements for the models were documented.

# Graduate Presentations

## Alphabetical: Author Last name

### **Longitudinal Research: A Methods Study**

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Authors: Ashlee Noblin & Shonda Sears

Mentor: Dr. Kim Nimon

Longitudinal research is conducted with the purpose of studying a group over time to understand the change phenomena that occurs within a given context. While these types of studies are common in health and medical fields, a brief review of literature has shown that they are less common in the field of Human Resource Development (HRD). The goal of this research project is to inform scholars and practitioners in HRD on the concepts of longitudinal research and the benefits of using these methods in their own studies. Todd Little (2013) states that most of the design and measurement problems that plague longitudinal studies are due to a lack of proper planning. Through this methods analysis we hope to aid researchers in their preparation for longitudinal studies by providing key background information, discussing benefits and challenges found within literature, and providing examples utilizing statistical analyses to interpret results which will offer a practical application to research. The results of this methods analysis showed that longitudinal research can offer advantages over other research methods based on its potential to enhance the effectiveness of determining patterns over time, to study developmental trends, and in some cases can provide flexibility dependent on the context and content of the study (Lerner et al., 2009; Avey et al., 2008). While there are many challenges to the method, with proper planning, there are statistical and theoretical tools that can aid researchers in conducting these studies. Through our research we have found that being an informed scholar and understanding the methods available is vital to the design of a valid and reliable study.

### **Travel Demand Forecasting to Predict Parking Behavior At University Campuses: A Case Study at The University of Texas at Tyler**

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Author: Sohil Paudel

Mentor: Dr. Matthew Vechione

With limited capacity, space, and funds to expand parking facilities, there is a dire need to better understand parking behavior at university campuses so as to better utilize the limited resources available. One potential methodology, which is used by cities and Metropolitan Planning Organizations (MPOs) is known as Travel Demand Forecasting (TDF). The socioeconomic data used includes income, number of households, people in a given household, number of working people, etc. This data is used to divide a city into different Traffic Analysis Zones (TAZ). Similar to how a city is zoned, a university campus has parking zones, each of which is adjacent to a specific building and could serve as a TAZ. Therefore, course schedule data and floor space utilization data of buildings on a campus could be some predictors of parking demand at each zone on a university campus. If true, changes to the course schedule data could be made to better handle parking demand in the future. This study aims to use the University of Texas at Tyler (UT Tyler) as a case study. The trips that are arriving to and departing from each zone were counted during a given week using pneumatic tube counters. Then, the course schedule data and floor space utilization data for each building on campus were extracted. The extracted data served as input data to predict the parking demand at each TAZ on campus. Lastly, parking demand data was used to predict the interzonal trips within the campus network.

# Graduate Presentations

## Alphabetical: Author Last name

### **Talking About and Preparing for Death Among Older Adults**

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Author: Michael J Persin

Mentor: Dr. Michael Barnett

Experts on end-of-life issues recommend that individuals make preparations – living will, health care proxy, last will and testament, and memorial service – for their eventual death (Bischoff, Sudore, Miao, Boscardin, & Smith, 2013). While these experts further encourage a broader process of advance care planning, which includes conversations with loved ones, many individuals are reticent to engage in such end-of-life conversations (Brinkman-Stoppelenburg, Rietjens, & Heide, 2014). The purpose of this study was to investigate relationships between older adults' comfort having end-of-life discussions with family members, death preparation, and comfort with their end-of-life plans. Community-dwelling older adults (N = 354) participated in an interview survey about end-of-life issues. Comfort with having end-of-life discussions with family was associated with greater death preparation and comfort with end-of-life plans. Death preparation mediated the relationship between comfort with end-of-life discussions and comfort with end-of-life plans. Overall, the results are consistent with the notion that individuals who are more comfortable discussing their end-of-life plans with loved ones engage in greater death preparation and thereby feel a greater sense of contentment with their plans for death.

### **What causes the most anxiety in an introductory statistics course interpreting, asking for help, statistics exams? A Rasch analysis of the statistical anxiety scale (SAS)**

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Author: Emily Santistevan & Erica Martinez

Mentor: Dr. Samantha Estrada

The purpose of this study is to examine the psychometric properties of the Statistical Anxiety Scale. While statistical anxiety and self-efficacy has been researched in the literature, the majority of this research has been performed on undergraduate, usually psychology, students. To contribute to the literature on statistical anxiety our study focuses on validating the scale with a unique population of community college students as well as developing an item hierarchy to understand what items are endorsed by the participants as causing them more anxiety. Data was collected in community college. Participants were enrolled in an introduction to statistics course (N = 108). The SAS is a 24-item measure was used to evaluate factors of statistical anxiety. Factors included (1) examination anxiety, (2) asking for help anxiety (3) interpretation anxiety. Participants responded on a 5-point Likert scale that had a range from 1 (no anxiety) to 5 (considerable anxiety). High scores in each of the three factors, indicated high levels of statistical anxiety. A principal component analysis was applied to the items and showed the three dimensions of the scale. The scores of the subscales all had good reliability. Rasch analyses revealed the items that caused the most anxiety for each of the three subscales were: fear of asking a private tutor for help, understanding the statistical analyses described in the abstract of a journal article, and realizing too late they cannot do the problems.

# Graduate Presentations

Alphabetical: Author Last name

## **Supporting a Racially Diverse Facial Dataset: Normative Valence and Arousal Ratings Across Race and Moderation by Race**

Authors: Emily Santistevan, Kaitlyn Niederstadt, Bridget Kennedy, Priyanshi Chhabra, Nguyen Nguyen, & Nicholas Sims-Rhode  
Mentor: Dr. Sarah Sass

The primary goal of this project was to collect normative emotional valence and arousal ratings using the RADIATE facial database. The RADIATE database is one of the few that is racially diverse, yet it is underutilized, due in part to a lack of normative valence and arousal ratings. A secondary goal was to explore whether the race of the rater moderated emotion ratings. As part of an ongoing study, 204 participants (Asian: 9, Black: 25, Latinx: 39, White: 131) were randomly assigned to one of 10 blocks of 36 faces. Each block included faces counterbalanced on race, gender, and emotion so that each participant rated an identical number of faces with respect to these categories. Participants viewed faces in Qualtrics and rated each on valence (from 1-9, unpleasant to pleasant) and arousal (from 1-9, low to high). A 4-way Race of Rater x Race of Face x Emotion x Gender repeated-measures ANOVA with repeated-measures on the last 3 factors was used for valence and arousal ratings. As expected, across racial face categories, happy faces were rated as more pleasant ( $M = 6.50$ ) and sad faces as more unpleasant ( $M = 3.03$ ). In addition, happy ( $M = 4.29$ ) faces were rated more emotionally arousing than sad ( $M = 3.76$ ) and neutral faces ( $M = 3.29$ ). The race of the rater moderated valence but not arousal ratings. Black raters rated Asian females as happier than Asian males and Latinx raters rated Latinas as sadder than Latinos, with no other evident effects. Present results contribute to sparse valence and arousal data for the RADIATE dataset. Results further suggest that emotional faces are not rated in a universal manner as some emotion theories presume. Implications of the results and future research directions are discussed.

## **Understanding the Needs of Military Sexual Trauma Survivors and Barriers to Therapy Attendance and Retention**

Author: Gracie Staley

Mentor: Dr. Adam McGuire

Military sexual trauma (MST) is defined by the sexual assault or harassment of military personnel. When this occurs, there is a negative impact on survivors' mental health, physical health, and living functions. Additionally, research suggests the interpersonal nature of sexual assault trauma can sometimes lead to difficulties or complications with successful therapy. Therefore, thorough and empirically supported guidelines for treatment of MST are essential. Although there is help available to MST survivors, there is a notable gap between those who could benefit from and those who access these resources. Previous research suggests many MST survivors often avoid starting treatment, drop out of treatment, or wait several years before going get treatment. A literature review will examine current interventions used for veterans at different Veterans Affairs (VA) facilities, along with barriers to successful treatment outcomes, engagement, and retention. Analyses of previous research studies and individual case studies suggest a level of perceived mistrust the VA or other organized bodies as a whole due to the nature of the trauma. It would be beneficial to further research how to outreach to survivors to encourage accessing therapy treatments promptly. The VA is responsible for providing both physical and mental health survivors to America's veterans. Early outreach may help regain a level of trust for survivors and the VA to improve veteran survivors' overall attendance and retention therapy.

# Graduate Presentations

## Alphabetical: Author Last name

### **HPLC Analysis of Active Ingredient Content of Cannabidiol (CBD) Products Commonly Used by UT Tyler Students**

Authors: Sarah Thompson & Abdullah Alkarboly    Mentor: Dr. Ayman Hamouda & Dr. Brittany Parmentier

Unlike marijuana and its major component tetrahydrocannabinol (THC), hemp products rich in cannabidiol (CBD) and containing less than 0.3% of THC are legal in Texas. This legal status of CBD products has resulted in an unprecedented increase in unregulated CBD incorporation in virtually all forms of human and animal products (oils, capsules, topical products, food products, etc.). CBD products are not manufactured under standard pharmaceutical practices. Therefore, variabilities in quantities and formulation of cannabinoid content results in unpredictable product outcomes including posing a health risk. The two purposes of the study were to determine cannabinoid contents of CBD products most commonly used among UT Tyler students and to determine CBD content recovery under conditions that simulate gastric and intestinal physiological fluids. Cannabinoid contents were extracted at 37°C under three different conditions: a mix of 1:1 methanol: isopropanol (M/I), simulated gastric fluid (SGF), and simulated intestinal fluid (SIF). Extracted cannabinoids were fractionated using high performance liquid chromatography (HPLC) on a C18 column with a linear gradient of 70-95% acetonitrile in water over 8 min and quantified using absorbance at 220 nm. So far two CBD products, DFo1 and DFo2, were analyzed. For both products, we were able to recover only ~75% of labeled CBD content in the M/I mixture. In addition, CBD content recovery of DFo1 in either SGF or SIF was <65% of labeled amount. The current lack of control over the processing of CBD products has led to products that do not contain the levels of CBD claimed or processed in a way that is not suitable for CBD dissolution in the gastric and intestinal fluids, potentially leading to variable CBD dosing.

### **A Warning Unheeded: Psychological Intimate Partner Violence Among College Students**

Authors: Rawda Tomoum & Melanie Rawls    Mentor: Dr. Ramona I. Grad

Intimate partner violence (IPV) constitutes a major public health concern in the US; it affects 1 in 4 women and 1 in 10 men in their lifetime. IPV is any form of physical, sexual, psychological, or economic abuse committed against a current or former intimate partner. The focus on IPV among college students has heightened because students are at high risk of experiencing it during college years. Estimates indicate that 88% of students experience various forms of IPV. Of all types of IPV, psychological IPV (P-IPV) tends to be the most overlooked and the least reported, despite being equally severe. Forms of P-IPV include name calling, humiliation, intimidation, exploitation, social isolation, and coercion. P-IPV has been linked to poor academic performance and a myriad of long-term physical and psychological repercussions including, but not limited to, depression, anxiety, alcohol use, drug use, and physical complaints. Additionally, P-IPV correlates with and can be an antecedent to physical IPV. Research has shown that P-IPV can even have more detrimental consequences on mental health than physical IPV. The purpose of this presentation is not only to shed light on the impacts of P-IPV among college students, but also on the cruciality of P-IPV screening, training, and prevention programs on college campuses. Efforts are direly needed to help detect and prevent P-IPV and to provide resources to treat and support survivors of P-IPV. Moreover, this presentation illuminates the need for future research in order to better understand P-IPV among college students with the hope that institutions of higher education will make P-IPV a priority in their educational efforts, as well as increase students' support services (e.g., counseling).



# Graduate Presentations

## Alphabetical: Author Last name

### **Evaluation of Joint and crack load transfer**

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Author: Syed Touseef Ali

Mentor: Dr Mena ibrahim souliman

This research documents evaluation of load transfer efficiency of joints and crack for rigid pavements. Load transfer is essential because parameter affects pavement longevity. LTE at the joint is determined universally by using falling weight deflectometer, it is based on the ratio of the maximum deflection at the joint of the loaded slab and the deflection of the unloaded slab measured right across the joint from the maximum deflection. Deflection-testing data in LTPP program was used for calculation of load transfer efficiency parameters and joint stiffness. Trend analysis were performed in MATLAB using artificial neural networking (ANN) to assess the effect of designs characteristics and site conditions on load transfer efficiency. Key findings from this study were large amounts of high quality LTE data was analyzed. LTE data from LTPP program can be used for future designs of pavements and rehabilitation procedures. Load Transfer Efficiency is a depends on many factors like plate load position temperature and seasons, Falling weight deflectometer (FWD) device , presence of dowels, joint openings, base type, subgrade stiffness and PCC thickness. A correlation were found between load transfer efficiency and PCC slab temperature when higher temperature resulted in higher LTE for joints. LTE of doweled joints was significantly higher than efficiency of non-doweled joints in findings. One benefit of this study is for proper and effective treatment selection, which will result in lower maintenance cost of pavements.

### **The use of DBT to treat high-risk behaviors in veteran populations**

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Author: Annika Wurm

Mentor: Dr. Adam McGuire

Dialectical Behavior Therapy (DBT) is an empirically supported psychotherapy intervention that has long been used with borderline personality disorder (BPD) populations. Today, it has become a recognized third wave Cognitive Behavioral Therapy (CBT) treatment and is often used with individuals suffering from the effects of trauma. However, there is currently a lack of conclusive data illustrating how veterans respond to DBT treatment. This poster reviewed the literature to assess whether veterans exhibiting high-risk behaviors such as Substance Use Disorder (SUD), suicidal ideation (SI), or self-harm benefit from DBT treatments. Several studies have already demonstrated the efficacy of DBT with Post-Traumatic Stress Disorder (PTSD) populations, DBT with SUD recovery, and DBT with SI and self-harm. This suggests a strong likelihood that at-risk veterans could and should be a target demographic for DBT. The four core skills that are at the forefront of DBT, namely, mindfulness, distress tolerance, interpersonal effectiveness, and emotion regulation, seem to be key in addressing military-related trauma, which may include combat exposure or commonly, sexual assault. These findings demonstrate the need for larger randomized controlled trials (RCTs) to substantiate the results of isolated studies and draw empirically based conclusions about the use of DBT with high-risk veteran populations.

# Undergraduate Presentations

Alphabetical: Author Last name

## **Longitudinal Research: A Methods Study**

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Authors: Rebecca Richardson & Bridget Gutierrez

Mentor: Dr. Sooah Park

Our goal is to inform the audience about sexism women faced, which has been displayed through the history of musical theatre. We will present two representative works that show examples of sexism in the genre of Broadway Musical Theater. We will discuss how sexist influence in the literature has affected our society and the hardships some of the women still have to endure. As part of the presentation, two students will perform a song each that represents contrasting characters of the two female characters in Sweeney Todd by Stephen Sondheim and Street Scene by Kurt Weill respectively. Women in the Georgian Era took on a submissive role with expectations of being under men's power. The story of Sweeney Todd takes place in the Georgian Era, specifically 1785. In the musical, Johanna embodies the women of this era and the sense of powerlessness that many women must have felt under male authority. Johanna was a victim of Judge Turpin's control. A student presenter will perform "Green Finch and Linnet Bird" from Sondheim's Sweeney Todd as an example to support the discussion. Contrasting to females from the Georgian Era, women in the 1940's experienced a drastic change due to World War I and II. Men had to go to war and women had to take on new roles in society. Street Scenes (1946) invites us into the lives of characters who share their lives in a personal way. In Kurt Weill's musical, Rose is a teenage girl who is confident and knows what she wants. Rose is a great example of the women in this era. A student presenter will perform "What Good Would The Moon Be" from Weill's Street Scene to supplement the discussion about the independent women in the 1940's.

## **The HK97 Virus-Like Particle and the RAFT Polymerization of Virus-Like Particles for Drug Delivery**

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Author: Christopher Armstrong

Mentor: Dr. Dustin P. Patterson

Virus-like particles (VLPs) are protein cage structures that have the same organization and structural conformation of the native virus they are derived from but are devoid of certain viral proteins and the viral genome so that they are not pathogenic. The small size, physical properties, and their ability to travel through the circulatory system and enter cells make VLPs potentially useful candidates for drug delivery applications. Loading large quantities of drug cargo on the inside of VLPs could be achieved through polymerization reactions that utilize amino acid residues on the interior of the VLP as nucleation points to localize drug molecules. An approach that looks at utilizing Reversible Addition Fragmentation chain Transfer (RAFT) polymerization is laid out for its use in the encapsulation of drug cargoes on the interior of the VLP derived from bacteriophage HK97. Medicine, in general, would benefit from the RAFT mechanism described in this presentation to produce pure protein-polymer conjugates that provide specific targeting towards undesired diseases or conditions.



# Undergraduate Presentations

## Alphabetical: Author Last name

### **Perceived Differences: Twentieth Century Eugenics and Scientific Racism in the West**

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Author: Ashlynn Beard

Mentor: Dr. Colin Snider

In this research, I explored the relationship between scientific racism and eugenics in association with white supremacy. I studied the origins of these practices by starting at the ideological and intellectual frameworks on which these harmful concepts were founded upon. For instance, scientific racism has its roots going back centuries, all the way back to the Age of Enlightenment in terms of its foundation. The primary question I formulated to potentially guide my research was: How did notions from the Enlightenment era develop into and come to influence scientific racism and eugenics in Western nations in the 20th century and beyond? I tackled this question by starting with analyzing documents and writings from Enlightenment thinkers and their evolution, then sought to answer the questions of: Who connected these ideas with racial superiority? Who and how did they take it further? Who were the first to bring these ideas into physical manifestation? Where did it start and where did it end? Has it actually ended? I wanted to look at this subject under the scope of how this influenced cultural and social history going from the 20th century into modern times and perhaps explore how ideas of scientific racism and eugenics looked in politics at the time, both in Europe and the US. I wanted to study the elements of the "scientific" racial line made evident among studies made by contemporary epidemiological scientists and geneticists, who still utilize race as an agent for environmental and social factors. Essentially, I wanted to create a timeline of scientific discrimination that include factors of racism and ableism.

### **Chemiluminescent Probe for In Vivo Imaging of Triple-Negative Breast Cancer**

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Author: Katherine Binkley

Mentor: Dr. Jiyong Lee

Breast cancer cell growth typically relies on a source of hormones and growth factors such as estrogen, progesterone or HER2; thus, hormone or growth factor deprivation therapy is at the forefront of oncological treatment methods. However, one subtype of breast cancers, Triple Negative Breast Cancer (TNBC), lacks receptors for estrogen, progesterone or HER2. This makes it highly invasive and clinically problematic; additionally, in vivo imaging has proven difficult because TNBC tumors are anomalous in their properties and evade mammography, MRI and ultrasound imaging. Methodology to image TNBC in vivo would be a revolutionary step in TNBC diagnosis, prognosis and treatment. Thus, our current research aims to create a chemical agent which selectively images TNBC tumors via a chemiluminescent reaction. To do this, we are working to conjugate our TNBC-targeting oligopeptoid, LC129-8, with the chemiluminescent probe HyCL-4-AM. The probe is designed to undergo a light-emitting reaction when triggered by hypoxic conditions such as that of cancerous tissue. Thus, the product should in theory be a chemical agent that congregates specifically in TNBC tumors and releases light, allowing for surgeons to image the cancerous tissue for discriminatory removal. Currently, we are in the process of analytically characterizing the finished oligopeptoid before conjugation to HyCL-4-AM, after which it will undergo in vitro testing for chemiluminescent imaging capacity.

# Undergraduate Presentations

## Alphabetical: Author Last name

### **Masculinity, Femininity, and Gender Roles: Character Analysis in The House of the Seven Gables and The Wide, Wide World**

Author: Megan Byrd

Mentor: Dr. Ann Bebe

Societies are known to change over time, as do social roles and expectations. Literature is one art form that can indicate social change by mirroring values held by authors and readers. Furthermore, it can inspire discussion and conflict over notions of proper social behavior and conventional gender roles. In studying classic American Renaissance literature, one can compare historical and modern societal standards and explore social change, evaluating participant security and growth in their individual personal identities. This paper will explore masculinity, femininity, and gender roles, and analyze a selection of multi-dimensional characters in American Renaissance novels *The House of the Seven Gables* (1851) by Nathaniel Hawthorne and *The Wide, Wide World* (1850) by Susan Warner. While Hawthorne and Warner depict characters that appear to support modern-conservative views in encouraging masculinity in men and femininity in women, a closer inspection will reveal inconsistencies and even challenges to these ideas. These inconsistencies and challenges will prove that limitations posed by the pressures of social gender roles and expectations are detrimental to both character and human development. Not only do they hinder personal growth opportunities, they can produce feelings of insecurity and prevent people from reaching their full potential as well-rounded human beings. Social change may meet resistance, but progressive changes in how we consider masculinity, femininity, and gender roles can help alleviate social constraints and better the individual, which will in turn better society as a whole.

### **Radical Moderation: The Politics of Suffrage, Free Love, and Homosexuality under Wilhelm II**

Author: Bethany Collier

Mentor: Dr. Mandy Link

The reign of Kaiser Wilhelm II, from 1888 to 1918, was a time of immense change for both Germany and the world at-large. One of these changes that gripped the Western world by storm was a push for women's suffrage, and the German Empire was by no means immune to this drive for expanded suffrage. Alongside this widely recognized feminist movement, however, were the beginnings of a movement for the decriminalization and social acceptance of homosexual men and women, most prominently represented by Magnus Hirschfeld's Scientific-Humanitarian Committee in Germany. With prominent supporters such as Social Democratic Party founder and leader August Bebel, this movement sought both to define itself as its own movement and to build ties with wider socialist, liberal, and feminist movements in Germany. While the movement was able to attain an uneasy alliance with the Social Democratic party, its attachment to the Marxist wing of the German feminist movement ultimately forced the movement for the decriminalization of homosexuality into a wider dispute between bourgeois and proletariat feminists, a dispute that would ultimately lead to decriminalization being left at the wayside when the Weimar Republic was formed. Utilizing the original works of authors such as Hirschfeld and Bebel along with modern analyses of the movement for decriminalization, this presentation aims to present the efforts said movement went to in order to broaden its appeal and win its goal, and how such efforts ultimately resulted in that goal's failure.

# Undergraduate Presentations

Alphabetical: Author Last name

## Finding a Uniformly Most Reliable Graph

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Author: Daniël du Preez

Mentor: Dr. Christina Graves

The reliability polynomial of a simple graph  $G$  represents the probability that  $G$  will remain connected given a fixed probability  $1 - p$  of each edge failing. A graph  $G$  is uniformly most reliable if its reliability polynomial is greater than or equal to the reliability polynomial of all other graphs with the same number of vertices and edges for all  $p \in [0, 1]$ . We examine the set of graphs with 8 vertices and 21 edges to determine if there exists a most reliable graph for this case. Specifically, we show that the graph whose complement is  $2K_3 \cup P_2$  is the uniformly most reliable graph with 8 vertices and 21 edges.

## Not so dumb jocks? The effects of physical activity on test-related anxiety in college students

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Authors: Greyson Givens, Kaycee West, Averi Brown, Marcelina Perez, & Ana Clara Zaidan

Mentor: Dr. Amy Hayes

Student-athletes, perhaps surprisingly, tend to have better academic performance than non-athletes in college (as measured by factors like GPA and graduation rates). Such conflict led us to investigate what could be causing student-athletes to outperform their peers, even with the time restraints. One of the factors that is shown to influence academic performance that is not impacted by time is test anxiety (Von der Embse, 2018). A primary indicator of test anxiety is heightened levels of physiological arousal, in the form of increased heart rate. Studies have shown that trained individuals show significantly lower cortisol and heart rate responses to stressors if compared to untrained ones, suggesting that exercise provides a protective effect against stress-related disorders (Rimmele et al., 2007). Research has shown that intense aerobic training for long periods of time (230 minutes a week) leads to lower negative affect in high stress situations, like taking a test. Thus, in our study, we predict that college students' time spent exercising each week (number of minutes) will predict lower heart rate and self-reported anxiety on exam days in their classes. Our study involves a two-time (one test day, one non-test day) data collection with students that involves them reporting their heart rate as measured with a phone app-based HR monitor, and an online survey for them to report their explicit nervousness.

# Undergraduate Presentations

Alphabetical: Author Last name

## **The Slavery Controversy in the United States During the Antebellum Period**

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Author: Michael Graham

Mentor: Dr. Colin Snider

The world view articulated by pro-slavery thinkers in the American south during the antebellum period allows the institution of slavery to exist as a morally viable socioeconomic system. Although the scope and focus varied among these thinkers, there seems to be little disagreement between them. Many talking points resurface across their works and collectively form an ideological mosaic. This ideology interacted with and came into conflict with both radical abolitionists as well as advocates of gradual phasing out of slavery. Despite efforts to maintain the Union between free and slave states, the incompatibility between the south's proslavery position and the north's vision for the nation led to the secession of the southern states and the American Civil War. Many pro-slavery thinkers including Thomas Roderick Dew, William Harper, Thorton Stringfellow, and James Henry Hammond, obscured the moral issues associated with American slavery by arguing that the notion of inalienable human rights is an ungrounded moral principle. They argued instead that often, morals are relative and merely conventions that serve society. The exception to this moral relativism is the Christian Bible which is referenced frequently by pro-slavery thinkers and used to support their argument that slavery is not inherently evil. Pro-slavery intellectuals often argue that slavery in the Bible is not only not condemned by God, rather, it is implicitly approved of as a legitimate institution. There is some disagreement surrounding whether or not slavery is evil in the abstract. Some argue that it is not while others argue that there are evils associated with it that could at best be exchanged for other evils in a society that did not.

## **Civil Rights Violations**

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Author: Charles Taylor Haskell

Mentor: Dr. Colin Snider

Human equality is a set of rights that Americans have continued to fight for since the country's inception. Racism and social inequality have continued to divide our country, despite numerous civil rights movements. The purpose of this paper is to review the violations of past African American Civil Rights, acknowledging the past might help prevent us from repeating civil rights violations in the future. Past events that will be evaluated include, Jim Crow Laws, separate but equal, protest sit-ins, freedom rides, and other social movements in the early 1960s that paved the way towards social justice and racial equality and helped change the way of life for African Americans and their futures.



# Undergraduate Presentations

Alphabetical: Author Last name

## Design and Optimization of Acoustic Metamaterial for Focusing and Noise Reduction

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Author: Monu Jaiswal

Mentor: Dr. Tahsin Khajah

Wave manipulation of low-frequency sound remains a major challenge in the field of acoustics. It is desired to amplify or diminish the sound intensity efficiently using rather small devices. This is challenging because the dimension of conventional acoustic devices should be more than the wavelength of the sound leading to designs well beyond a meter in dimension. Hence, it is quite impractical and costly to use conventional methods to manipulate low-frequency sound. Acoustic metamaterials can be designed to more effectively manipulate sound waves even when they are quite smaller than the wavelength. In this work, we present analysis and optimization of meta-materials for focusing and noise reduction at targeted frequencies. For noise reduction, a simple Wunderlich curve was chosen as the initial design and its size and shape were optimized to reduce noise levels at the outlet of a duct while allowing passage of fluids. For sound focusing, an optimum design was found which outperformed previous designs while reducing the number of cylinders required. As a result, we were able to reduce noise inside the duct by over 99% and magnify the intensity at a point by 16 dB at targeted frequencies of sound. The efficiency and tunability of the metamaterial designs allow numerous applications in fields of biomedicine, aerospace, civil, military, and communication.

## Comparative Genomic Analysis of Cryptophyte Algae Plastid Genomes

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Author: Prabhat Kattel

Mentor: Dr. Matthew J. Greenwald

Cryptophyte algae have four different genomes. Through secondary endosymbiosis, cryptophytes derived the nuclear and mitochondrial genomes from an unknown eukaryote host and the nucleomorph and plastid genomes from a red algal. Cryptophytes are also important for studying photosynthesis. They have undergone differential retention and loss of photosynthetic genes due to some species being photosynthetic while others are non-photosynthetic. In collaboration with the Department of Energy (DOE) Joint Genome Institute (JGI), we sequenced the plastid genomes of 28 cryptophyte species and assembled them using NOVOPlasty. The assembled genomes were comprised of 1 - 7 contigs with 3 being the most common number. We used NCBI BLAST to align the contigs to reference genomes. For the majority of species, two contigs were found to align to the whole genome and rest of the contigs were hypothesized to be inverted repeats. Fourteen species were found to have a complete genome and hence they were qualified for downstream comparative genomic analyses. The sequencing depth was determined using Bowtie 2 and the results were visualized using Tablet. Average coverage depth ranged from 515 to 11,891, hence all 14 genomes had extremely good coverage depth. GeSeq was used for gene annotation. The GenBank files outputted by GeSeq were uploaded to GeneCo to visualize synteny and the presence/absence of genes among 8 published cryptophyte plastid genomes and 14 novel genome sequences presented here.



# Undergraduate Presentations

Alphabetical: Author Last name

## Species features and genomic characterization of *Spingobium yanoikuyae* JS1018

Author: Stefaniya Kinzy

Mentor: Dr. Riqing Yu

*Spingobium yanoikuyae* JS1018 is a novel strain of bacteria with one of the highest plant phytoalexin stilbenes degradation rates in the peanut root microbiome. Prior studies have determined the initial catabolic pathways and identified the CCO (carotenoid cleavage oxygenase) genes. We propose that peanut plants have evolved an "arms race mechanism" to protect themselves from bacterial and fungal invasion. This research serves to further characterize this bacterial strain, both in physical characteristics and in a full genome sequence. The physical characteristics tested, such as carbon source, gram stain, cell morphology, and NaCl tolerance were added to the previous characterization to form a full strain characterization. The test indicated that galactose, dextrose, maltose, and arabinose, when added as the sole carbon source in the medium, significantly stimulated the growth of JS1018, while lactose, benzoic acid, and soluble starch only increased minor growth of this strain. Xylose could not be used by the species. It is a Gram-negative species based on the straining text. The NaCl tolerance test showed that this strain could tolerate salinity from 1.5 to 8% as NaCl, whereas 10-25% of salinity completely inhibited its growth. The genome sequence is ongoing, but it has revealed a total genome size of 5,402,660 bp, a CG content of 64.06% and 4,767 CDS features. Of those features, 1,262 are hypothetical proteins that will be compared to a similar strain to attempt to determine function through the BRIG software.

## Development in Southwest China

Author: Ekaterina Menkina

Mentor: Dr. Thomas Guderjan

In recent decades, Southwest China has been a focus of social, economic, and environmental concerns. The Chinese government has worked on improving the conditions of the area by funding several environmental programs and improving the living conditions of local ethnic minority groups. Altogether, Southwest China's environmental problems, migration, poverty, poor infrastructure, and condensed populations have significantly transformed the region's economy and lifestyle. This paper discusses governmental and non-governmental organizational approaches to development in Southwest China, focusing particularly on ethno-tourism. While ethno-tourism served as a way to modernize China, it also played a significant role in disrupting the livelihood of the ethnic minorities, population migration, social-economic dynamics, landscape reforms, and archaeological research projects in the region. This paper explores development efforts in Southwest China from the death of Mao to the 21st century. Drawing on and analyzing qualitative and quantitative data on local and global policies in development projects in Southwest China, this paper demonstrates the impact of recent transformations in development of ethno-tourism as a viable development model. The paper analyzes the effect ethno-tourism has on changes to the population and the environment through development policies since the death of Mao, highlighting effective and ineffective strategies.



# Undergraduate Presentations

## Alphabetical: Author Last name

### **Simulated Double Pipe Heat Exchanger Using Simulink Modeling**

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Author: Kiril Nikolov

Mentor: Dr. Mohammad Biswas

Heat exchangers are devices used to transfer energy by heat transfer from one medium to another, often utilizing common fluids such as water or air. Typical applications can include large-scale industrial complexes where hot working fluids passed through chemical processes are simultaneously passed through a heat exchanger alongside a coolant in order to regulate the working fluid's temperature. Furthermore, heat exchangers are useful in academic settings where they are used to provide students with exposure to thermal-fluids systems and experience working with practical engineering applications. To further assist in the learning experience, heat exchangers can be virtually simulated using computational modeling software such as MATLAB and Simulink. Using such software to simulate heat exchangers allows the process to be observed and analyzed without the need to have physical equipment. Given that physically constructing and maintaining a functioning heat exchanger is an expensive and laborious process, this use of computer software allows for a more affordable and convenient approach to test and analyze various heat exchangers. The Simulink heat exchanger model presented is a set of nonlinear transient mass and energy balance equations for given inputs such as fluid flow rates and was implemented using the Simulink S-function tool which is a specialized function suited for non-linear process modeling. This function is useful for generating real-time heat exchanger simulations which can be updated and changed by user-defined inputs as the simulation is being conducted. By using this model, the user is given the ability to control the system as well as the changes and disturbances which are occurring and analyze how they affect the heat transfer process in real-time.

### **Continuous monitoring of wound healing with a novel four-in-one smart wound patch**

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Author: Alina Nietzsche Pereira

Mentor: Dr. Shawana Tabassum

Real-time monitoring of wounds is critical to facilitate timely and effective management of chronic wounds. The traditional wound dressings fail to indicate the infection status of wounds due to the lack of timely monitoring of the wound site. A smart wound patch that integrates electronic circuits on a flexible substrate can overcome this challenge through real-time wound-monitoring, infection diagnosis, and on-demand therapy. Here, we report a four-in-one intelligent wound patch that will provide in-situ monitoring of the pH and three key biochemicals present at the wound site, namely, uric acid and two cytokines. Chronic non-healing wounds have shown elevated levels of pH and the mentioned biomolecules, which lower as the wound heals. Our smart wound patch will allow quantitative assessments of wound healing status and initiate on-demand treatment. To realize the smart wound patch, we are developing a low-cost screen-printed electrochemical sensor that is composed of four working electrodes (for detecting pH, uric acid, and two cytokines), one common counter electrode, and one common reference electrode. The working electrodes will be modified with coatings for selective detection of pH, uric acid, and two cytokines. The integrated biosensor is designed on a medical gauge and hence is oxygen permeable, maintains a moisturized environment, and covers the wound area with no discomfort or irritation. Future endeavors include integrating an intelligent and regulated drug delivery system with our wound patch that will monitor the wound status and release drugs on-demand to assist the healing process. This research holds great promise in wound management and treatment, through continuous monitoring of wound site and release of drugs accordingly.

# Undergraduate Presentations

Alphabetical: Author Last name

## **Optimum design of axially loaded fiber-reinforced composites by targeting micro- and macro-mechanical properties**

Author: Robert Ray

Mentor: Dr. Tahsin Khajah

This study is concerned with a multi-variable optimization to find the strength ratio of axial loaded composites. Typically, macro-mechanical properties like fiber orientation and layer thickness are optimized to increase strength assuming a fixed volume fraction; However, for this study, strength was optimized by including micro-mechanical properties in optimization. Specifically, fiber volume fraction was added as an optimization design variable. The optimization was performed using differential evolution, which is an evolutionary optimization. Static failure theories were utilized to compute theoretical strength ratios. Tsai-Wu Failure Theory was applied in conjunction with the Maximum Stress Failure Theory to verify the minimum mode of failure. Results are presented numerically and graphically for axial loads on various composite designs.

## **A miniature potentiostat for integration with wearable biosensors toward rapid and continuous monitoring of disease biomarkers**

Authors: Claude Larrieux, Zeeshan Shaikh, Miguel Gomez, Luis Trevino, & Amstrong Otieno

Mentor: Dr. Shawana Tabassum

Monitoring the levels of disease biomarkers in human body fluids (e.g. blood, sweat, saliva) using an electrochemical biosensor usually entails a potentiostat to control and run the electroanalytical experiments. However, the commercially available potentiostats are bulky, expensive, and not suitable for wearable applications. This study aims to design a low-cost potentiostat circuit that can operate in a wearable configuration and read data from a multi-electrode electrochemical biosensor. The digital module of the potentiostat consists of the ESP32-S2 microcontroller whereas the analog module is a series of operational amplifiers. Together the two modules extract concentrations of the biomarkers using a previously obtained calibration curve. Our simulation results demonstrate that the potentiostat can apply and measure potentials in the range of  $\pm 0.8$  V and measure and apply currents ranging up to 200  $\mu$ A. This miniaturized potentiostat will be able to perform cyclic voltammetry, amperometry, and Electrochemical Impedance Spectroscopy based measurements. Our prototype has an estimated size of  $4.85 \times 3.9$  cm<sup>2</sup> (fits inside a wristband) and an overall cost of \$22.47, which are lower than the currently available potentiostats on the market. The results obtained from this portable potentiostat will be compared with a commercially available potentiostat to validate its accuracy. We will integrate this potentiostat with our previously designed four-electrode wearable biosensor that will assist in continuous and rapid monitoring of prokaryotic infections in human sweat. The societal benefits of this research are significant because the potentiostat when combined with a wearable biosensor has the potential for early diagnosis and intervention through on-body data analytics.

# Undergraduate Presentations

Alphabetical: Author Last name

## Sentiment Analysis of Business Reviews

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Author: Merisha Subedi

Mentor: Dr. Nary Subramanian

Sentiment analysis is a technique to gauge the overall sentiment of a statement or series of statements that can be used to determine the attitude of a writer towards the topic in question. The application of sentiment analysis ranges from social media monitoring, product analysis, market research to brand reputation management. In our study, we incorporate sentiment analysis to develop a method that provides the sentiment of reviews of a business provided by its customers. Customer feedback is very important for the success of any business and going through each review manually consumes a lot of time and effort. The purpose of our study is to give the summary of all the reviews of a particular business based on their sentiment. The model features percentage-wise distribution between positive, negative, and neutral reviews with a categorization of positive and negative reviews for any business. Moreover, it provides an unbiased overview of any business with good accuracy. The developed model is based on a combination of web scraping, sentiment analysis, and text analysis, besides providing a graphical user interface for specifying the website to get reviews from. The model has been validated against test data and the result shows 83% accuracy in predicting positive sentiment, 77% accuracy in predicting negative sentiment, and 97% accuracy in predicting neutral sentiment. It can be used to provide valuable user feedback to both consumers and producers for making better decisions about their products and services.

## Constantinople: The Value of Life in the Tectonic Succession of Empires

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Author: Jacob Williams

Mentor: Dr. Colin Snider

The fall of Constantinople and the Eastern Roman Empire at the hands of the Ottoman Empire is an epoch defining moment in the history of the western world, a siege that saw the fall of arguably the greatest empire that the ancient western world had seen and one that had endured for odd 1,500 years. In my research I explore the grounds of the battlefield, and I look at human rights questions that may have been asked in the violations that occurred during the siege perpetrated by Ottoman forces. Further I delve into the justification or reasoning behind the actions that motivated the fall of Constantinople. Who was targeted in the midst of the siege? Were the civilians treated as combatants and obstacles to be slain? And if so, why were the inhabitants of Constantinople treated in the manners that played out in the processes of conquest? My research is filtered through the lenses of military and political history to determine the intricacies in the motivating factors that drove the Ottomans to take the city. What caused the Ottoman inheritance of the Imperial legacy of Rome? and at whose personal expense did the geopolitical landscape shift upon in this momentous change in rule?

# Undergraduate Presentations

Alphabetical: Author Last name

## **Effects of Family and Community Based Approaches in Nutrition Interventions**

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Author: Ellie Youngblood

Mentor: Ms. Rebecca Egdorf

Malnutrition may not only affect the body, but also may affect the relationships between family members and communities. Relationships may be repaired through adequate nutrition and interventions that are family-focused or community-based. This study's objective was to analyze the potential link between the success of nutrition interventions and the focus on building and repairing relationships within families and communities that could help in improving malnutrition relief efforts. The research question this research is studying is the following: do nutrition intervention programs that utilize a family-centered and/or community-based approach have improved nutrition outcomes? A survey was created and sent to public health organizations that had nutrition interventions in order to gain an understanding on the effects of malnutrition and possible solutions for malnutrition. Recruitment included sending surveys to 30 public health organizations internationally through email. Out of the 30 organizations the survey was sent to, 3 participated. Data was analyzed using a qualitative approach. The results suggested that nutrition interventions through family and community-based approaches may improve outcomes. Of the recorded responses, all agreed that the lack of nutrition or access to food places a strain on relationships. A limitation of this study is the small number of participants. As such, more research is needed on this topic.

# Graduate Presentations

Alphabetical: Author Last name

## Literature review and validating of Composite driveshaft designs

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Author: Mahmoud Abdalmola

Mentor: Dr. Tahsin Khajah

Due to weight savings, or when traditional material cannot be used, composite materials are widely used in aircraft, helicopter and automotive applications. One of these common applications are drive shafts. Despite its simple appearance, a thin-walled cylindrical shaft is quite complex to design because it must meet several conflicting requirements. These requirements include: the natural frequency should be outside the working frequency range, it must endure the applied torsional torque without failure or buckling, and it should be accomplished within a low price and low weight range. In this project, we will analyze the composite driveshaft to explicitly bring out the assumptions and the limitations of the results obtained. More specifically, the project will analyze the torsional stability, the natural frequency for transverse bending vibration, ply stresses, laminate failure torsional vibration frequencies and the effect of centrifugal force.

## Analysis of Laminated Composite Plate under Combined loads at Various Lamination Angles

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Author: Divya Sree Anusuri

Mentor: Dr. Tahsin Khajah

In this paper, analysis is performed to predict engineering properties of multilayered plate, effects of moisture and temperature and the stress-strain distributions for various lamination angles of continuous fiber composite laminate is described. Plane classical lamination theory and stress-strain relationships are mainly used for analysis. The analyzed laminate plates have been composed with unidirectional layers that were made from composite materials: the reinforcement fibers were E-glass and as matrix material the epoxy resin were used. The engineering properties values of multilayered plate and several of the numerous results of the stress-strain distributions in the layers of the analyzed laminated plate subjected to known the force resultant  $N_x$  and bending moment resultant  $M_x$  graphically in diagrams are presented. The numerical results in this work were calculated using MATLAB software.

# Graduate Presentations

Alphabetical: Author Last name

## **Weight minimization of fiber-reinforced composite materials.**

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Author: Mohammad Atmeh

Mentor: Dr. Tahsin Khajah

Fiber-reinforced composite materials have shown excellent properties and the possibility of outperforming conventional materials, especially in aerospace applications. Among the desired properties of fiber-reinforced composite materials is the possibility of considerably reducing their weight while maintaining the load-carrying capacity. In this study, the stacking sequence of the composite materials was optimized to safely reduce their weights by reducing the laminate thickness under in-plane uniaxial and multi-axial. The optimization algorithm was selected based on its success in finding the global solution optimizing the stacking sequence and ply thickness. The Tsai-Wu failure theory was used to ensure the optimum design found is capable of carrying the design load.

## **How Can Restructuring Global Financial Institutions Assist in Decreasing Conflict and Instability?**

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Author: Aaron Baksh

Mentor: Dr. Amentahru Wahrab

Global conflict and instability continue to be one of the utmost important issues that plague the international community. Seeking solutions or the best outcomes in decreasing conflict and instability is no easy task, but it does begin with economic measures. Identifying these economic measures requires looking towards global financial institutions and identifying how these institutions affect the increase and decrease of instability. The purpose of this paper will seek to identify how restructuring the International Monetary Fund can be beneficial to the decreasing of instability and conflict globally. This will require analyzing the mechanisms that play a factor both for economic and institutional means regarding the relationship to instability. This paper concludes that global financial institutions play a crucial factor in the increase of instability due to the inherent structure that benefits western developed countries by exploiting underdeveloped countries. Reshaping the structure of financial institutions and economic policies will be vital in the attempt to decrease instability. Further research will be needed to identify the best practices and policies to obtain a more peaceful and prosperous global society.

# Graduate Presentations

Alphabetical: Author Last name

## **Optimization of laminated composite grid plates for maximum buckling load**

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Author: Manoj Bhandari

Mentor: Dr. Tahsin Khajah

Composite grid structures are widely used in aerospace, transportation, and construction industries. This study intends to find the optimum stacking sequence and pattern composition of the laminated grid plates subjected to uniaxial or shear buckling loads. The square and rectangular laminated grids considered were composed of four different grid patterns with equal weight and thickness. The Classical Laminated Plate Theory along with Ritz Method were used to obtain the elastic buckling loads. The grid pattern and orientation of each layer were optimized to increase the capacity of the laminated grids to handle buckling loads. Unlike previous studies, non-uniform stacking sequence was considered to further enhance the properties of the laminated grids under various boundary conditions.

## **Why are other countries involving themselves in the Syrian Civil War?**

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Author: Zac Burger

Mentor: Dr. Amentahru Wahrab

This paper looks at the civil war in Syria. It has been ongoing for nearly a decade now, and over its duration it has expanded to involve other countries. Many of the countries involved have their own reasons for supporting one side or another. This paper looks at what several of the key players such as Russia, Turkey, Iran, and the United States seek to gain by involving themselves in the civil war. There will be a portion devoted to giving background information on the causes of the civil war in order for the reader to better understand the civil war. It will look at various factors such as what caused the civil war as well as the effects the civil war has had on the country. These reasons for each country involving themselves in the civil war are varied, but this paper will look at the motivations of the previously mentioned Russia, Turkey, Iran, and the United States. Looking at the motivations of the various countries involving themselves in the civil war will help to understand how the situation became long lasting and bloody.

# Graduate Presentations

Alphabetical: Author Last name

## **Electrospun Drug-Loaded PLA fibers for Wound Dressings**

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Author: Alexandra Craig

Mentor: Dr. Shih-Feng Chou

Electrospinning is a technique that is widely used to produce continuous non-woven polymeric fibers that can be used in various biomedical applications. In this study, we electrospun biocompatible and biodegradable poly(lactic acid) (PLA) fibers for a wound dressing application. Acetylsalicylic acid or aspirin (ASA), a hydrophilic small molecule drug, is incorporated into the PLA fibers at 15wt% loading, tripling the loading capacity of wound dressings that are currently available on the market. The goal of this research is to correlate the physico-mechanical properties, the drug loading and the drug release rates of the ASA-loaded PLA fibers. Our work will provide valuable information on the fabrication of drug-loaded PLA fibers suitability for the application as a wound dressing material.

## **Progress Toward the Design, Synthesis, and Analysis of Paired Coiled-Coil Peptidic Molecular Building Blocks**

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Author: Jason DiStefano

Mentor: Dr. Sean C. Butler

Initial progress toward the design, synthesis, and characterization of paired coiled-coil peptidic molecular building blocks are presented. Molecular building blocks have been used for the manufacturing of advanced materials, the formulation of new drugs and drug delivery systems, the advancement of technology, and are fundamentally at the core to biological synthesis and processes. Eight unique 32-residue peptides were designed and successfully synthesized with one modified residue to covalently crosslink two peptides via a 1,3-dipolar cycloaddition click reaction. These crosslinked dipeptidic molecular building blocks were specifically designed for controlled self-assembly with their complementary peptide pair, resulting in paired  $\alpha$ -helical coiled-coil heterodimer peptide pairs. HPLC, mass spectroscopy, and size exclusion chromatography (SEC) results show successful synthesis and purification of individual peptides. Additional SEC data shows successful click reaction of peptide pairs and self-assembly of paired coiled-coil peptides.



# Graduate Presentations

Alphabetical: Author Last name

## **Composite Laminate Design for Improved Open-Hole Compression Strength Using Non-Standard Ply Angles and Customized Stacking Sequences Characterized By [D] Matrix**

Author: Siyavash Ebrahimian

Mentor: Dr. Tahsin Khajah

The design of the composite materials in this study is used stacking sequences and ply angles. This research study is used non-standard ply angle designs and flipped angle designs to improve the open-hole compression strength of composite laminates with stiffness. Non-standard angle designs have the possibility to reduce the weight, less sensitivity to the hole, and better efficiency to the small load misalignment. Flipped angle designs improve the open-hole compression failure strength using the non-standard and standard ply angles by up to 33%. Stacking sequences of the composite laminates were optimized to reduce the ply thickness under in-plane uniaxial and multi-axial. This design is shifting from fiber fracture to shear fracture mechanisms for un-flipped angle and predicting Tr [D\*] matrix from Classical Laminate Theory (CLT) which is characterized by [D] matrix.

## **Challenges to Combating Transnational Terrorism: A Benghazi Case Study**

Author: Aldyn Edwards

Mentor: Dr. Amentahru Wahlrab

Terrorism has increasingly become a global issue that affects all nations no matter their political or economic status. The attack on the United States embassy in 2012 by the terrorist organization Ansar al-Sharia, highlights the obstacles that the international community faces while combating terrorism. States and international organizations all have different abilities and are limited by their internal design and the nature of the international system. The Benghazi attack illustrates these abilities and limitations which include ideological and political obstacles that states and organizations have been facing in their attempts to combat transnational terrorism. Ideological misconceptions, lack of a universally agreed definition of terrorism, and inadequate cooperation all play roles in disrupting the international community's ability to effectively combat terrorism. This paper argues that individual state responses fail in effectively combating terrorism and that it is more plausible that collaboration between international players offers greater potential to reduce terrorism.

# Graduate Presentations

## Alphabetical: Author Last name

### **Exploring Potential Risk and Protective Factors for Negative Cognitions and Emotions in Veterans with PTSD**

Author: Candice Hayden

Mentor: Dr. Adam McGuire

Veterans with post-traumatic stress disorder (PTSD) struggle with negative cognitions (NC), which contribute to the development and maintenance of trauma-related symptoms. They also face negative emotions like shame and guilt, which can be elicited by trauma-specific cues. This study examined potential risk and protective factors for experiencing NC and emotions in veterans after exposure to a trauma-cue. This experimental study included a sample of 90 veterans with significant PTSD symptoms who completed self-report measures at baseline, then wrote a narrative about their worst traumatic event for 15 minutes. Next, they completed self-report measures of NC and emotions. Using multiple linear regression models, protective factors (quality of life [QOL], gratitude, mindfulness, elevation) and risk factors (number of deployments, combat experiences, PTSD severity) were entered as predictors for five separate DV's that include NC about self, the world, and self-blame, and state shame and guilt. QOL was significantly associated with NC about self ( $B = -0.55, p < .001$ ), the world ( $B = -0.11, p = .001$ ), and state shame ( $B = -0.09, p = .021$ ). Trait Mindfulness was significantly associated with NC about self ( $B = -1.52, p < .001$ ), state guilt ( $B = -0.31, p = .015$ ), and shame ( $B = -0.35, p = .002$ ). PTSD severity was only associated with NC about the world ( $B = 0.18, p = .005$ ); trait elevation was only linked with state shame ( $B = .18, p = .05$ ). Identifying protective and risk factors for trauma distress adds to the body of research by delineating "in the moment" reactions to trauma cues. Future studies should explore whether targeting risk factors alleviates distress and assess the potential utility of protective factors in prevention and treatment efforts.

### **A Wearable Plant Biosensor for Real-time Detection of Salinity Stress**

Author: Nafize Ishtiaque Hossain

Mentor: Dr. Shawana Tabassum

Soil salinity is one of the major threats to plant growth and development impacting crop yield, yet there is no wearable sensor on the market today that can monitor the impact of salinity stress on plants in real-time for automated, precise, and personalized use of resources. Plants release a panel of phytohormones in response to salinity stress, and the levels of these phytohormones are altered prior to any visual symptoms. We are developing an integrated crop-wearable sensing platform comprising a hollow microneedle structure for collecting sap from plant stem and a low-cost screen-printed electrochemical sensor for detecting two key salinity stress-related phytohormones, salicylic acid (SA) and jasmonic acid (JA) in the collected sap. Considering plant stem structure, sap properties, and sap flow, the hollow microneedle has a length of  $3500\mu\text{m}$ , an inner diameter of  $100\mu\text{m}$ , and tip angle of  $15^\circ$ . The electrochemical sensor has two working electrodes, one counter electrode, and a reference electrode where the working electrodes will be modified with non-enzymic coatings for selective detection of SA and JA. The sensor is estimated to fit in a  $1\text{cm} \times 1\text{cm}$  chamber. The electrochemical sensor can be readily reconfigured and expanded to monitor other biomarkers for environmental stresses, including drought/floods, temperature variations, soil nutrient/pH deficiencies, and pest as well as herbivore attacks. Thus, this sensing platform is expected to revolutionize the field of wearable sensors for plants and automate optimal application of agrochemicals. We envision that the mass deployment of the device in agricultural settings will enable farmers to make efficient and site-specific use of



# Graduate Presentations

Alphabetical: Author Last name

## **The Evaluation of Systemic Racism and its Present-Day Integration in Society**

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Author: Natoya Inglis

Mentor: Dr. Amentahru Wahlrab

Rinku Sen, executive director of Race Forward, defines “systemic racism,” which is also known as “institutional racism,” as “a form of racism that is embedded as the normal practice within society or standard operating procedures within an organization.” This paper combines theory and practice by showing the relationship between systemic racism and the effects it has on the lives of real people around the world. Further, by examining racism through a historical lens and its impact on Europe, the United States, Canada, the Caribbean, and Latin America, it will become clear that systemic racism is a global phenomenon best understood through the transdisciplinary approach of global studies. Two cases will be used to illustrate specific effects of systemic racism in the world: health care and policing. Relatedly, these cases showcase how systemic racism impacts its victims, primarily ethnic minorities and the new poor. Because systemic racism is often overlooked or denied by those who do not themselves feel victimized by it, this paper uses a transdisciplinary approach to make it visible. Especially relevant to this project will be sociology, global history, political science, and criminal justice literatures.

## **Relationship Between Traumatic Stress and the COVID-19 Pandemic**

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Authors: Bridget R. Kennedy & Anwesha Maitra

Mentor: Dr. Ramona I. Grad

A growing body of literature has captured the adverse psychological impact that the COVID-19 pandemic has had globally (Serafini et al., 2020). However, a thorough investigation of the relationships between the COVID-19 pandemic and traumatic stress has not been completed. The purpose of this project was to conduct this thorough examination. It was hypothesized that literature would support a positive relationship between traumatic stress and the COVID-19 pandemic. Four hundred and twenty-two articles were initially identified as related to the research question. Each article was examined and was excluded from the systematic review if it was a duplicate record, an intervention study, case study, or commentary, or if the article was not available in full-text format. Studies that did not include an assessment of traumatic stress were also excluded. Eight articles were included in the final systematic review. The results suggest a positive relationship between traumatic stress and the COVID-19 pandemic. Specifically, studies suggest the presence of traumatic stress related to COVID-19 among the general population, healthcare workers, individuals with comorbid depression symptoms who were quarantined, psychiatric patients, individuals returning to work, Chinese youth and samples from the general public. Results of this review support the hypothesis that individuals from a variety of populations may experience traumatic stress that is related to the COVID-19 pandemic. The presentation will include a table highlighting the findings from each article included in the review and discuss implications and suggestions for future research.



# Graduate Presentations

Alphabetical: Author Last name

## **The Syrian Civil War: Power in Objectives**

Author: Abigail Marrs

Mentor: Dr. Amentahru Wahlrab

This paper questions how political objectives past and present can shape power structures within international relations and political economy. The paper will first discuss objectives of the US, Russia, and Turkey when entering the Syrian civil war, followed by an analysis of their effects from three ideological perspectives. Using the event as a case study provides a focal point for understanding an all-encompassing system of international trade, migration, and security. The perspectives of realism, Neo-Marxism, and Neo-liberalism will provide an agreed effect of change simultaneously providing unique interpretations of how those changes occur from the objectives. Different perspectives on for instance the effect of anti-terrorism objectives by the US and Russia while also monitoring the respective objectives of natural resource allocation and ally ship. Differing perspectives on Turkey's desire to stem the flow of the refugee crisis and considering the decimation of the Kurds objective. By studying newspapers, international financial reports, government reports, diplomatic meeting reports, white papers, and secondary academic sources. This paper shows the global effect of great power politics and economic objectives within the context of a single but continuously developing moment in history.

## **Weight minimization of blended composite structures under buckling lamination parameters layup design**

Author: Amr Mohamed

Mentor: Dr. Tahsin Khajaha

Composite laminates have outstanding mechanical performance and many applications such as aerospace, automotive, marine, and civil industries. One of the most significant properties of the composite laminate fibers is the weight minimization of the composite structure under a certain load. In this study, an optimization of the stacking sequence of the composite material to reduce the weight making the optimized structure more manufacturable and improving its performance. Weight can be controlled or reduced by reducing the thickness of each laminate. Three-ply angles( 25, 50, 75 ) are used in this optimization. Using the classical theory of composite materials to know the properties of each laminate, Tsai-Hill failure theory used to test stiffness properties of the optimized laminate under a certainly designed load.

# Graduate Presentations

Alphabetical: Author Last name

## **An Expanded Approach to Stacking Sequence Optimization of Laminated Plates**

Author: Yoseph Mohmand

Mentor: Dr. Tahsin Khajah

Design of laminated composite plates often leads to macro-mechanical optimization of composite laminate. Numerous studies have been performed to find the optimum stacking sequences of composite materials under various in-plane biaxial loadings. Classical theories such as Tsai-Wu failure criterion are widely used to evaluate the design. In this study, an optimization algorithm is developed to expand the number of design variables and find the optimum material properties by incorporating micromechanical properties of each ply. Hence, the number and angle of plies as well as the fiber volume fraction of each ply are optimized simultaneously.

## **Real-time monitoring of a panel of inflammation biomarkers by a point-of-care sensor**

Author: Tanzila Noushin

Mentor: Dr. Shawana Tabassum

When the entire world is grappling with the COVID-19 pandemic, this is an opportunity for us to use the lessons learned to be prepared for detecting, containing, and rapidly responding to and mitigating the spread of emerging infectious diseases. Hence, in this project, we have developed a novel biochip for rapid and real-time detection of infection at the point-of-care. The biochip features multiplexed detection of 4 inflammatory biomarkers using electrochemistry-based measurement technique. We have demonstrated the detection of Interleukin-6 (IL-6), the elevated levels of which is found to associate with adverse clinical outcomes and death in critically ill SARS-CoV-2 patients. Our design consists of 4 working electrodes (WE) for detecting 4 biomarkers, one reference electrode (RE), and one counter electrode (CE) for real-time monitoring of biomarkers. Gold nanoparticles (AuNPs) decorated multi-wall carbon nanotube (MWCNT) nanocomposite is formed on each WE to create a three-dimensional working surface, which substantially enhances the sensitivity. The Au-MWCNT functionalized WEs are immobilized with antibodies specific to the biomarkers. The protein biomarkers are selectively captured on the respective WEs depending on the protein-antibody binding and result in variations in current flow from WE to CE. The sensor demonstrates a sensitivity of  $9.128 \mu\text{A } \mu\text{M}^{-1} \text{cm}^{-2}$ , a limit of detection of 2.6 femtomolar, and a response time of only 2 seconds. Our research holds substantial societal benefit because it will reduce the time to detection (which is especially critical in an under-resourced setting) and save lives. Our device has huge potential to manage future pandemics through early diagnosis and timely treatment and isolation.



# Graduate Presentations

Alphabetical: Author Last name

## **The Political Agency of Women in Colonial Africa**

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Author: Ruth Nwokora

Mentor: Dr. Amentahru Wahlrab

This paper asks the question, what was the political agency of women during pre-colonial, anti-colonial, and post-colonial political times? First, this paper shows that African women contributed immensely to the decolonization process. Without women's constant rebellion, protests, riots, and battles, the continent's independence would have come much later. To show this, this paper gives details of the Ashanti warriors of Ghana, the riotous women of Eastern Nigeria, and the Senegalese women who marched against the French empire. The second part of this paper focuses on the roles played by African women in the development of the post-colonial state. In this period, the political agency of women was often stymied by western ideologies that were intended to keep women "in their place." Studies have shown, in this way, how African women were colonized twice: once by the Western powers and their religions, and second by African elites that denied women access to economic and political power. African women, however, continue to resist oppression and fight for their place in society. They have seen numerous successes, including electing more women presidents than any region in the world.

## **COVID-19 Guideline Compliance and Mental Health in Texas**

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Author: Grant Paul

Mentor: Dr. Mark Owens

The COVID-19 pandemic has proven to be one of the most daunting public health challenges of the 21st century. It has presented unique difficulties to the American medical system due to the overwhelming burden on Americans' mental health stemming from two major factors: uncertainty relating to the virus itself, and a lack of clarity regarding conflicting public health guidelines. Due to a lack of experiences comparable to the COVID-19 pandemic, there is little existing research on whether or not there is any association between self-reported mental health and compliance with official pandemic guidelines. According to the Texas Mental Health Survey conducted by the University of Texas at Tyler, a higher incidence of adverse mental health effects (anxiety, depression, and loneliness) is generally associated with lower incidence of social distancing and mask usage. Working overtime, working fewer hours, and lower income have all produced worse mental health outcomes and lower compliance with pandemic guidelines. Given this data, public health providers in Texas and elsewhere can better target their outreach efforts to the most vulnerable populations.



# Graduate Presentations

Alphabetical: Author Last name

## **Correlation between CSF biomarkers of Alzheimer's disease and cognitive decline toward a machine learning based predictive model**

Author: Vivek Kumar Tiwar

Mentor: Dr. Shawana Tabassum & Dr. Premananda Indic

Early diagnosis of Alzheimer disease (AD) is still lacking as the traditional cognitive tests have several limitations. The most commonly utilized Mini-Mental State Examination (MMSE) scores assess cognition at one point in time and do not reflect its decline over time, they do not assess the subject's functional status, and are susceptible to cultural influences. The search for molecular biomarkers for precise and early detection of the AD stages remains a challenge. The three biomarkers namely Ab<sub>1-42</sub>, T-tau, and P-tau that are found in the cerebrospinal fluid (CSF), have shown promise in AD diagnosis. In this work, we have analyzed an electronic health record of 378 subjects (collected from the National Alzheimer's Coordinating Center database), including 145 subjects with normal cognition, 105 with mild dementia, 104 with moderate dementia, and 24 with severe dementia. We calculated the association between CSF biomarkers of the subjects with their MMSE scores using Pearson correlation. Our results : 1) in subjects with moderate dementia, MMSE scores correlate weakly with the three CSF biomarkers ( $r=0.19$  for Ab<sub>1-42</sub>,  $r=0.15$  for P-tau, and  $r=0.13$  for T-tau) and 2) in subjects with severe dementia MMSE correlate moderately with the biomarkers ( $r=-0.34$  for Ab<sub>1-42</sub> and  $r=-0.62$  for T-tau). The results are quite promising as they validate the need for a point-of-care sensor for non-invasive monitoring of these biomarker levels over time to facilitate early diagnosis and treatment of AD. Our next goal is to train a ML model for predicting the stage and conducting risk stratification of AD from the biomarker levels. The impact of our research is significant because the prediction models will aid the clinicians in diagnosing AD early and taking preventive action accordingly.

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