Aggie Research Program Poster Session Abstract Book

Wednesday, October 2, 2019
Memorial Student Center, MSC 2300E
1:00 – 3:00 PM

LAUNCH Undergraduate Research Expo
http://tx.ag/UGRexpo
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1 a. **A Survey of STEM-Focused Programmable Toy Market**
Luca Tjom, Yara Mohamed, Eunyoung Kim, Juliana Shrestha, Gabriel Fula-Pinto, and Aamir Fidai

Teaching, Learning & Culture

Research has shown that microcontroller-based programmable toys have the potential to increase student academic achievement in STEM (Science, Technology, Engineering and Mathematics) coursework while producing a positive affect towards STEM professions. But the high cost of these programmable toys has proven to be a detrimental force in allowing more school districts to participate in this kind of coursework. There is a need for a more affordable options for programmable toys so that students from Low SES backgrounds can have access to same learning opportunities in STEM education as their more privileged peers. Development of an affordable programmable toy requires us to do an inventory of the characteristics of currently available high-cost programmable toys. In this study, we analyze the characteristics of currently available programmable toys and provide such an inventory. The implications of this study include a checklist of required functionalities in the proposed low-cost programmable toy.

1 b. **Effects of District Expenditures on Student Science Achievement**
Madison Benzor, Juliana Shrestha, Khoi Ngo, and Aamir Fidai

Teaching, Learning & Culture

Public schooling is supposed to provide all students with the best science education and prepare them for post-secondary STEM (Science, Technology, Engineering and Mathematics) tracks. But students’ science achievement is not the same across Texas school districts. Given that achievement in science during K-12 is vital for success in post-secondary education, the identification of potential district-level factors on the quality of science instruction is crucial. The purpose of this study is to investigate the statistically significant relationship between district expenditures and student performance on the State of Texas Assessment for Academic Readiness (STAAR) Science test. The implication of this study could lead to equitable allocation of financial resources within all Texas school districts.

2. **Determining the Accuracy of Automated Roost Counts for Wild Turkeys**
Alexis Salazar, Aliyah Watts, Dr. Michael Morrison, and Amanda Beckman

Ecology and Evolutionary Biology

More and more technology has become available to monitor wild animals, but the accuracy of new technologies need to be estimated to know about their shortcomings. The objective of our project was to determine if trail cameras could be used to estimate wild turkey (Meleagris gallopavo) numbers at roosts. Previous studies showed that trail cameras were not effective at estimating turkey numbers during the day because they moved too randomly. However, some roosts are used reliably each night so cameras could monitor the number of individuals at the roost. We will work in January-May 2020 to place trail cameras at known roosts at a ranch in South Texas. We will compare the numbers of turkeys that we count in the morning with number detected by the cameras to determine accuracy. If trail cameras provide an accurate count, then roost-use patterns can be monitored remotely by landowners, land managers, and biologists.
3. The Racialized Food Pantry: A Case Study of Victor Ray’s Theory of Racialized Organizations

Andrew McNeely, Brianna Kalin, Abdullah Siddiqi, Elif Kilicarslan, and Sarah Gatson

Sociology

In this research brief, we draw on field notes and autoethnographic accounts from our participant observation study of local food pantries to examine a case study of a racialized organization. A racial organization is one in which racism is embedded into the structure of an organization itself, not just in the mentalities and culture of its membership. Micro and meso level analysis of our ethnographic accounts provides evidence to support Ray’s theory, and contrasting accounts of other food pantries in the county demonstrate the constraining nature of the macro level racialization in the food pantry system. We contextualize these accounts as an outcome of the charitable choice provisions of the Personal Responsibility and Work Opportunity Reconciliation Act.

4. Stem Cell Manufacture at Texas A&M

Sujata Dalal, Calvin T. Phinney, Megan G. Lopez, Andrew W. Haskell, Robert E. Rogers, Roland Kaunas, and Carl A. Gregory

Molecular and Cellular Medicine

Mesenchymal stem cells (MSCs) offer immense potential in treating inflammatory disorders, musculoskeletal trauma, and cancer. However, the current MSC manufacturing techniques are costly, yield suboptimal quantities, and exhibit variability. Our group has minimized batch variability by use of clonally-derived induced pluripotent stem cell MSCs (iPS-MSCs) and has developed customizable and degradable microcarriers compatible with large bioreactors to maximize yield. Current efforts are directed towards optimization of the use of media factors like fetal bovine serum and human platelet lysates, to further reduce cost. The iPS-MSCs generated by the new approach retain their efficacy in vitro and in vivo. If successful, this new process of growing MSCs would create clinically relevant quantities of cells while decreasing expenses and variability thereby accelerating translation to clinical applications.

5 a. How Much Progress is Acceptable for Children with Autism?

Saron Araya, Christopher Coppins, Theophile Destain, Kaylyn Dinh, Tanjim Islam, Abigail Meibaum, and April Haas

Educational Psychology

Peer-mediated academic instruction (PMAI) shows positive effects for increasing academic skills for students with autism. The purpose of this study is to visually and statistically analyze the effects of PMAI. Studies will be visually analyzed by educators and individuals unfamiliar with classroom behavior. This analysis will guide the creation of a benchmark measurement, that will suggest how much progress is adequate when implementing PMAI.
5 b. Does Working Out Really Work Out for Students with Autism?

Blake Bellomy, Aaron Harlow, Lupe Rojas, and April Haas

Educational Psychology

Students with autism are often excluded from class due to disruptive behaviors. Prior research indicates antecedent exercise can be useful to modify behavior. The purpose of this study is to review the literature and synthesize for whom and under what circumstances antecedent exercise is used to change behavior for students with autism in the classroom. Studies will also be visually and statistically analyzed to understand the effects of the intervention.

6. Testing the Effect of Low-Dose Ethanol on Microvasculature of the Chick Chorioallantoic Membrane (CAM) Model

Ashritha Rao, Kaijie Sheng, Caroline E. Keefer, Jessica Nguyen, Omar M. Khurshid, and Christopher M. Quick.

Biomedical Sciences

Low-dose ethanol exposure upregulates endothelial nitric oxide synthase, increases nitric oxide production, and stimulates endothelial cell proliferation. The effect of low-dose ethanol on microvascular growth is unknown; in conventional animal models, persistent increases in blood flow are not easily maintained, and microvascular radii cannot be measured before and after dosing. The chick CAM model presents itself as a novel research platform that allows direct access to vessels over time as blood flow and vessel diameters increase. Therefore, we are developing this animal model to test the hypothesis that low-dose ethanol exposure will lead to an increase in microvascular diameter.

7. Quantifying Guyton’s Cardiac Output

Camille N. Brown, Dylan J. Fishbeck, Meghan R. Scott, Madison E. Culver, Kumail H. Syed, and Christopher M. Quick

Biomedical Sciences

Guyton’s cardiac output (CO) - venous return (VR) graph is a standard tool to conceptualize how hemodynamic equilibrium is established. An algebraic formula predicting VR has provided critical insights into the effect of changing mechanical properties of the systemic vasculature on equilibrium. Because conventional mathematical models for CO must be solved numerically, equivalent insights have been lacking. Therefore, the present work linearized standard model equations to derive an algebraic formula for CO as a function of right atrial pressure. This novel tool reveals that the slope of Guyton’s CO curve is not influenced by left ventricular contractility as conventionally believed.
8 a. Physiological Measures as Indicators of Workload in Virtual Reality Environments
Alexandra Pacheco, Zain Raoofi, Carel Lachlan Lewis, Samantha Caswell, and Carolina Rodriguez-Paras
Industrial & Systems Engineering

Human operators may experience high workload levels and stress in their professional environment, which significantly affects their performance. This, however, may not be adequately addressed in training. Virtual reality (VR) environments may provide a safe training environment, with varying levels of workload. Because VR environments are very immersive, workload levels may be reflected, and any changes observed. Physiological changes, subjective measures, and performance will be collected while participants perform different tasks in a VR environment. These results can be analyzed to determine the suitability of the VR technology as a training tool in multitasking environments.

8 b. Measuring Effective Driver Takeover in Partially-Automated Vehicles
Quincy Sorenson, Kellie Hastings, Pasakorn Choterungruengkorn, and Carolina Rodriguez-Paras
Industrial & Systems Engineering

With the growing trend of partially-automated vehicles, the safety of human driver and their interactions with machine systems needs to be supported. This study aims to investigate different displays that provide takeover cues to capture the driver’s attention when a possible automation failure may occur to facilitate driver takeover. Discrete events will be used through the driving scenario to simulate automation failures in a partially-automated vehicle, while the driver concurrently performs a secondary task. Physiological data, driver performance, and subjective measures can provide insight into how quickly and competently a driver takes over from automation.

9. Team Resilience in Emergency Operations (TREO)
Changwon Son, Farzan Sasangohar, S. Camille Peres, and Jukrin Moon
Industrial & Systems Engineering

The project aims to understand how incident management teams (IMTs) adapt their performance to constantly changing situations surrounding a disaster. In order to understand the IMT’s adaptive performance, this project investigates patterns of interactions between human (e.g., emergency operators) and technical agents (e.g., information tools) in a team environment. For the investigation, we collected data from multiple sources (e.g., naturalistic observation, interview, survey), which can be analyzed in both qualitative and quantitative manners. Especially, the current project efforts are focused on comparing expected IMT behaviors (‘work-as-imagined’) and actual IMT performance (‘work-as-done’). By inspecting the difference between the two, recommendations can be made to reconcile ‘work-as-imagined’ and ‘work-as-done’ in order to enhance the resilience of the IMTs.
10. Chick CAM model Optimization Study of Vasculature Networks
Cole L. Randolph, Clayton A. Cole, Julian Edmonson, Linh T. Luong, Cesar A. Torres, and Christopher M. Quick
Veterinary Physiology & Pharmacology

Although conventional models for vascular networks of mature subjects have been optimized, models to study embryonic development have not been fully established. The chick chorioallantoic membrane (CAM) model shows a promising alternative animal model for microvascular research. Present work focuses on developing an ex ovo CAM model for intravital vascular studies. Three critical constraints have been identified. 1) environmental: temperature, humidity and oxygen regulation 2) visualization: ensuring a planar surface to access entire vasculature, and 3) incubation: maintaining aseptic conditions. To make this a scalable model, these constraints must be met while minimizing cost and maximizing reproducibility.

11. Recapitulating the Tumor Microenvironment of Colon Cancer In Vitro
Daniel Penarete, Rachel Stading, Laura Emerson, Michael Horn, Arum Han, and Arul Jayaraman
Biomedical Engineering

The colon tumor microenvironment presents complex gradients of oxygen and metabolites. This complexity arises from the diverse microbial community that inhabits the colon. Metabolites produced by this community act as modulators of epithelial cell proliferation, malignant transformation, and immune system activation. Advancement in the mechanistic understanding of this functional role is hindered by the complexity of in vivo models and the scarcity of in vitro models that specifically mimic a carcinogenic microenvironment. Here, we present a microfluidic device that aims to recapitulate the colon tumor microenvironment. The device allows for the continuous perfusion of cancer cells embedded in a hydrogel with differentially oxygenated media, which maintains an oxygen gradient. This permits the co-culture of aerobic mammalian cells with facultative and obligate anaerobes from the gut microbiota. Current efforts include the characterization the response to co-culture by cancer cells and the bacterial community.

12. Finding Fit During Recruitment: The Role of Core Competencies
Eva Gail Calvert, Samantha Greig, Alex Ogden, Katie Seabolt, Victoria Wang, Natalie Wilson, and Dave Sullivan
Management

The experience of person-job fit during the application and recruitment process is one of the most influential factors when making a job decision. While previous research has examined the impact of perceptions of person-job fit, no research to date has fully explored the impact of the underlying components establishing these perceptions. Through this research program, we will investigate the impact of eight core competencies on the development and experience of person-job fit during the recruitment process. We will assess these core competencies through coding actual recruitment material and directly assessing actual job applicants’s perceptions of their own abilities.
13 a. **Whereof We Cannot Speak**

David Anderson, Ifeoluwa Adebiyi, Diego Lavado, Ann Plat, and Malia Madaffri

Philosophy

We explore how two apparently radically different intellectual movements in the history of philosophy, medieval apophatic theology and Wittgensteinian philosophy of religion, address the questions: What, if anything, is inexpressible, unspeakable, or inconceivable by human language and thought? And if anything is thus ineffable, what consequences follow for human life, thought, and language? We hypothesize that contrary to logical positivism and ordinary language philosophy, Ludwig Wittgenstein’s work holds a place for the mysterious and ineffable and can therefore contribute to a better conceptual understanding of underappreciated medieval philosophers and theologians.

13 b. **Evil and Evolution**

David Anderson, Harrison Buenger, Matthew Buttry, Cooper Cash, Mack Cleveland, Zelia Flores, Layne Matthews, Brandon Smith, Aliyah Watts, Kennedy Wiley, and Malia Madaffri

Philosophy

We explore the impact of evolutionary theories, including Darwinian evolution, Henri Bergson’s creative evolution, and Samuel Alexander’s emergent evolution on the traditional formulations of the philosophical problem of evil, particularly as expressed by Christian apologists C. S. Lewis and C. E. M. Joad. We hypothesize that while Lewis did not write on evolution extensively or explicitly, evolutionary concerns underlie many of his theistic arguments, including the arguments from reason and morality for the existence of God. We proceed with a comparative analysis of Lewis’ and Joad’s views on the moral and spiritual status of non-human animals.

14. **Bioactivity Testing of Chemical Libraries to Identify Drug Candidates for Human Diseases**

Yana Krykunenko, Kevin Lal, David Leavitt, Tyler Lowry, Shruti Prasad, Lindsey Thomas, Dwight Baker, and Inna Krieger

Biochemistry and Biophysics

The modern drug discovery process aims to target a variety of disease components and proteins to acquire new candidate medications for experimental therapeutic use. High-throughput screening (HTS) is an integral step in this process; it uses libraries of chemicals in model biological and biochemical assays to identify those compounds which interact with the disease target. Potentially useful chemicals are identified through luminescent or fluorescent-based assays and subjected to further characterization to test for significant activity with the target. Our focus will be on identifying lead candidates for tuberculosis, malaria, and various cancers through the employment of online data analysis tools, high-throughput screening, and other pertinent assays.
15. Mapping Projection Art for Holocaust Dance Performance
Eman Al-Zubeidi, Amanda Blettner, Connor Bugni, Julia DeLaney, Hwaryoung Seo, and Caleb Kicklighter

Visualization
This project centers around creating visual art that will be projected on multiple outdoor environments in Downtown Bryan. The projection-mapped art will accompany an evening-length dance theatre production based on the historical event of the Holocaust and its parallels to our current political climate. Our aim is to engage the live audience in an immersive experience through the use of projection-mapped art and interactive design techniques. As we are still in the conceptual development stage, our progress will focus on gathering background research on how to elevate the performance by combining impactful audience/dancer interactions, 2D traditional art, and 3D procedural art.

16. Assessing the Social Determinants of Health Insurance in Rwanda
Racha Cherradi, Sanam Maredia, Allen Nguyen, Natalie Freeman, Eniola Olatunji, and David Washburn

Health Policy and Management
Having access to healthcare is one of the Sustainable Development Goals (SDG) target which is in line with the Universal Health Coverage initiative. Health insurance has been identified as one of the tools to help improve access to health care while reducing the burden of ill health. Following the announcement of vision 2020 in Rwanda, the key health statistics in the country has improved dramatically. The objective of this research is to assess the social determinants of health insurance in a Rwanda. The Demographic Health Survey will be used to assess these factors and any change in trend over a five year period. In addition, the countries health system and the health insurance structure would be reviewed. Results will include descriptive statistics and the use multivariate logistic regression to show how key socio-demographic factors determine health insurance status.

17. Art Curation Using Augmented Reality Technology
Eun Sun Chu, Ahsan Waseem, Amanda Blettner, Araceli Reyes, Jack Greene, Julia Delaney, Jinsil Hwaryoung Seo, and Caleb Kicklighter

Visualization
We present a mobile app that allows children to curate, display, and document their artworks through mobile augmented reality technology. In traditional art classes, children are taught to display their artwork with tools such as frames, tables, and pedestals for physical art exhibition. However, due to limited space and cost of tools, this traditional display of children’s art has a few limitations. Our project aims to improve the aforementioned art display environment with augmented reality technology which enables users to utilize the virtual space by using 3D assets and engaging in multi-user communication through the app. As we are still in the early stages of developing this project, we are conducting foundational research about how the traditional display of children's art can be improved so we can proceed to analyze user interaction with mobile AR technology.
18. A General Algebraic Model for Evaluating Intracranial Pressure After a Hemorrhagic Stroke

Faith E. Olson, Gracie H. Jones, Sydney A. Collis, James B. Bluhm, Grant T. Wood, and Christopher M. Quick

Biomedical Sciences

The damage from a hemorrhagic stroke can occur within minutes, and the resulting elevation of intracranial pressure (ICP) can negatively impact long-term clinical outcomes. ICP emerges from the complex interaction of the mechanical properties of the cerebral vasculature, cerebrospinal fluid, brain tissue, and hematoma. Therefore, we developed a simple algebraic formula for ICP by linearizing the equations of a standard mathematical model of ICP. The resulting algebraic formula can be used for investigators to determine how mechanical properties impact ICP elevation with hemorrhagic stroke and suggest novel medical treatments to lower ICP without surgery.

19. Understanding the Role of Gut Microbiota Metabolites in Hypertension

Alexa Auger, Rahul Vegiraju, Kirsten Doering-Ough, Gaurav Baranwal, and Joseph M. Rutkowski

Medical Physiology

There is an epidemic of hypertension in the United States. This project seeks to identify novel connections between gut microbiota metabolites and hypertension, focusing on how these metabolites impact renal immune cell activation. Team members are learning and applying numerous lab techniques including PCR for genotyping and gene expression analysis and immunolabeling for imaging and protein quantitation. Members also learn basic animal handling and physiological measurement techniques. The work integrates three collaborative labs with different expertise: Hypertension, Microbiology and Immunology, and Kidney Disease for an interdisciplinary approach to the clinically-relevant questions of hypertension causes and remediation.

20 a. Shake it Like a Salt Shaker: Unique Characteristics of Bay Salt in Historical Contexts

Lois-Anna Voelkel, Alyssa Shewmaker, Thuy Nguyen, and Grace Tsai

Anthropology

The Ship Biscuit and Salted Beef Research Project (SBSB) recreated shipboard food items during the Age of Sail in order to understand the nutrition and health of sailors prior to canning and refrigeration. While researching the ingredients used to produce the foods, several recipes specified the use of bay salt (solar salt). This poster covers the research done to elucidate why people preferred bay salt over other historical salts. Methods include mineral analysis, microbiological analysis, and colorimetric analysis. While mineral analysis did not show significant differences in salt makeup, the bay salt grew 22,451 thousand CFU/g compared to other historical salts that were generally below the detectable limit. The microbiological content seemed to also correspond to nitrite levels in the meat and brines, and the microbes identified thus far are all nitrogen fixers. Due to this, it is hypothesized that the bay salt’s microbes contained nitrogen fixing and denitrifying microbes. This feature in bay salt is believed to be the reason it was preferred over other historical salts, as nitrate and nitrite have preservative effects on meat.
20 b. Health Effects of Volatile Compounds in 17th Century Salted Beef Replica
Matthew Magno, Somer Smith, Daisy Abraham, Kayley Wall, and Grace Tsai
Anthropology

Historic documents describe the poor quality of salted meat during the Age of Sail due to the lack of modern preservation techniques on board sailing vessels. This study aims to determine the overall efficacy of meat preservation and the effects of volatile compounds from meat spoilage on human health based on analysis of the shipboard salted beef. Further research was done on the values from Gas Chromatography/Mass Spectrometry (GC/MS) analysis, revealing few detrimental health effects according to the chemical compounds, even with considerable change in ionic count. Given that all detected compounds are used as flavoring agents in modern-day cuisine, they do not appear to pose health threats unless taken in high doses. This poster is an extension of the GC/MS analysis, that attempts to find a link between rancidity and edibility of the meat, alongside the potential health effects of the volatile compounds, and concludes with the next steps in the project.

21. Layer by Layer Assembled Coatings of Antioxidant Polymers
Jane Nguyen, Hope Tang, Brent Vela, William Zenor, and Hanna Hlushko
Materials Science & Engineering

Layer-by-layer assembled coatings of antioxidant polymer (P3) with various binding partners, including polyethylene oxide (PEO) and branched polyethylene amine (BPEI) were studied. Strength of interactions between binding partners determined the properties of the coatings. P3-PEO coatings grew exponentially, while P3-BPEI coatings showed linear growth. Stability of the coatings was tested by immersion in solutions of sodium chloride and iron(III) chloride. P3-BPEI coatings swelled in 1.1 times when immersed in sodium chloride solution, while P3-PEO coatings swelled in 1.4 times and deteriorated in solutions of iron(III) chloride. Spectral changes in FTIR show that the polymer was oxidized by iron(III) ions. Understanding coating properties will help to design antioxidant coatings for corrosion protection of steel.

22. Development of the Inner Ear Model through Good Modeling Practices
Hannah M Prutchi, Hannah Curry, Haley Schake, Samantha Tittle, and Alan Gonzalez
Biomedical Sciences Program

The purpose of the present work is to develop a multicompartment model that is amenable to deriving a general algebraic formula for endolymphatic fluid volume in terms of the critical properties of the inner ear. Four strategies were identified to construct a model: tabulate measured hydrostatic and osmotic pressures in each compartment, lump adjacent compartments with the smallest differences in Starling forces, assume the Starling-Landis equation or simple resistances to characterize flow, and assume constant osmotic pressures. Using these strategies, model equations can be solved analytically for endolymphatic volume. The resulting general algebraic formula indicates how compartment properties interact.
23 a. **3D Printed Biopolymer-based Hydrogels for BZ Reaction Studies**

Ilse Nava-Medina, Karli Gold, Ivie Izekor, Magdalena Nino, Morgan Rogers, and Savannah Cooper

Materials Science & Engineering

Our objective is to create self-oscillating hydrogels using a novel Belousov-Zhabotinsky (BZ) system. BZ reactions occur when an organic substrate is oxidized in the presence of a strong acid and a metal catalyst resulting in chemical waves that can be converted to mechanical energy when incorporated into a polymer matrix. Our BZ system is unique because previous research focused on synthetic polymer matrices whereas our system contains a gelatin matrix. We are 3D printing our biopolymer-based gels because this technique allows us to control the size and shape of our hydrogels; however, the gelatin needs to be reinforced before it can be effectively printed, so we employed another biopolymer called kappa-carrageenan, a carbohydrate derived from seaweed. Furthermore, we used iron as the metal catalyst instead of the usual ruthenium. Our choice of metal catalyst and biopolymers makes our system a more eco-friendly and economically viable option than traditional BZ systems. Also, our choice of biopolymers and the ability to create shapes of specific dimensions makes our research a good prospect in the biomedical field for modeling oscillating phenomena such as cardiac arrhythmia and migraines. We have determined a reliable recipe for 3D printed gelatin and BZ reactants that results in distinct wave patterns. The waves were analyzed through various software, and a dominant frequency for each gel was determined. Currently, we are only testing circular gels, but we plan to test different shapes. Furthermore, we are testing variables to achieve consistent movement in our gels.

23 b. **Self-Oscillating Reactions in Liquid Crystalline PNIPAM-co-Polyacrylamide Hydrogels**

William Seidel, Benjamin Barkai, Anh Vu, Brandon Felan, and Ilse Nava-Medina

Materials Science & Engineering

Belousov-Zhabotinsky (BZ) reactions are a class of complex chemical processes that display oscillatory behavior for extended periods of time. These reactions show potential as chemical models for biological systems and can play a role in the development of novel materials that can interact with set conditions in unusual ways. In this study, PNIPAM-co-Polyacrylamide hydrogels containing exfoliated Zirconium Phosphate (ZrP) nanosheets were synthesized. The oscillatory behavior under BZ conditions was tested within these hydrogels. Colloidal liquid crystals, such as the ones formed by ZrP suspensions, show an isotropic-nematic (I-N) transition due to a change in the ordering of the phases. While a colloidal phase diagram ordinarily shows this transition, the phase change in our hydrogels was visible by changes in the oscillatory frequency of the BZ reactions. Additionally, the presence of target waves and spiral waves within the hydrogels is reported.
24. Pendant Tetrazine-Norbornene Click Cycloaddition Products Enable Non-Covalent Dynamic Stiffening in Hydrogels for 3D Cell Culture

Samantha E. Holt, Isabelle Agurcia, Julio Arroyo, Austen Fricks, Emily Poux, and Daniel Alge

Biomedical Engineering

Hydrogels, water-imbibing crosslinked polymer networks, are useful for 3D cell culture because of their tissue-like mechanical properties and high water content. This work aims to leverage novel non-covalent intermolecular interactions resulting from inverse electron demand Diels-Alder tetrazine-norbornene click cycloaddition products to develop a user-controlled, dynamically stiffening hydrogel platform. Hydrogels were assembled from 8-arm poly(ethylene glycol) (PEG) end functionalized with norbornene, crosslinked at a 1:2 thiol-ene ratio with PEG-di-thiol or an enzymatically-degradable peptide. Unreacted norbornenes were reacted with varying ratios of monofunctional methoxy-PEG-thiol to methoxy-PEG-tetrazine to form pendant (not crosslinked into the network) thiol-norbornene (ThNP) or tetrazine-norbornene products (TzNP). Gel storage moduli trended with increasing TzNP, while maintaining acceptable enzymatic degradation rates and gel swelling. Preliminary results indicate TzNP-containing gels support viability of 3T3 fibroblasts. This could offer a user-friendly method for recapitulating tissue stiffening in vitro to model dynamic biomechanical environments such as in fibrotic diseases and cancer.

25. The Influence of Hyperglycemic and Hyperketonic Environments on Murray’s Law in the Chick Chorioallantoic Membrane Model

Janisah Amirah I. Saripada, Matthew R. Magee, Nour Hilal, Corbyn M. Gilmore, Matthew S. Spencer, and Christopher M. Quick

Biomedical Sciences

Endothelial shear stress stimulates nitric oxide production and blood vessel growth. When shear stress is regulated, vessel radii at branches follow Murray’s Law: the cube of the mother radius equals the sum of the cube of daughter radii. Hyperglycemic and hyperketonic conditions have been reported to impact the function of endothelial cells. We determined the feasibility of using the chick chorioallantoic membrane (CAM) model to test the hypothesis that hyperglycemic and hyperketonic conditions lead to deviation from Murray’s Law. Four requirements were identified: mapping microvessel networks, maintaining aseptic conditions, regulating ambient conditions, and quantifying branching patterns. All requirements are attainable.
26. **Research Design with Live Participants**

Jim Morales and Kirsten Yates

Sociology

Experimental studies of human behavior and decision-making in small groups require a high degree of flexibility and control. For an experiment to produce reliable data, researchers must standardize laboratory procedures. Designing an experimental protocol is a trial and error process. Constant pre-testing, however, can increase the reliability and validity of experimental data. Our research regarding small group studies is still in progress, so we will discuss the importance of a functional experimental design. When working with human subjects, one of the most important things to emphasize is repetition. Instructions should include multiple reiterations, especially of steps that are critical for usable results. A subject enters a study with no expectation or idea of how the study is meant to go, so the person administering the experiment must speak clearly and with repetition. Experimental design is a crucial aspect of research which can influence the validity of the end results.

27. **Ultrasonic Obstacle Detection for the Visually Impaired**

Shaheer Mirza, Anthony Teo, Shaheen Ebrahimi, Sabrina Pena, Isabella Arenas, Seyed Pouyan Sabahi, Rolando Garcia, Josh Cherian, and Tracy Hammond

Computer Science & Engineering

In a world that is rapidly developing new technological conveniences, visually impaired persons are still unable to benefit from applications commonplace in 21st century society. GPS navigation and obstacle detection systems have improved significantly over the years, becoming increasingly accurate. The potential application of these technologies on assisting the visually impaired is huge. We plan to use previous research on haptics and brainstorming of other potential haptic locations to decide on the best integration of haptics. Building up on previous research, we hope to make use of ultrasonic sensors to add an obstacle detection feature that would make haptics a viable tool for blind navigation. Visually impaired A&M students will test the wearable technology without other assistance to test the viability of haptics as a replacement for guide dogs or canes.

28. **Developing Perceptions of Pre-service Teachers: Does Diversity Impact Classroom Management?**

Megan Pravinkumar, Francisca Ogwuegbu, Linda Zuniga, Karen McIntush, and Megan Hardy

Teaching, Learning & Culture

This study examines how preservice teachers view the impact of a diverse student population on classroom management. The research question for this study is, how does diversity impact how a classroom is managed? Researchers coded open-ended responses from survey data using Grounded Theory. Emergent themes of preservice teachers’s perceptions will be discussed including diversity, inclusion and accommodations. Literature will be explored that address the idea of equity versus equality within the classroom.
29. **Genome Editing for Shortened Days to Flowering in Rice**

Emily Chao, Blake Pope, Benjamin Rogers, Haley Sloan, Karina Morales, and Michael Thomson

Soil and Crop Sciences

Out of all of the crops that we cultivate, rice is the most important as it serves as a staple for billions of people around the world. Due to its high consummation and photoperiod sensitivity, the focus of our research is on the reduction of flowering time. Altering the flowering time will allow for the avoidance of maturation during periods with high risk of drought, flooding, and extreme temperatures. This will ultimately result in faster seed maturation. We have chosen eight specific genes to edit in order to increase our understanding of those genes through observing their phenotype changes. Gene knockouts will be performed using the CRISPR/Cas 9 system. After DNA purification and genotyping, we expect that the modified rice will have faster flowering times.

30 a. **Analysis of English Spelling Errors of Taiwanese Learners**

Macy Land, Omar Manzur, and Keith Graham

Teaching, Learning & Culture

This poster presents research on English spelling errors committed by English learners in Taiwan. Fifty-six elementary students enrolled in an intensive English program in northern Taiwan were administered the Woodcock-Johnson III spelling subtest. Spelling errors were analyzed using the following categories: omission, substitution, insertion, and transposition (Cook, 1999). Preliminary analysis suggests that the substitution error type was the most predominant of the four error types. However, a large percentage of errors were found to be unintelligible (i.e., uncategorizable) or a combination of categories. This suggests a need for an expansion of spelling error categorization in future research.

30 b. **Analysis of English Writing Development in a Taiwanese CLIL Program**

Lauren Boraud, Dorothy McIntush, Ashok Meyyappan, Skylar Nelson, and Keith Graham

Teaching, Learning & Culture

This poster examines the writing development of elementary students enrolled in an intensive Content and Language Integrated Learning (CLIL) English program in northern Taiwan. Students were asked to complete a narrative and expository writing sample. The samples were scored using various measures of complexity, accuracy, and fluency (CAF). This cross-sectional study examines the differences between genres in terms of the CAF measures as well as explore how CAF develops over multiple grade levels in a CLIL elementary program.
31. Understanding Genetic Drivers of Virally Induced Neurological Diseases

Aracely Perez, Molly Nolan, Kathleen Stephenson, Sidharth Nayak, Annaliese Fowler, Nick Smotherman, Yori Escalante, Raj Patel, and Koedi Lawley
Veterinary Integrative Biosciences

Neurological diseases, such as epilepsy, Parkinson’s disease, multiple sclerosis, and amyotrophic lateral sclerosis, may be the result of an earlier viral infection. In some cases, individuals infected by a given virus will eventually develop the associated neurological condition, while others will develop more variable symptomologies in response to the same viral agent. Theiler’s murine encephalomyelitis virus (TMEV) provides a useful model to understand how a single virus can contribute to different types and severities of neurological outcomes. In mice, TMEV infection elicits diverse neurological conditions, depending on the infected mouse strain, suggesting that the genetic background of the individual influences the neurological disease characteristics observed. To further our understanding of how the genetic background impacts neurological damage in response to viral infection, we aim to elucidate the immunological and genetic determinants that drive the differences we see neurological disease symptoms in genetically distinct mice.

32. Predicting Transport Properties in Solid Tumors using General Algebraic Formulas

Madison B. Gray, Makayla J. Garza, McKynzi N. Harper, Shivani V. Desai, Emily E. Findeisen, and Christopher M. Quick
Biomedical Sciences Program

Experimental approaches to determine the flow of nutrients into tumors and the accumulation of fluid pressure in tumors are limited because they arise from the complex interactions of microvascular filtration into tumors and lymph flow from tumors. Existing mathematical models assume specific parameter values to solve, making results impossible to generalize. Therefore, the present work derived general algebraic formulas for critical tumor variables assuming the standard Starling-Landis and the Drake-Laine equations. This novel approach provides novel insights into how tumor properties can affect the transport of nutrients to the tumor and the high tissue fluid pressure within the tumor.

33. PTSD Continuous Monitoring System

Mahnoosh Sadeghi, Ricky Bengani, Mariana Ginebra, Ian Coyne-Pierce, and Garrett Weston
Industrial & Systems Engineering

Post-Traumatic Stress Disorder (PTSD) is a prevalent psychiatric condition that is associated with high incidence of suicide and substance abuse. The emerging mobile health apps (mHealth) have shown promise to facilitate self-management and have the potential to facilitate direct communication between PTSD patients and their health care providers. In this poster we illustrate our efforts to develop a smartwatch/phone application that includes a predictive algorithm that utilizes real-time heart rate data, collected using commercial off-the-shelf wearable sensors, to detect the onset of PTSD triggers.
34. Childhood Food Insecurity in the Brazos Valley

Ava Reynolds, Hannah Horcha, Kendall Sitzmann, Michelle Lee, Olivia Gonzalez, Patricia Partida, Marita John, and Sarah Gatson
Sociology

In 2015, approximately one out of every four children in Brazos County, Texas lived in a food insecure household. Childhood food insecurity has been associated with negative health and social effects. Our research is ethnographic based and we teach school-aged youth to home garden. We have noticed that since we began our research, the participants have become more willing to try new foods and are more focused on eating healthier. We argue that sustainable home gardening could be a secondary or tertiary method to combat food insecurity. We want to encourage more urban gardening in our communities and promote community education about home gardening techniques for different household needs. We explore the impact of childhood food insecurity and more effective ways to combat food insecurity. We seek to provide the youth in Brazos County the skills required to home garden.

35 a. Monitoring Hypoglycemic Tremors Through a Wearable Sensor

Diego Asturias, Michael Dvorkin, Farzan Sasangohar, and Karim Zahed
Industrial & Systems Engineering

Existing solutions for glucose monitoring such as continuous glucose monitors (CGMs) are invasive, costly, and reactive. Self-monitored glucose approaches are intermittent and miss hypoglycemic events, especially at night. Also, a significant portion of the type 2 diabetes patients currently do not use CGMs and thus cannot monitor for hypoglycemic events. We propose to test a wearable, non-invasive, reliable, inexpensive, and proactive device to detect and prevent hypoglycemic events by detecting early onsets of hypoglycemic tremor. Currently, remote sensors to detect tremor in a wearable configuration do not exist and will be a contribution of the proposed effort. Existing approaches to tremor detection are based on quantification of movement over a time period. The innovation of our approach is to develop machine learning-based pattern detection algorithms to explicitly detect and characterize the frequency and amplitude of tremor. Later on, Innovative ensemble model fusion based on multiple machine learning and neural network models, and feature extraction will be used to improve the sensitivity and specificity of tremor detection.
35 b. **At home Hypertension Monitoring**

Maria Paula Useche, Karim Zahed, and Farzan Sasangohar

Industrial & Systems Engineering

In this project, the team will be developing an AHA approved plan to help participants with hypertension learn how to better manage their condition while assessing the impact of behavior change interventions on their engagement with the regimen and its effect on their health outcomes.

36. **Developing Adaptive Mathematical Model to Predict Hypoplastic Left Heart Syndrome**

Michael Abreo, Grace Gu, Kristen Meaux, Jason Nguyen, Balqees Abushanab, and Christopher Quick

Biomedical Sciences

Hypoplastic left heart syndrome (HLHS) is characterized by malformations of the left ventricle and manifests as decreased ventricular contractility and increased diastolic stiffness. It is unknown whether associated abnormalities of the vasculature are a cause or an effect; while mature cardiovascular systems have been successfully modeled mathematically, fetal models are limited. Therefore, the purpose of the present work was to develop a mathematical model that predicts changes in ventricular diastolic stiffness in response to changes in vascular properties. The resulting general algebraic formulas predict that the left ventricle becomes stiff in response to increased vascular resistance consistent with HLHS.

37. **The Effect of Cadmium on Chicken Embryonic Heart Development**

Naomi McCauley, Nicole DePadova, Mahi Basra, Xochilt Albiter Loyola, Nishika Peeris, Anna Linthicum, Audrey Donohoe, Ke Zhang, and Linglin Xie

Nutrition and Food Science

Cadmium (Cd) is considered the 7th hazardous substance due to its carcinogenic properties and its ability to bioaccumulate in tissues. Previous studies have shown that Cd can cause cardiovascular inflammation in rats and thinner ventricular walls in chickens. Aiming to elucidate the teratogenic effects of cadmium in early chicken embryonic development, chicken saline or CdCl2 injections of 10, 50, and 100μM were administered at HH13-16 (day2) or HH27-28 (day5). Survival rate at HH35 (day9) decreased significantly in day2 treatments compared to the saline control (p=0.03, LD50=69.18μM), more so than day5 (p=0.629, LD50=98.38μM). Hyperplastic myocardium was observed in day9 embryos from both day2 and 5 treatments, with significant incidence among day2 treatments (p=0.003). The increase in ventricular myocardium area was more severe in day9 embryos treated at day2 than day5. Overall, our findings suggest that early Cd exposure affects myocardium development of the chicken embryos.
38. The Effect of Collaboration on Teachers Job Satisfaction: A Comparison Study between U.S. and China

Nguyetcam Truong, Jonathan Thomas, Zhihong Xu, Haoran Li, and Wen Luo
Teaching, Learning, and Culture

The purpose of this study is to investigate the effect of collaboration on teachers job satisfaction. The factors used in this study are based on a rich set of items in the national dataset, TALIS 2018. School-related factors include school/principal background information, professional development (induction and mentoring), and school climate. Teacher-related factors include teachers’s background information, professional development, school climate, and general teaching practice.

39. Identification of Novel Protein-Protein Interactions Between Rice and the Rice Blast Fungus

Nick Farmer, Kavita Misra, Elsy Macias, and Eric Barnes
Plant Pathology and Microbiology

The fungus Pyricularia oryzae infects a wide range of grass hosts, with populations specialized to different host species including rice, on which it causes the major disease rice blast. A family of previously uncharacterized effector genes of P. oryzae has been identified. The gene family members were named HAG (Host Adapted Gene) genes because there appears to be a characteristic set of gene family haplotypes for pathogen populations adapted to different host populations. Our research utilizes Yeast Two-Hybrid assays to identify protein-protein interactions between the effector proteins encoded by these genes and expressed proteins of rice. It is our hope that this research will contribute new insights into the mechanisms by which P. oryzae causes disease in rice and other host plants.

40. Control and Operation Considerations of Three-Phase AC Microgrids

Abhimanyu Arora, Paula Geronimo, Marcos Ibanez, Damilola Owolabi, Abel Martinez Ramirez, Ogbonnaya Bassey, and Karen L Butler-Purry
Electrical & Computer Engineering

Power outages due to extreme weather conditions, cyber-attack, and occasional faults sometimes force sections of the electric power grid to operate in isolation to form autonomous microgrid. Advances in power electronics have enabled advanced control and integration of distributed generators to microgrids and distribution systems. The control and operation of the three-phase autonomous microgrid present variants of the challenges required for the operation of the main power grid. This project explores the state of art control and operation strategies of microgrids from literature, and identifies current challenges and proffers potential solutions. Computer simulation models of power electronics interfaced distributed generators are developed and used for simulation studies to verify solutions to different control and operation challenges of autonomous microgrids.
41. The Effect of Low-Dose Radiation on the Lymphatic Microvessels of the Chicken Chorioallantoic Membrane

Oula M. Eldow, Mark C. Mattin, Xuan T. Tran, Jawad Muayad, Harikanth R. Karanam, and Christopher M. Quick

Biomedical Sciences

Lymphatic vessels proximal to tumors facilitate tumor growth and metastasis. Although high-dose ionizing radiation is known to obliterate vessels and inhibit lymphangiogenesis, the effects of low-dose radiation is unknown. Low-dose radiation, however, is known to downregulate nitric oxide synthase, an enzyme necessary for vessel growth in response to luminal flow. We have established that lymphatic vessels in the chicken chorioallantoic membrane (CAM) can be studied before and after interventions, a property absent in conventional animal models. We are therefore developing the ex ovo CAM model as a novel model to study the effects of low-dose radiation on lymphatic vessel adaptation.

42. Crisis Management Information System

Parker Caputo

Information and Operations Management

In this project, research is being conducted into the applications of artificial intelligence, machine learning, and big data concepts as they are applicable to a crisis management system. Undergraduate researchers will investigate the ability of these concepts to produce data in a meaningful way such that it may promote the safety of an individual during a crisis. Undergraduate researchers will observe the feasibility of connecting first responders to individuals affected by a crisis situation via a centralized information system. The goal of the system is to increase the flow of accurate communication, thereby reducing the chaos that typically follows a crisis. A number of functional crisis situations will be investigated, including but not limited to natural disasters, mass shootings, sexual assault, and gang violence. This multi-year project has the potential to allow students to participate in the development of an actual information system in later semesters.

43. Evaluating the Feasibility of the CAM Model to Characterize Local Hypoxia on Endothelial-mediated Growth and Remodeling of Microvasculature

Parker D. Stallings, Jyotirmaya Jain, Rafael Lugo Luna, Bhumika N. Purohit, Jeegn N. Rathod, Kush P. Rama, Mansi V. Pandya, and Christopher M. Quick

Biomedical Sciences

The structure and function of the chick chorioallantoic membrane (CAM) can be studied before and after experimental interventions. However, this unusual property is underutilized in CAM models, in part, because the divergent environments, cultured in both in ovo and ex ovo, make data difficult to interpret. Oxygen and carbon dioxide partial pressures are powerful mediators of microvascular growth and remodeling. We therefore evaluated the feasibility of using the chick CAM model to quantify the effect of hypoxia on flow-mediated microvascular growth and remodeling and developed novel techniques to compare in ovo and ex ovo models.
44. **Antioxidant Hydrogen-Bonded Coatings of Linear Synthetic Polyphenols**  
Raman Hlushko and Svetlana Sukhishvili  
Materials Science & Engineering

Linear synthetic polyphenol were with poly(ethylene oxide) (PEO) for assembly of layer-by-layer films. The thickness and composition of the films were monitored by spectroscopic ellipsometry and Fourier transform infrared spectroscopy, respectively. Self-association of gallol groups of P3HMA resulted in exponential growth and strong chain intermixing in the P3HMA/PEO system, while P2HMA/PEO films deposited linearly. Assembly of antioxidant polymers preserved their functionality, while dramatically extending the time scale for radical scavenging by the films.

45. **Emotion Elicitation Using Virtual Reality**  
Sahinya Susindar, Harrison Wissel-Littmann, and Samruddhi Arkatkar  
Industrial & Systems Engineering

Classical methods for eliciting emotional responses, including the use of emotionally-charged pictures and films, have been used to study the influence of emotions on human decision-making. This research explores the use of advanced multisensory display systems, such as Virtual Reality (VR) headsets, to elicit emotional responses in-laboratory. VR can offer a degree of immersion that may support more reliable elicitation of emotional experiences than less-immersive displays, and can provide a powerful yet relatively safe platform for inducing some negative emotions. However, it is not well understood how the presentation medium influences the degree to which emotions are elicited.

46. **Modulating Drug Delivery via Polymer Interaction Strength**  
Danielle Yarbrough, Samantha Hernandez, Victoria Albright, and Svetlana Sukhishvili  
Materials Science & Engineering

Upper critical solution temperature (UCST) polymers are a unique class of polymer capable of temperature-reversible bonding. Synthesis of these UCST polymers in a block copolymer enables the formation of temperature-responsive micelles. In order to prevent the disintegration of micelles at temperatures greater than their UCST, they can be assembled with a hydrogen-bonding binding partner in a Layer-by-Layer coating. Here, we use UCST micelles consisting of a poly(acrylamide-co-acrylonitrile) core and a polyvinylpyrrolidone (PVP) corona with poly(methacrylic acid) (PMAA) as a binding partner. We explore the influence of micelle assembly solution pH, binding partner molecular weight, and prime layer components on the drug-release kinetics and stability of the films. Maintaining the structural integrity and functionality of these films improves their drug-carrying capacity and enhances drug release, demonstrating the potential of these temperature-responsive films for controlled delivery of bioactive molecules.
47 a. Theoretical Foundations of Agricultural Communications: A Bibliometric Analysis

Caitlin Benge, Sharon Wagner, and Tracy Rutherford

Agricultural Leadership, Education, and Communications

A theoretical framework not only guides a research project, it also guides a scientific discipline. Previous research has illuminated the primary research methods employed in agricultural communications, but not a distinct theoretical framework which defines the discipline. We sought to extend the work by Shinn et al. (2008) by providing graduate faculty mentors with specific curriculum suggestions for theory-based instruction. We explored 25 years of content in agricultural communication’s premier journal and used bibliometric analysis to identify the specific theories exerting the most significant impact on published agricultural communications research. Our initial analysis of 251 articles yielded 5,615 citations, of which 395 (7.03%) were identified as a theoretical publication. The most cited theories included framing theory (n=35), uses and gratifications theory (n=30), and the elaboration likelihood model (n=25). The final results of this study can serve to shape future programming for doctoral education in agricultural communications.

47 b. Predicting Consumer Risk Perceptions of Bioengineered Foods

Harlea Hoelscher, Emily Wintermute, Sharon Wagner, and Deborah Dunsford

Agricultural Leadership, Education, and Communications

Consumer demand for animal-free foods has steadily increased over the past decade. Many companies are now offering plant-based alternatives or are exploring bioengineered options to meet this demand. Consumers have previously expressed concern about combining “science” with food, as evidenced by ongoing backlash from the use of genetically modified ingredients in products for human consumption. Perceptions of risk and other food safety concerns will likely be a barrier in consumer acceptance of lab-cultured milks and meats. This semester, our team will be designing an experimental protocol to identify the specific product attributes that function as predictors of consumer rejection of lab-cultured milks and meats.

48 a. Novel Design and Synthesis of Flexible Supercapacitors

Swarn Jha and Hong Liang

Mechanical Engineering

Due to the immense demand for flexible supercapacitors, it is important to develop low-cost and smart solutions. To date, supercapacitors made of eco-friendly materials have been either expensive or of limited use. Here we report a new class of solid-state, lightweight, and low cost supercapacitors to be used in flexible electronics. Electrochemical performance is superior than reported. The remarkable electrochemical performance of the new class capacitors make them useful for a wide variety of electronics. This new approach to fabricate electrodes with simple processing and cost-effectiveness, marks an important step towards next generation energy technology development.
48 b. **Comparative Study of Cu and Al substrates for Flexible Supercapacitor Electrodes**

Swarn Jha, Siddhi Mehta, and Hong Liang

Mechanical Engineering

With rapid rise in demand for next generation flexible supercapacitors there is need to produce supercapacitors with the best choice of material with low cost of fabrication. However, to date, little progress is achieved in commercial viability of such low cost technology for electronics manufacturing. Specially, the effects of metallic substrates on performance and device stability have not been thoroughly understood. In this work, a comparative study of Cu and Al current collectors is done. The results indicate at the better suitability of synthesized material with an appropriate current collector for use in energy storage applications.

49. **The Development of Preservice Teacher Efficacy for Writing Instruction**

Stephanie Moody, Macey Todd, Meredith Dunn, Hannah Worthy, Lizette Rodriguez, and Paola Loera

Teaching, Learning & Culture

Writing is a critical skill that is often neglected in schools, largely because teacher preparation programs fail to provide any instruction on writing pedagogy. To improve student writing performance, preservice teachers need to develop personal teaching efficacy for writing. This poster will highlight qualitative data from six preservice teachers, specifically investigating their prior writing experiences and how their personal teaching efficacy changed and/or developed after one year of intensive training and hands-on field experiences for writing instruction. We will illustrate the necessity of including writing pedagogy within teacher education programs.

50. **Algebraic Formula Identifying Critical Hemodynamic Parameters in Response to Graded Tilt**

Stephen R. Whitney II, Joseph M. Pydyn, Angela Zhang, Nathaniel J. Perez, Makenzie M. Roybal, and Christopher M. Quick

Biomedical Sciences

The tilt test is used to evaluate degree of debility from dysautonomia and resulting syncope. Generally, the response of blood pressure and heart rate are measured while the table supporting a patient is tilted. However, there is debate about how to interpret the data, because clinical data are limited and animal models are problematic. Although mathematical models can predict the effects of tilt on hemodynamic variables from assumed properties of the cardiovascular system, they are too complex to be used clinically. The present work therefore aims to develop a simple algebraic formula allowing investigators to infer cardiovascular properties from clinically-measured hemodynamic variables.
51. Characterizing Lymphatic Propulsion in the Chick Chorioallantoic Membrane Model
Alyssa M. Mazzoccoli, Syed M. Haidry, Melika Hajykarim, Spencer N. White, Eileen Chen, and Christopher M. Quick
Biomedical Sciences Program

The CAM is a standard model to characterize tissue responses to tumors, anti-angiogenic drugs, and biomaterials. Lymphatic function is of special interest because it affects interstitial pressure, delivery of nutrients and drugs to tissues, and transport of inflammatory mediators. Active propulsion of lymph in vertebrates arises from periodic contractions of lymphatic muscle or periodic compression of lymphatic vessels by adjacent tissues. Neither the existence nor the absence of active lymph transport have been previously reported in the CAM. Therefore, the purpose of the present work is to evaluate whether it is possible to identify active lymph propulsion in the CAM model.

52. Unraveling the Physics of Host-Invasion with 3D-Printed Artificial Bacteria
Tarek Dawamne, Sophia Lin, and Viktor Melnikov
Chemical Engineering

Flagellar motility is among the important virulence factors responsible for chronic bacterial infections. Research indicates that cellular and flagellar morphologies play crucial roles in determining the effectiveness of host invasion by pathogenic bacteria. Whether evolution favors motility in certain cell morphologies and how morphology influences navigation in complex microenvironments in the host remain significant open questions in the field of biophysics. These questions need to be addressed to counter the growing threat of untreatable, antibiotic-resistant infections. Because bacterial cell morphologies and filament characteristics are difficult to modulate in the microbial world, we proposed to prepare artificial 3D printed bacterial models to mimic their natural counterparts. 3D printing provides unprecedented control over cell-filament characteristics. This makes it an ideal tool to accomplish our goal of developing motile 3D motile bacterial models to test current understanding of bacterial motility and navigation.

53. AggieNova: Understanding Exploding Stars
Tate Walker, Noah Sharp, Akash Gajendra, Drager Landry, Jennifer Martin, Mahir Pirmohammed, and Peter Brown
Physics & Astronomy

Our team is improving on previous efforts to use data on the brightness of exploding stars in the ultraviolet and optical light. To accomplish this, we are automating the data analysis process through Python scripts and supporting data science packages. Our data products will be used to estimate the total energy of the explosions and to predict the amount of light observed from future exploding stars using various ground and space-based observatories.
54. **Antimicrobial Coatings**

Jeremy Zheng, Christian Frey, Victoria Albright, and Svetlana Sukhishvili

Materials Science & Engineering

Bacterial infections remain a challenging problem in a variety of biomedical applications. Our goal is to create a family of stimuli-responsive drug releasing coatings that eliminate bacteria. Polymer coatings were assembled from polyphosphazenes (PPzs), which are a class of flexible, inorganic-organic hybrid polymers, and cationic antimicrobials. We studied the effect of PPz fluorination degree and ionic group type on film properties including growth, swelling, degradation rate, and mechanical strength. Taken together, these films are highly tunable and useful for creating biocompatible coatings for a multitude of purposes.

55. **The Impact of Linguistic Diversity Education on Facilitating Effective Communication between American Undergraduates and International Teaching Assistants**

Xueyan Hu, Darcy Rydle, Sang King, and Yijie Zhu

Teaching, Learning & Culture

This experimental study focuses on the impact of language ideology education on improving UGs’s attitudes towards ITAs’s speech and their teaching performance. It aims to extend the studies with contact activities by using a compact one-hour workshop about linguistic diversity to challenge UGs’s language ideology so as to improve UGs’s attitudes towards ITAs’s accented English and teaching performance in a more efficient way.

56. **Generalized Algebraic Formula to Predict Glomerular Filtration Rate**

Zane C. Hayden, Jack Lyons, Nate Fernandes, Paulina Aragay, and Louis Flores

Biomedical Sciences

The complex interactions of the efferent and afferent arterioles, the glomerulus, proximal tubule, and peritubular capillaries makes it difficult to identify the primary determinants of glomerular filtration rate (GFR), a clinical index of kidney function. Conventional mathematical models that intended to reproduce this complexity must be evaluated numerically and produce results that are difficult to interpret. Therefore, we developed a simple algebraic formula for GFR in terms of mechanical properties. The resulting formula not only elucidates the primary determinants of GFR, but also can provide a novel tool to infer particular mechanical properties from clinical measurements of GFR.
57. Predicting Endothelial Shear Stresses and Radii of Cerebral Vessels by Modifying a Standard Model with a Simple Growth Rule

Daniella S. Matuk, Zoe M. Norkiewicz, Elvis R. Martinez, Junhong Peng, and Paulina Aragay Herrera-Blanc
Biomedical Sciences Program

Although conventional mathematical models can predict how cerebrovascular networks adapt to perturbations, they universally assume constant endothelial shear stress. The present work modified a standard cerebrovascular model with a simple growth rule that is more physiological. To construct this model, it was assumed that 1) vessel lengths and blood viscosity are constant, 2) flow in large vessels are governed by Poiseuille's Law, 3) conservation of mass is maintained, and 4) radii grow proportionally with endothelial shear stress. The result is a novel modeling approach that can translate basic research in mechanotransduction to clinically-relevant changes in cerebrovascular radii and blood flow.

58. Detecting Subtle Changes in Micro-vascular Structure with Low Doses of Sodium Fluoride in the Chick Chorioallantoic Membrane (CAM) Model

Erin O'Connor, Alena Flores, Kortney Lyle, Ali Shewmaker, Josie Wang, and Sophia Abbasali
Biomedical Sciences Program

High-dose administration of sodium fluoride (NaF) induces hypertension in vivo. Both blood pressure and flow are extremely sensitive to subtle changes in microvascular radii. Low doses of NaF affect the response of endothelial cells to shear stress in vitro. The chick chorioallantoic membrane (CAM) model has the unique property that the dramatic increase in flow during development can be measured in each microvessel of a specimen over successive days. Therefore, the purpose of the current study is to test the feasibility of using the chick chorioallantoic membrane (CAM) model to test the hypothesis that low-dose NaF limits microvessel growth.

59. The Response of Microvessels in the Chick Chorioallantoic Membrane to Low-Dose Aspartame

Robert Hayes, Madilyn Feik, Brooke Grieme, Jocelyn Mata, Eileen Chen
Biomedical Sciences

The Response of Microvessels in the Chick Chorioallantoic Membrane to Low-Dose Aspartame (APM) has been evaluated for teratogenic potential by examining morphological changes in response to high doses. APM is reported to impact endothelial function in vitro, and endothelial shear stress is a powerful stimulus of microvascular growth and remodeling. Because microvascular blood flow cannot be continually monitored in conventional animal models, the effects of low-dose APM on endothelial-dependent growth of microvessels cannot be evaluated. We are developing the chick chorioallantoic membrane model to study APM, because the microvasculature is exposed to sustained increases in blood flow, and radius and endothelial shear stress can be tracked in individual vessels over successive days.
60. Derivation of an Algebraic Fluid Balance Model to Optimize Oral Drug Bioavailability

Prit Prakash, Troy La, Devon Thomas, Angela Zhang

Biomedical Sciences

Oral drugs can enter blood circulation through the portal system or the mesenteric lymphatic system. The latter route bypasses the liver and delays hepatic metabolism (i.e., the first pass effect). Because results from animal experiments are difficult to generalize, we developed an algebraic formula that predicts the relative rate of drug transport via mesenteric lymphatics. Fluid transport was characterized by the standard Starling-Landis and Drake-Laine equations. The resulting formula is a tool to suggest novel strategies to optimize drug plasma concentrations in healthy patients and patients with morbidities as diverse as hepatic cirrhosis, congestive heart failure, and Crohn's disease.

61. Algebraic Formula Identifying Critical Hemodynamic Parameters in Response to Graded Tilt

Stephen Whitney

Texas A&M University

The tilt test is used to evaluate degree of debility from dysautonomia and resulting syncope. Generally, the response of blood pressure and heart rate are measured while the table supporting a patient is tilted. However, there is debate about how to interpret the data, because clinical data are limited and animal models are problematic. Although mathematical models can predict the effects of tilt on hemodynamic variables from assumed properties of the cardiovascular system, they are too complex to be used clinically. The present work therefore aims to develop a simple algebraic formula allowing investigators to infer cardiovascular properties from clinically-measured hemodynamic variables.