WORKS IN PROGRESS SYMPOSIUM 2025

THE UNIVERSITY OF MEMPHIS | Helen Hardin Honors College

Monday, November 10th | Maxine A. Smith University Center

Welcome to the 2025 Works in Progress Symposium

The Helen Hardin Honors College is proud to sponsor the 2025 Works in Progress Symposium. This annual event provides a means for undergraduate students throughout the University to share their research with the general University community and recognizes the significant contribution to research by University of Memphis undergraduates.

Providing undergraduates with the opportunity to engage in scholarly research is important to our students' educational experience and professional development. To the faculty mentors who have guided their students along the way, we thank you for ensuring UofM students have every opportunity to pursue undergraduate research.

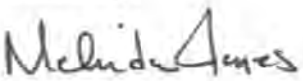
Thanks also to the faculty evaluators, who kindly provide feedback to the student presenters to better prepare their research projects for submission to professional conferences. We also thank our moderators for their assistance and support.

A special thanks is due to the incredible, hard-working Honors College team, without whom the planning of such an event would be impossible: Jonathan Holland, Assistant Director; Chetana Wilson, Coordinator of Recruitment and Engagement; Chasitee Monger, administrative assistant; the Honors College Student Ambassadors; and Ifeoluwa Awopetu, doctoral student in English who designed the Works in Progress program book.

Finally, to the student presenters, congratulations for the quality research you have accomplished and for your participation in the Works in Progress Symposium. I hope you will consider submitting your research to QuaesitUM, the University of Memphis undergraduate research journal.

Welcome to the 2025 Works in Progress Symposium. We hope you will enjoy the conference and the students' presentations. Best wishes to all faculty, staff, and students who make this event possible.

Sincerely,



Melinda Jones, Ph.D.
Director

Acknowledgments

Faculty Mentors

The Honors College gratefully acknowledges the following faculty sponsors whose mentoring has contributed to the research produced by our presenters:

Amanda Gaggioli, History
Amy Abell, Life Sciences Anthony
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Brooke Shannon, Political Science
Carl Herickhoff, Biomedical Engineering
Chen Chinfei, Neurobiology Chrysanthe Preza,
Electrical & Computer Engineering
Daniel Foti, Mechanical Engineering
David Arellano, Civil Engineering
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Ryan Parish, Earth Sciences
Stephanie Ivey, Civil Engineering
Tomoko Fujiwara, Chemistry
Will Robertson, Anthropology
William Alexander, Chemistry
Xiaolei Huang, Computer Science
Yaowen Dong, History

Acknowledgments

Faculty Evaluators

The Honors College thanks the following faculty, staff, and graduate students for providing feedback to the undergraduate presenters:

Abena Abokoma Asemanyi,Communication and Film Studies
Albert Okunade, Economics
Alexander Gavrilyuk, Math
Amanda Lee Savage, History
Amy Curry, Biomedical Engineering
Andie Tubbs, Biomedical Engineering
Andrew Garth, EECE
Anna Gretz, Division of Epidemiology, Biostatistics, and Environmental Health; School of Public Health
Arleen Hill, Earth Sciences
Ashish Shrestha, Civil, Construction & Environmental Engineering
Ayomiposi Falade, (CERI)
Brianna Butera, World Languages & Literatures
Charllote Boateng, Epidemiology and Biostatistics
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Wendy Yeboah, Communication Studies
Yuan Gao, Mechanical Engineering
Zohreh Hafshejani, CERI

Session Moderators

Thank you to the following individuals for serving as session moderators:

Amanda Rodino, Disability Resources for Students
Ashley Roach-Freiman, University Libraries
Caitlin Harrington, University Libraries
Carl Hess, University Libraries
Deborah Thompson, Kemmons Wilson
Elizabeth Langston, Admissions
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THE UNIVERSITY OF MEMPHIS.

Presentations (12:00 - 2:30)

	Memphis A 340A	Ballroom A 320A	Ballroom C 320A
12:00	**Hang Vo** Sensing Aggression in Drosophila melanogaster Mentor: Philip Kohlmeier, Biology	**Isaac Perriguey** SPEED - Sustainable Polymers Enabled by Emerging Data analytics Mentors: Tomoko Fujiwara & QianyiCheng, Chemistry	**Emily Willis** Aggression Influences Social Behaviors and Information Transfer in Drosophila melanogaster Mentor: Philip Kohlmeier, Biology
12:30	**Sophia Gonzales** Fostering Belonging: Exploring the Link Between Teacher Cultural Humility and Student Well-Being Mentors: Emily Srisarajivakul & Rane Ankney, Psychology	**Mayira Sharif** iTiger - GPU Computing for Mid-South Research Institutions Mentor: Xiaolei Huang, Computer Science	**Mackenzie Saylors** Flute Extended Techniques and Their Effects in Coleman's 'Danza de la Mariposa' Mentors: Emily Srisarajivakul & Rane Ankney, Pschology
1:00	**Mia Chambers** Individual and Community-level Factors Associated with Favorable Attitudes towards Crime among College Students Mentor: Kathryn Howell, Psychology	**Aliya Ali** Ultrasound Trapezoidal Array Geometry Mentor: Carl Herickhoff, Biomedical Engineering	**Ashlee Yancey** Impacts of Urban Redlining on Male Fertility and Female Mate Choice in Drosophila Melanogaster Mentor: Philip Kohlmeier, Biology
1:30	**Julia Whitehead** Sex-dependent effects of psychoto-mimetic and antipsychotic drugs on risky decision-making Mentor: Nicholas Simon, Psychology	**Sumiran Sharma & Ebla Bogoneh** Colorimetric Dressing for Detection of Wound Infection Mentor: Jessica Jennings, Biomedical Engineering	**Daniel Wade, Jacob Borden, & Holly Hoffman** Accelerate Memphis: Project Delivery Research Mentor: Stephanie Ivey, Civil Engineering
2:00	**Sang Nguyen** When examined among subgroups of participants who experienced their worst trauma, which categories show the highest average PTSD severity within these group? Mentor: Meghan McDevitt-Murphy, Pschology	**Mallory Martin** Determining the Best Solution for Unsuitable Soil at a Building Expansion Site Mentor: David Arellano, Civil Engineering	**Erenne Coats** Drosophila Melanogaster Diet Comparison Mentor: Philip Kohlmeier Biology

Presentations (12:00 - 2:30)

	Bluff 304	Poplar 308	Shelby 342	Conference Room 208
12:00	**Gerrell Dabbs** Python for Unified Hyperspectral Unmixing Mentor: Chrysanthe Preza, Electrical and Computer Engineering	**Blake Robinson** Investigating tRNS-Induced Activity in the Mouse Visual Cortex Mentor: Chinfei Chen, Neurobiology	**Rachel Bonner** Soul, Stage, and Self: Investigating the Role of the Arts in Community Health Mentor: Will Robertson, Anthropology	**Mauriz Mendizabel** The Art and Science of Ancient Egyptian Ornament Reconstruction Mentor: Marika Snider, Architecture
12:30	**Anita Sadat** A Comparative Analysis of Monetary Policies for Reducing Food Insecurity in Memphis Mentor: Brooke Shannon, Political Science	**Savanna Eggenberger** Investigating Glyphosate Tolerance and Degradation Potential in Clam-Associated Microbes Mentor: Rachel Diner, Biology		**Amiya Taylor Hill** Prevention of Skin Breakdown on ICU Patients Mentor: Kristin Geater, Nursing
1:00	**Wesley Gifford** 'The Untold History of Southwest Memphis' Mentors: Anthony Lauricella, Anthropology; Amanda Gaggioli, History	**Jumana Tuffaha** Reconstructing 3D Environmental Structures from 2D Lidar scans Mentor: Eddie Jacobs, Electrical and Computer Engineering	**Joshua Hackney** Framing the Market: Cognitive and Linguistic Mechanisms of Misinformation in Financial Decision-Making Mentor: Leah Windsor, English	**Cate VonNostrand** A Tale of Secrets and Shadows: Spies, Codes, and Deception in World War II Mentor: Yaowen Dong, History
1:30	**Ella Dina** Sex-Specific Effects of Antipsychotic Drugs on Risky Decision-Making Mentor: Nicholas Simon, Psychology	**David Adaway** Comparison of Processing Methods for Image Restoration for 3D Fluorescence Microscopy Mentor: Chrysanthe Preza, Electrical and Computer Engineering	**Cyrsten Vann** The Evolution of Ink Mentor: Mento Javanmardi, English	
2:00	**Kaitlyn Sjoblom** Does the Use of Jargon Affect Perceptions of Psychotherapists? Mentor: Jeffrey Berman, Psychology			

Presentations (2:30 - 4:30)

	Memphis A 340A	Ballroom A 320A	Ballroom C 320A
2:30	**Ashmita Nauhria** Novel vs Familiar Social Interaction on Anxiety-related Behaviors in Mice Mentor: Deranda Lester, Psychology		**Daja Key** Chemical Mate Choice Copying in Drosophila melanogaster – A Naturally Occurring Behavior? Mentor: Philip Kohlmeier Biology
3:00	**Ellie Gevers & Ariadna Mendoza** Systematic Categorization of Educational Technologies to support AI-Assisted Selection for Adoption in Engineering Classroom Mentors: Pegah Farshadmanesh, Civil Engineering & Kathryn Bridson, Computer Science	**Suzulan Brickeen** Fabrication and Comparative Characterization of Gelatin–PEO Copolymer Scaffolds Mimicking Epidermal Architecture for Anti-Inflammatory Wound Healing Mentor: Gary Bowlin, Biomedical Engineering	**Helen Tran** Investigating the Antimicrobial Properties of Violacein From Janthinobacterium Mentor: Rachel Diner, Biology
3:30	**Muhammed Jobarteh** Design and Fabrication of a 3D Printed Skull Plate for Optimizing Acoustic Window Localization in a Human Skull Mentor: Carl Herickhoff, Biomedical Engineering	**Gianna DeLisio** Investigation of the Lewis Basicity of Small Organics Interacting with Uranium Hexafluoride Mentor: William Alexander, Chemistry	**Jamie Champasouk** Investigating antibiotic resistance in possible pathogenic bacteria from oysters gathered in the Gulf of Mexico Mentor: Rachel Diner, Biology
4:00	**Benjamin Agyemang & Jean Thiemele Marco** Cellulose Functionalization Mentor: Jessica Jennings, Biomedical Engineering	**Onyinyachukwu Okoli & David Hunt** Ionic liquids as Solvents for Biopolymer Electrospinning Mentor: Jessica Jennings, Biomedical Engineering	**Keilan Roseheart** Examining the role of MAP3K4 and HDAC6 on fetal and placental growth in the 129/SvEv background Mentor: Amy Abell, Life Sciences

Presentations (2:30 - 4:30)

	Bluff 304	Poplar 308	Shelby 342	Conference Room 208
2:30	**Eshan Bhagat** The Role of Ventral Pallidum in Decision-Making with Delayed and Immediate Punishment Mentor: Nick Simon, Psychology	**Audrey Alberson** Mechanical Property Evaluation of Manuka Honey-Incorporated Vascular Grafts Mentor: Gary Bowlin, Biomedical Engineering	**Maxwell O'Hearn** Tennessee Historical Seismicity Map Mentor: Kent Moran, Center for Earthquake Research and Information (CERI)	
3:00	**Ellie Gevers & Ariadna Mendoza** Systematic Categorization of Educational Technologies to support AI-Assisted Selection for Adoption in Engineering Classroom Mentors: Pegah Parshadmanesh, Civil Engineering; Kathryn Bridson, Computer Science	**Timbrook Hodge** Modulating Neutrophil Inflammation with Manuka Honey and Its Bioactive Phenolic Components Mentor: Gary Bowlin, Biomedical Engineering	**Jacob Brown** Sourcing Ancient Stone Tools from Parsons, TN Mentor: Ryan Parish, Earth Sciences	
3:30		**Natania Middleton, Jaretzy Nicolas, & Cherno Keita** Efficient Fan Design Using Propellers for Fan Array Wind Tunnels Mentor: Daniel Foti, Mechanical Engineering		
4:00	**Alex Castro** Precision Pressure Sensing and Automated Mapping of Non-Uniform Wind Profiles Mentor: Rafi Rahman, Electrical Computer Engineering; Eddie Jacobs, Electrical Computer Engineering	**Onyinyachukwu Okoli & David Hunt** Ionic Liquids as Solvents for Biopolymer Electrospinning Mentor: Jessica Amber, Jennings, Biomedical Engineering	**Bryan Mendoza, Jayce Fiene, & Brandon Burnett** RANS Simulations for a Laboratory Scale Wind Array Mentor: Daniel Foti, Mechanical Engineering	**Grayson Kendall & Hafsa Khan** Quantification of Microplastic Release in Campus Bottled Water Under Simulated Daily Use Mentor: William Alexander, Chemistry

Abstracts

MATH AND COMPUTER SCIENCE

iTiger - GPU Computing for Mid-South Research Institutions

Mayira Sharif
Mentor: Xiaolei Huang, Computer Science

The rapid growth of artificial intelligence and data-driven research has dramatically increased the need for shared computing resources. Responding to this national priority, the University of Memphis developed iTiger—a high-performance computing (HPC) initiative built in collaboration with regional universities and industry partners. Equipped with 88 advanced NVIDIA GPUs (5000Ada, 6000Ada, and H100), iTiger provides powerful computing capabilities to accelerate research and education across the Mid-South.
As the spearhead of user management, outreach, and tutorial development, I explore our current efforts to improve data science and computational research at the University of Memphis and surrounding Mid-South institutions. This work focuses on making high-performance computing more accessible to students, educators, and researchers by building training resources, streamlining user support, and promoting collaboration. Through these initiatives, iTiger demonstrates how shared HPC infrastructure can empower regional innovation, strengthen research capacity, and prepare the next generation for an AI-driven future.

ENGINEERING

Modulating Neutrophil Inflammation with Manuka Honey and Its Bioactive Phenolic Components

Timbrook Hodge
Mentor: Gary Bowlin , Biomedical Engineering

This study investigates whether different concentrations of methyl syringate or whole Manuka honey can reduce neutrophil-driven inflammation. We hypothesize that treatment will decrease release of pro-inflammatory and increase pro-regenerative cytokines (Angiopoietin-1, FGF-2, G-CSF, HGF, IL-1 beta, IL-10, IL-1RA, IL-22, IL-6, IL1β, TNF-α, MCP-1, IL-8, VEGF-A), degradative enzymes (MMP-9, MMP-1, proteinase 3, neutrophil elastase), and myeloperoxidase (MPO) in a dose-dependent manner. Human neutrophils will be isolated, stimulated with PMA, and cultured for 3 and 6 hours in the presence of 5% Manu-ka honey, 10% Manuka honey, 600 µM Methyl Syringate, and 1300 µM Methyl Syringate. Supernatants will be analyzed using a Luminex assay for cytokines and enzymes, and ELISA for neutrophil elastase. Results will be reported as mean concentration (ng/mL) ± standard deviation (n=5). By targeting NF-κB–mediated cytokine and enzyme release, this work aims to demonstrate the potential of Manuka honey and its bioactive components to mitigate neutrophil-driven inflammatory feedback loops, providing a novel strategy for modulating immune responses in tissue engineering and regenerative medicine.2nd Generation 180° Ultrasound Scanner.

Mechanical Property Evaluation of Manuka Honey-Incorporated Vascular Grafts

Audrey Alberson
Mentor: Gary Bowlin, Biomedical Engineering

Cardiovascular diseases remain a leading cause of death in the developed world, with atherosclerosis, the narrowing of blood vessels due to plaque buildup, posing an ever-growing clinical challenge. One current treatment involves replacing sections of affected veins with synthetic ePTFE GoreTex grafts, which are less effective for small-diameter veins due to poor graft patency. This study aims to fabricate polydioxanone small-diameter vascular grafts that incorporate Manuka honey. Manuka honey has been shown to inhibit the pro-inflammatory neutrophil response, which, if dysregulated, can lead to graft failure. However, the effects of Manuka honey on the mechanical properties of these templates is not yet known. Using different concentrations of Manuka honey, the mechanical properties of the grafts were tested and compared to commonly implemented ePTFE vascular grafts as well as saphenous vein literature values. The mechanical measurements evaluated included longitudinal uniaxial elongation, circumferential uniaxial elongation, suture retention, and burst pressure completed according to international standards. Next steps include analyzing the immune response to these grafts as well as testing the mechanical properties of Manuka honey incorporated with other polymeric biomaterials.

Abstracts

Design and Fabrication of a 3D Printed Skull Plate for Optimizing Acoustic Window Localization in a Human Skull

Muhammed Jobarteh
Mentor: Carl Herickhoff, Biomedical Engineering

The purpose of the research as a whole is to optimize a transducer device for accurately determining the acoustic window of a human skull. This is achieved by analyzing the propagation of ultrasound waves through a skull submerged in a controllable water tank environment. To facilitate this experiment, a custom skull plate was designed to securely hold the skull in a stable position during data acquisition. CT scans of the skull were processed in 3D Slicer to generate an STL model, which was then imported into Autodesk Fusion 360 for the plate design. The design ensured that the estimated acoustic window was positioned at the center of the plate for optimal signal transmission and reception. The final model of the design was fabrica- ted using an Ultimaker 3D printer with a 20% infill density, providing sufficient structural integrity while minimizing material usage, and fabrication time. During the design, challenges arose related to dimensional accuracy leading to errors in the estimation of the skull geometry and plate dimensions. This led to several iteration and refinement of the design. Despite these issues, the resulting 3D printed skull plate effectively holds the skull , making it suitable for wave propagation in the water tank.

Colorimetric Dressing for Detection of Wound Infection

Sumiran Sharma & Ebla Bogoneh Mentor:
Jessica Jennings , Biomedical Engineering

The current standard of care relies first on clinical assessment of a patient's symptoms, and often empirical antibiotics are used indiscriminately, even without confirmation of infection, which contributes to the development of antimicrobial-resistant strains of microorganisms. Infection detection involves culturing tissue samples, which is a time-consuming process. Patients managing their care at home often have reduced access to medical care and may delay seeking treatment, leaving the infection to spread rapidly.

Our technology is based on the detection of a molecule produced specifically by pathogenic bacteria. We have incorporated a textile sensor window into a wound dressing, which would absorb exudate and change color if the wound is infected. This would provide a "window to the wound," allowing patients and clinicians to monitor the tissue status without having to remove the dressing, preventing further injury from dressing removal and reducing the risk of contamination from the environment.

The dressings consist of ESCMS (Electro-spun chitosan membranes), which are often used in regenerative applications like dressings. Our research goals are to optimize fabrication, determine what concentrations of microbes can be detected (sensitivity), and determine how long it takes for color to develop (response time). After this is completed, we will evaluate it in an ex vivo model (pig skin).

Cellulose Functionalization

Benjamin Agyemang & Jean Thiemele-Marco
Mentor: Jessica Jennings, Biomedical Engineering

Cellulose, a renewable polysaccharide rich in hydroxyl groups, is an attractive scaffold for functional modification in biomedical and industrial applications. Acylation (esterification) has been used on cellulose derivatives to impart hydrophobic character, but its effect on drug release remains under-explored. In this work, we investigate hydrophobic acyl modifications of cellulose via reactions using acyl chlorides or anhydrides under varied reaction times and conditions. We characterize success by Fourier Transform Infrared Spectroscopy (FT-IR), identifying ester carbonyl stretching and reductions in hydroxyl absor-bance, determine degree of substitution, and investigate wettability and morphology changes. Finally, the modified cellulose materials are evaluated for drug release using model compounds, with the goal of achieving tunable and sustained release profiles. Results will help establish whether simple acylation of cellulose can produce bio-compatible carriers combining hydrophobicity and controlled drug delivery.

Abstracts

Ionic liquids as Solvents for Biopolymer Electrospinning

Onyinyechukwu Okoli & David Hunt
Mentor: Jessica Jennings, Biomedical Engineering

This study investigates the use of ionic liquids (ILs) as alternative solvents for electrospinning chi-tosan-based membranes, with the goal of developing safer and more sustainable materials for regenerative applications such as wound dressings. Current electro-spinning methods commonly employ trifluoroacetic acid (TFA), a solvent that is both toxic and corrosive, posing risks to users and electrospinning equipment. Ionic liquids—salts that remain liquid at room temperature—offer a green, biocompatible, and non-volatile alternative to traditional solvents. In this experiment, chitosan solutions were prepared at varying concentrations in selected ILs and electrospun to form fibrous membranes. Preliminary results showed that a 5% chitosan solution produced fibers that were too thin, indicating the need for higher polymer concentrations to achieve optimal fiber morphology. Ongoing analysis focuses on identifying the concentration that yields uniform fibers and on measuring fiber diameters to evaluate the influence of IL type and chitosan concentration on fiber formation. This work aims to advance electrospinning techniques by introducing a non-toxic solvent system suitable for biomedical use.

Fabrication and Comparative Characterization of Gelatin–PEO Copolymer Scaffolds Mimicking Epidermal Architecture for Anti-Inflammatory Wound Healing

Suzulan Brickeen
Mentor: Gary Bowlin, Biomedical Engineering

The immune system is critical for maintaining homeostasis, with skin serving as the body's primary barrier against pathogens, regulating temperature and water balance, absorbing UV radiation, and protecting tissues from environmental and mechanical stress. Chronic wounds fail to heal within 4–6 weeks due to persistent infection, impaired extracellular matrix remodeling, or prolonged immune activation. Sustained inflammation recruits neutrophils and macrophages excessively, causing fibrosis and impaired tissue regeneration, often requiring corticosteroids or, in severe cases, amputation. Gelatin, a collagen-derived polymer, is biocompatible, supports cell adhesion, and mimics the extracellular matrix, making it ideal for electro-spun scaffolds. Poly(ethylene oxide) (PEO) is miscible with gelatin, enhances mechanical strength, prolongs degradation, and exhibits low cytotoxic. Scaffolds with varying gelatin and PEO concentrations will be electrospun and mechanically tested for tensile strength, elasticity, and flexibility to identify formulations that mimic skin mechanics. Following mechanical optimization, fibroblasts will be seeded to assess attachment, proliferation, and viability, confirming biocompatibility and minimizing immune activation. This study aims to identify a gelatin–PEO copolymer scaffold that replicates epidermal architecture and supports fibroblast-driven tissue regeneration, advancing next-generation wound dressings that closely mimic epidermal tissue.

Ultrasound Trapezoidal Array Geometry

Aliya Ali
Mentor: Carl Herickhoff, Biomedical Engineering

Conventional ultrasound uses a 1D array of rectangular transducer elements to acquire 2D images but cannot detect motion through the image plane. This work explores a novel trapezoidal element array transducer to track scatterer motion (e.g., red blood cells or microbubbles) through vessels intersecting the y=0 image plane. Using Field II, a MATLAB-based ultrasound simulation tool, we model array transducers to optimize performance. The goal is to detect scatterers moving in the elevation dimension (y), distinguishing locations above and below the image plane. Unlike conventional linear arrays, the proposed design uses alternating symmetric trapezoidal elements, shifting element centroids into two distinct elevational positions. We are developing a flexible simulation framework to model trapezoidal-element arrays with selectable parameters: element height, azimuthal pitch, kerf width and angle, and number of elements. This enables systematic exploration of how geometry affects acoustic field asymmetries and imaging performance. Future comparisons with conventional arrays will highlight beam pattern differences and through-plane tracking capabilities. This work contributes to improving image quality in medical ultrasound.

Abstracts

Comparison of Processing Methods for Image Restoration for 3D Fluorescence Microscopy

David Adaway
Mentor: Chrysanthe Preza, Electrical & Computer Engineering

Fluorescence microscopy enables the imaging of biological samples that emit light under excitation. This study uses a three-dimensional (3D) fluorescent sample of a human glioblastoma tumor to compare several image processing methods.

Widefield microscopy is the most basic type of acquisition, as a single image of captured for each chosen focal plane along the depth of the sample, forming a 3D stack of 2D images. The stack of images is then processed by widefield deconvolution, which uses the microscope's point-spread function to obtain an improved stack with the out-of-focus light restored to the in-focus plane.

In structured illumination microscopy, a grid pattern projected onto the sample during acquisition modulates its emitted light, allowing higher frequency information to be captured. Changing the phase of the pattern changes the visible emission; capturing and applying mathematical operations to three phase images results in a more detailed image for each focal plane than in widefield microscopy. The image can be further improved by ApoTome deconvolution, which involves applying a regularized inverse filter.

Continuing research from last summer, this presentation will showcase the computations involved in each step and compare the image processing methods by quality of output images and user accessibility.

Plant fluorescence simulation via custom built LED array

Alexis Luna
Mentor: Eddie Jacobs, Electrical & Computer Engineering

Plant stress can seriously impact cotton yield, so catching it early is an important step to improving crop production. One way to tell if a plant is stressed before it shows up as an outward, physiological change is to measure its fluorescence, which is a faint red glow that plants give off during photosynthesis. In this study, a custom LED array system will be developed that simulates the glow so that we can observe it at different levels of intensity. The Thor-labs T-Cube current controller powers the 740 nm LEDs in a 5×5 array, and an Arduino R3 controls them for smooth, precise brightness control. The LEDs are inside a diffusion box that spreads the light out evenly and emits a signal similar to how real plant fluorescence looks. We can use this setup to test hyperspectral cameras and see how well they can find small levels of fluorescence. The goal is to make it easier to find and deal with crop stress, which will lead to better farming and higher yields.

Python for Unified Hyperspectral Unmixing

Gerrell Dabbs
Mentor: Chrysanthe Preza, Electrical & Computer Engineering

Hyperspectral Imaging is a technique that captures data in both the spatial and spectral domains. The rich spectral information allows for more in-depth analysis of scenes such as material classification and anomaly detection. Hyper-spectral data processing is generally leveraged through the MATLAB platform which houses an official toolbox for hyperspectral data processing with occasional work in Python. However, the reliance on MATLAB poses two significant limitations: the cost of the platform, which creates a barrier to entry for many researchers, and the official toolbox's lack of some of the well-known hyperspectral algorithms.

These limitations highlight the need for a unified, open-source framework for hyperspectral data processing that can be collaboratively developed and continuously updated with state-of-the-art methods. Python would be an ideal candidate for this role as it has already seen use in various hyperspectral applications in the form of several libraries, though currently unmaintained, that have attempted to replicate MATLAB's functionality.

In this work, we present a foundation for such a unified framework for Hyperspectral Data processing in Python. As an initial step, we start with reimplementing the end-member extraction algorithms from MATLAB to demonstrate both numerical accuracy and stability of Python. We further demonstrate our foundation with an implementation of Vertex Component Analysis, a widely used end-member extraction algorithm.

Abstracts

Reconstructing 3D Environmental Structures from 2D Lidar scans

Jumana Tuffaha
Mentor: Eddie Jacobs, Electrical & Computer Engineering

For the sick competition 2025-26, our team would like to introduce StreamEye, a multi-UAS (uncrewed aerial system) that provides high-resolution and real-time visual stream assessment (VSA). LiDAR technology has made significant strides in its ability to capture multiple scans from different vantage points. However, using a 2D LiDAR instead of a 3D system produces only a single flat mapping plane, limiting our understanding of complex environments. In contrast, 3-D representations are essential for applications such as UAV navigation and flight safety while providing accurate spatial data. My individual role in this project investigates methods for reconstructing 3D information from 2D Li-DAR scans, driven by collaboration with CEASER (Center for Applied Earth Sciences and Engineering Research) for stream data collection and for our Stream Eye in the SICK competition. Going beyond just data collection, this project offers many benefits. Using 2D LiDAR with 3D reconstruction methods creates a cost efficient system. It also offers weight efficiency, reducing the load for UAVs and allowing longer flight times or smaller drones. This work contributes to broader competition objectives, including the collection of real-time data, environmental modeling, and supporting research in efficient 3D reconstruction methods for real world settings

Precision Pressure Sensing and Automated Mapping of Non-Uniform Wind Profiles

Alex Castro
Mentors: Rafi Rahman, Electrical & Computer Engineering
Eddie Jacobs, Electrical & Computer Engineering

To characterize the flow characteristics of a fan array wind generator, precise sensing equipment is necessary. This need becomes accentuated when the desired wind profiles have a non-uniform intensity with respect to both location and time. A major challenge in collecting the data required to characterize such flow patterns is the accuracy needed to extract useful data from the flow field. The first problem this study addresses is in calibrating the sensor as even miniscule changes in the pressure reading results in large shifts when converting to velocity. Using a wind turbine producing clean flow and an averaging pressure sensor with verified calibration results, a calibration curve was created for a more sensitive Honeywell pressure sensor. By applying this calibration curve, point data for the flow field could be reliably gathered at a high sampling rate. To address the spatial aspect of data collection, two Zaber linear translational stages positioned the sensor to gather data in a precise array at various downstream locations of the flow field. Finally, custom software was written to interface the two systems and automate the entire data collection process for each plane data was gathered.

Determining the Best Solution for Unsuitable Soil at a Building Expansion Site

Mallory Martin
Mentor: David Arellano, Civil Engineering

The Facility Engineering department of The Kroger Company is responsible for remodeling and expanding stores to enhance the customer experience and maximize company profit. Upon performing a geotechnical investigation for the construction of a 33,567 square-foot expansion to the Murray, Kentucky Kroger, the site was found to contain unsuitable soil. Due to the presence of surficial fill, low strength natural clay, and high plasticity "fat" clay and elastic silt, subgrade remediation will be required to achieve suitable bearing for building support and to control settlements to tolerable limits. Available methods of subgrade remediation include scarification and recom-paction, removal and replacement with crushed stone, chemical modification with portland cement, and chemical modification with fly ash. Through analysis of the subsurface investigation and geotechnical investigation and by performing an alternative analysis with appropriate researched criteria and necessary volume and cost calculations, the optimal method for subgrade remediation can be determined to support the new expansion.

Accelerate Memphis: Project Delivery Research

Daniel Wade , Jacob Borden & Holly Hoffman
Mentor: Stephanie Ivey, Civil Engineering

The Accelerate Memphis initiative introduced the Construction Manager at Risk (CMAR) method across 37

projects, enabling a significant shift from the traditional Design-Bid-Build (DBB) process. CMAR is widely recognized for improving cost control, communication, and project adaptability. Given CMAR's novelty in Memphis, though, there is debate over the efficacy of the design process and a significant gap in the research comparing it to DBB.

This case study conducts a comparative analysis of CMAR versus DBB using data for the 37 CMAR projects in Memphis. The CMAR dataset—together with baseline data representative of multiple DBB projects—will be used to quantitatively evaluate the effects on cost increases, schedule overruns, and the number of change orders incurred. A survey is also being developed to assess the qualitative impacts of both methods with industry stakeholders. Questions will gauge project success, ease of design or constructability, and advantages or disadvantages of each method; open-ended questions will also be used to identify other performance measures that cannot easily be quantified.

To increase the efficiency of this and future evaluations, AI software will be utilized to condense the vast amounts of data available for these projects, respecting all privacy or security limitations. The objective is to establish a precedent for expedited data retrieval from traditional construction documentation that leverages AI systems, which are rapidly improving.

Systematic Categorization of Educational Technologies to support AI-Assisted Selection for Adoption in Engineering Classroom

Ellie Gevers & Ariadna Mendoza
Mentors: Pegah Farshadmanesh, Civil Engineering
Kathryn Bridson, Computer Science

Selecting effective educational technologies remains a challenge in engineering education. This project, supported by a University of Memphis Faculty Research Grant, develops an AI-assisted decision tool to help educators identify and prioritize EdTech options that best support learning outcomes. Using affordance-based categorization and data on cost, scalability, and instructional alignment, the model connects technology features to outcomes like problem-solving skills defined by ABET. The goal is a flexible, data-driven framework that guides more informed, outcome-focused adoption of emerging technologies.

RANS Simulations for a Laboratory Scale Wind Array

Bryan Mendoza, Jayce Fiene & Brandon Burnett
Mentor: Daniel Foti Mechanical Engineering

Testing unmanned aerial vehicles (UAVs) in unpredictable environments poses significant safety risks due to a lack of environmental control. This study presents Reynolds-Averaged Navier-Stokes (RANS) simulations conducted to analyze and optimize the aerodynamic performance of a novel 5x5 laboratory-scale fan array designed to replicate dynamic windwall behavior. The objective is to evaluate how different propeller arrangements influence thrust generation, flow uniformity, wake interaction, and turbulence within a controlled environment. Multiple geometric and operational configurations were modeled using steady-state RANS with experimental-scale parameters to ensure dynamic similarity with full-scale applications. The results provide a computational foundation for optimizing windwall designs, offering crucial insights into improving the aerodynamic fidelity of small-scale wind testing environments.

Efficient Fan Design Using Propellers for Fan Array Wind Tunnels

Natania Middleton, Jaretzy Nicolas & Cherno Keita
Mentor: Daniel Foti, Mechanical Engineering

This project is a design and experimental investigation aimed at maximizing the power efficiency of individual fan units or pixels that make up a fan array wind tunnel, on an open-concept wind tunnel solution that allows for testing of unmanned aerial vehicles (UAVs).Small individual fan pixels within the overall design are necessary for generating complex and dynamic wind profiles, gust, and shear flows. However, the fans are common computer server fans that are not energy efficient in off-design conditions. In this work, we will employ more efficient UAV motors and a variety of fan propeller designs to assess energy efficiency and thrust capabilities. Testing will utilize a fixed, custom-designed fan shroud with a force sensor to measure thrust and an anemometer to measure

wind speed in the fan-produced jet. We will test various propellor geometries with different blade counts, pitch, and solidity on a dedicated test stand. Performance metrics such as thrust, volumetric flow rate, and electrical power consumption are measured to identify a propeller that significantly improves the thrust-to-power ratio compared to the current fan.

LIBERAL AND FINE ARTS

Soul, Stage, and Self: Investigating the Role of the Arts in Community Health

Rachel Bonner
Mentor: Will Robertson, Anthropology

My research explores how cultural institutions contribute to individual and community well-being through music, theatre, and storytelling. As a first-generation Black queer woman and the only theatre major and South Memphis native in the 2025 Anthropolgy field school, I conducted field-based qualitative research at two culturally significant arts institutions: the Stax Museum of American Soul Music (Memphis, TN) and the San Pedro Playhouse (San Antonio, TX).

Drawing on over ten interviews, hundreds of field note observations, and exhibit engagement data, the findings reveal a consistent connection between artistic expression and mental/emotional health, particularly among marginalized communities. At Stax, music acted as both memory and medicine, where Black visitors expressed emotional healing through sound, youth gained cultural inheritance through soul music, and intergenerational ties were strengthened. At San Pedro Playhouse, interviews with cast, crew, and audiences showed how musical the-atre fosters identity development, gender/sexuality confidence, and safe spaces for expression.

Findings reveal that over 70% of participants described the arts as "healing" or "therapeutic," with community members highlighting music and theatre as tools for empowerment, belonging, and stress relief. This study affirms that arts institutions are not passive cultural archives—they are active agents of public health.

Flute Extended Techniques and Their Effects in Coleman's 'Danza de la Mariposa'

Mackenzie Saylors
Mentor: Elise Blatchford, Communication and Fine Arts

In Valerie Coleman's Danza de la Mariposa, the composer utilizes many extended techniques on flute to convey various emotions and effects. An extended technique is any non-traditional or unusual way to play something on an instrument. Extended techniques include flutter tonguing, singing while playing, and percussive sounds using the breath. With examples from the piece, each extended technique on the flute will be explained, shown visually, and performed on the flute. In exploring these techniques, the scenes and effects they create will be discussed, and how they work in the music as a whole. While these are sounds most are not used to hearing in classical music, they are more and more a part of instrumental music repertoire. Finally, the piece will be performed in its entirety, where the audience can hear, identify, and contextually understand each extended technique in Danza de la Mar-iposa.

A Tale of Secrets and Shadows: Spies, Codes, and Deception in World War II

Cate VanNostrand
Mentor: Yaowen Dong, History

This research project explores the critical role of Allied spies during World War II in shaping the outcome of the European and Pacific conflicts. Drawing on a range of primary sources including declassified intelligence documents, personal letters, and wartime reports, my research examines how covert operations conducted by agents from Britain, the United States, France, and occupied Europe disrupted Axis strategies and facilitated the success of major military campaigns. The study highlights the diversity of espionage efforts, from codebreaking at Bletch-ley Park to resistance movements in Nazi-occupied territories. By analyzing both well-known and lesser-studied figures, my project reveals how espionage served not only as a military tool but also as a form of moral resistance that underscored the global struggle for freedom.

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The Art and Science of Ancient Egyptian Ornament Reconstruction

Mauriz Mendizabel
Mentor: Marika Snider, Architecture

This interdisciplinary research endeavor focuses on the digital reconstruction and color restoration of ancient Egyptian ornament, specifically targeting the columns of the Hypostyle Hall of the Great Temple of Karnak. Representing a fascinating intersection of history, art, and digital technology, this work sought to restore the visual richness and cultural significance of these ancient structures. The methodology aligns directly with the principles of digital epigraphy, utilizing professional applications like Procreate and Photoshop for meticulous, high-resolution illustration and subsequent vectorization. This specialized digital workflow ensured the accuracy and scalability of the detailed line work and the systematic restoration of the lost polychromy, informed by an in-depth investigation into color theory and the cultural context of color in ancient Egypt. Furthermore, to address the core challenge of poor preservation on ancient surfaces, the project explored the innovative application of artificial intelligence (AI) to accurately infer and complete damaged or missing ornamental details. This comprehensive process establishes a versatile and accurate digital approach for reviving the complex visual language of ancient Egyptian art and architecture.

'The Untold History of Southwest Memphis'

Wesley Gifford
Mentors: Anthony Lauricella, Anthropology
Amanda Gaggioli, History

From a Mississippian chiefdom to a segregated state park, the history of 'Chucalissa' and Southwest Memphis tie together a millennium of the American past in a way seldom seen throughout historiography. I have spent the last nine months researching and filming at 'Chucalissa' with the ultimate goal of creating a comprehensive documentary that highlights the often overlooked impact the area has had on the development of Memphis and our country as a whole. As a filmmaker and a historian my career goal is to shed light on the past to help make the future a better place, and I am thankful to the Mellon Grant for supporting that vision.

My initial focus was on Mississippians and the discovery of our ancient abandoned town by a local CCC troop in 1936, but it rapidly became broader in scope to include the likes of Hernando Desoto, and the intricate histories of the Chickasaw and Choctaw peoples. It became even broader still with the incorporation of the neighboring railyards that gave Boxtown its namesake, alongside the sad legacy of slavery and convict labor, from the Ensley Plantation that T.O. Fuller was built on, to the segregated CCC troop and convict laborers that participated in the first excavations at 'Chucalissa'. The presentation will focus on my filmmaking and research processes while I share screenshots from the almost two terabytes of cinema quality footage I shot so far, along with a detailed explanation of my findings and the final goals I have for the documentary.

Tennessee Historical Seismicity Map

Maxwell O'Hearn
Mentor: Kent Moran, Center for Earthquake Research and Information (CERI)

Currently all the other states affected by the New Madrid Earthquakes from 1811-1812 have produced maps of their historical seismicity except for Tennessee. Dr. Moran and myself have been working on a map of historic earthquakes in the state of Tennessee as remedy for this situation. Ours is unique in that other states' maps were made by geologists; whereas, this effort is being primarily lead by historians. So ours will be more accurate. Alongside catching up to our neighboring states, the map will be able to be sold to politicians, schools, and insurance companies. Understanding the distribution and characteristics of past earthquakes is crucial for assessing long-term seismic risk in the region. We started by digitizing a compilation of historical earthquakes in and around Tennessee that was published in the late 1970s. It has data from the TVA, Richard Stearns, and Otto Nuttli. After that, we have been looking into many individual earthquakes to see whether their reports are accurate or not. We already have a prototype map, we just need to do more research into individual earthquake events for complete accuracy and transparency. We should have the map finished before summer of 2026.

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LIFE AND HEALTH SCIENCES

Sensing Aggression in Drosophila melanogaster

Hong Vo
Mentor: Philip Kohlmeier, Biology

Aggression is a natural social behavior that motivates animals to compete for necessary resources such as food, territory, and mates. In Drosophila melanogaster, the mechanisms that regulate the expression of aggression have been intensively studied, while how aggression is sensed by the receiver remains unclear. In this study, we aim to determine how aggression is perceived through individual sensory modalities and how it influences social learning behaviors such as mate copying. These aggressive females were deemed as "demonstrators" and left with a non-aggressive "observer" female. We observed how the observer flies responded to the aggressive demonstrators during a mate choice experiment. In mate copying, observer flies imitate the mating choices of the demonstrator fly; however, we found that when a demonstrator displays aggressive behavior, observations revealed that mate copying was suppressed in observers. This suggests that flies sense aggression through sensory pathways rather than olfactory senses. To determine how aggression is exposed to flies, we have begun to use observers with mutants that cause deficits to specific sensory modalities in pairing with mate choice copying assays. This study helps us better understand how Drosophila melanogaster perceives and displays aggression, providing more insight into sensory modalities and behavioral processes that shape social interactions.

Investigating the Antimicrobial Properties of Violacein From Janthinobacterium

Helen Tran
Mentor: Rachel Diner, Biology

Janthinobacterium spp. are a genus of bacteria commonly found in soil or freshwater ecological systems. They exhibit various survivability traits through the formation of bio-films or the production of a purple pigment that possesses antimicrobial and antiviral properties called "violacein". Three strains of Janthinobacterium, isolated from freshwater clams, were co-cultured with clam-derived bacterial isolates to observe microbial competition. Antibiotic susceptibility was initially tested to check the validity of their assay performance, for which zones of inhibition were observed on all plates. All observations were grown on Luria-Bertani Agar, and the antimicrobial activity was evaluated using lawn and spot assays. The co-cultured strains showed no zones of inhibition and were initially devoid of violacein. However, prominent violacein rings formed a week post-incubation, suggesting secondary metabolite production that could have been regulated by quorum sensing or exploitative competition. Moving forward, our research with these strains aims to investigate violacein's antimicrobial activities against human pathogens such as E. coli, S. aureus, and P. aeruginosa.

Investigating antibiotic resistance in possible pathogenic bacteria from oysters gathered in the Gulf of Mexico

Jamie Champasouk
Mentor: Rachel Diner, Biology

Humans commonly enjoy oysters. However, consumption of raw oysters has proven a risk to human health, causing infections from different Vibrio strains: V. cholera, V. par-ahaemolyticus, and V. vulnificus while also leading to a mortality rate of 33%. With Louisiana harvesting one third of America's oyster supply, investigating if bacteria isolated from oysters gathered in the Gulf of Mexico are antibiotic resistant towards common antibiotics like ampicillin, chloramphenicol, and gentamicin, and those especially used to treat Vibrio pathogens like tetracycline and eryth-romycin, will help further understand the influence between antibiotics and marine pathogens. For this research, three oysters were collected at each of the following sites: Pump House, Channel, and Houma by the Louisiana Universities Marine Consortium (LUMCON). Gill and gut tissues were dissected, and 105 bacterial isolates were plated on Marine agar libraries. We will initiate further testing for antibiotic resistance using the Kirby Bauer test.

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Impacts of Urban Redlining on Male Fertility and Female Mate Choice in Drosophila Melan-ogaster

Ashley Yancey
Mentor: Philip Kohlmeier, Biology

Environmental stressors such as heat, pollution, and habitat quality can strongly influence reproductive success and sexual selection. This study examines the effects of urban redlining on mate choice and fertility in Drosophila mela-nogaster. Virgin lab-grown females were presented with males collected from historically redlined (low-income) and greenlined (high-income) districts to assess differences in attractiveness and reproductive output. Preliminary results suggest that field-collected males from greenlined areas are significantly more fertile and larger, producing an average of 79 offspring compared to 51 from redlined males. Whereas for field collected redlined males, the infertility rates were higher (44%) than in greenlined males (32%). suggesting that environmental stress severely impacts male reproductive fitness. In contrast, when both groups were cultivated under identical laboratory conditions, these differences gradually discontinued, indicating that reduced fertility of redlined males is environmentally driven rather than genetic. As for the early mate-choice assay, there was a trend toward female preference for green-lined males, where attractiveness and fertility decline under stressful urban conditions. This research highlights how socio-environmental inequality can translate into biological effects, influencing reproductive success, mate choice, and overall fitness in urban populations.

Investigating Glyphosate Tolerance and Degradation Potential in Clam-Associated Microbes

Savanna Eggenberger

Mentor: Rachel Diner, Biology

Glyphosate (GLY) is the active ingredient in Roundup, a broad-spectrum herbicide widely used in agriculture and landscaping. While not considered a risk to humans when used as directed, GLY can negatively impact aquatic life and beneficial microorganisms even at low exposure levels. Discovering novel microbial taxa and metabolic pathways involved in GLY degradation will deepen understanding of microbial functional diversity and enhance potential for bioremediation. In previous work, we demonstrated that the microbiome of Corbicula fluminea, a nonnative bivalve from Nonconnah Creek, was largely unchanged when exposed to environmentally relevant GLY levels, leading to the hypothesis that clam-associated microbes may be tolerant to the herbicide. To test this, we collected 110 bacterial isolates from C. flu and plated them on GLY-enriched Luria-Bertani agar at 100, 200, 400, 800, and 1600 mg/L concentrations. Of these, 10 isolates grew at 1600 mg/L, indicating high GLY tolerance and potential degradation ability. These were incubated for 7 days in Mineral Salt Medium containing 400 mg/L GLY as the sole phosphorus source, with optical density (600 nm) measured every 24 hours. Of the 10 isolates, 8 showed significant growth, demonstrating their ability to utilize GLY as a phosphorus source. Ongoing research aims to characterize these isolates using 16S Sanger sequencing, determine their prevalence in tissue-specific clam microbiomes, and assess their GLY degradation capacity.

Examining the role of MAP3K4 and HDAC6 on fetal and placental growth in the 129/SvEv background

Keilan Roseheart
Mentor: Amy Abell, Life sciences

Fetal growth restriction (FGR) affects up to 10% of human pregnancies worldwide. FGR is a risk factor for multiple disease states in adulthood, including cardiovascular disease and diabetes. Placental dysfunction is one of the principal causes of FGR. Recently, our lab demonstrated that an enzyme called mitogen-activated protein kinase kinase kinase 4 (MAP3K4) has a critical role in embryonic and placental growth in mice. MAP3K4 kinase inactive mice (Map3k4KI/KI) also have reduced survival at weaning age, representing 6% of the total population. The few Map3k4KI/K mice that survived were significantly smaller than wild-type mice, a hallmark of FGR. We also demonstrated that the enzyme histone deacetylase 6 (HDAC6) is hyperactive and overexpressed in Map3k4KI/KI trophoblast stem cells that differentiate into the major cell types of the placenta. However, a role for HDAC6 in normal placental development is unknown.

The goal of this project was to test the hypothesis that

hyperactive HDAC6 has a role in the lethality and growth restriction phenotype of Map3k4KI/KI mice. To test this hypothesis, we genetically deleted Hdac6 from Map3k4KI/KI mice through a breeding strategy with a commercially available Hdac6 knockout strain from Jackson Laboratory. Our results suggest that deletion of Hdac6 improved midgestational growth of Map3k4KI/KI embryos and placentas. Collectively, our findings demonstrate a previously unidentified role for HDAC6 in embryonic and placental growth in mice.

Investigating tRNS-Induced Activity in the Mouse Visual Cortex

Blake Robinson
Mentor: Chen Chinfei, Neurobiology

Transcranial random noise stimulation (tRNS) is an emerging non-invasive brain stimulation technique that can enhance sensory processing and promote neural plasticity. Pairing tRNS with visual training can improve motion perception at the edge of blind spots in patients with strokes in the visual cortex. Despite these promising outcomes, the mechanisms underlying tRNS and its impact on plasticity remain unknown. We developed a mouse model to investigate how tRNS influences cortical activity. To assess neuronal populations activated in response to tRNS, we delivered stimulation over the visual cortex at varying intensities. Because tRNS is proposed to modulate excitability rather than directly activate neurons, we included a sham condition to isolate its effects. Following stimulation, brain sections were stained for c-Fos and NeuN. ImageJ analysis revealed that tRNS significantly increased c-Fos expression in both 25 μA and 250 μA groups compared to sham, indicating enhanced neuronal activity. NeuN staining showed no significant differences in cell counts, demonstrating elevated excitability without neuronal loss. Future work will identify optimal tRNS conditions and combine visual stimuli with stimulation to evaluate plasticity over multiple sessions. This work establishes a mouse model for studying tRNS and provides initial evidence that stimulation enhances cortical activity without cell loss, forming a foundation for future mechanistic and therapeutic studies.

Prevention of Skin Breakdown on ICU Patients

Amiya Taylor-Hill
Mentor: Kristin Geater, Nursing

Pressure injuries and skin break down are a huge concern for intensive care patients. This is because of factors such as immobility and the use of medical equipment which also can lead to skin break down. This project will explore evidence-based strategies that can possibly prevent pressure injuries. The goal is to identify effective interventions that not only reduce the likeliness skin breakdown, but complications as a whole.

PHYSICAL AND APPLIED SCIENCES

SPEED - Sustainable Polymers Enabled by Emerging Data analytics

Isaac Perriguey
Mentors: Tomoko Fujiwara, Chemistry
QianyinCheng, Chemistry

The SPEED Project applies machine learning to polymeric biomaterials by building a lab-to-database pipeline for degradable polymers. A standard melt-polymerization pathway suitable for both PLA and PLGA was utilized. In Spring 2025, work focused on LA PLA: glove-box handling, Me-DEG/$Sn(Oct)_2$ initiation in an aluminum block (80130 °C, 24 h), as well as qualitative and quantitative analysis by scraping the solid puck and running ^1H NMR in chloroform-D; when residual monomer was observed, a follow-on 145 °C overnight step was used. In Summer 2025, the same pathway was extended to PLGA copolymers. In parallel, literature and in-house measurements (feed ratios, molecular weights, thermal points, mass-loss) were curated into a simple excel proto-database. Near-term work will adopt a new annotation software to improve extraction, categorization, and experiment-level tagging, feeding an AI/LLM-ready polymer database. The end goal is a traceable dataset to train models that predict degrad-ability and guide synthesis.

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Investigation of the Lewis Basicity of Small Organics Interacting with Uranium Hexafluoride

Gianna DeLisio
Mentor: William Alexander, Chemistry

Utilizing computational chemistry, we seek to expand knowledge of how organic functional groups interact with uranium hexafluoride (UF6). This fundamental information can help researchers potentially develop ideas of how to use the surplus of seven hundred thousand tons of UF6 waste from uranium enrichment that exists in the United States. Different functional groups were screened to determine what led to the greatest disruption in UF6 octahedral geometry. Functional groups that contained only nitrogen heteroatoms compared to groups with nitrogen and oxygen heteroatoms, and groups with oxygen heteroatoms, had higher intermolecular binding energies (IBE) with UF6. Ultimately, the octahedral geometry of UF6 had a preference towards bonding with nitrogen, rather than oxygen lone pairs. As a functional group led to a larger angular deviation in the geometric structure of UF6, the IBE value between uranium hexafluoride and the functional group increased. Further, as IBE increased, the bond strength between the functional group and uranium hexafluoride increased. An interesting observation in initial studies was that the IBE values for adducts with UF6 could be correlated with the "BF3 affinity scale", widely used as a proxy for the Lewis basicity of organic functional groups. Our work here continues to probe these ideas of Lewis basicity in UF6 adducts to further our understanding of potential UF6 chemistry.

Quantification of Microplastic Release in Campus Bottled Water Under Simulated Daily Use

Grayson Kendell & Hafsa Khan
Mentor: William Alexander, Chemistry

Microplastics (MPs) appear in human hearts, lungs, and even brain tissue, but we do not yet know how they get there. As college students leave bottled water in hot cars, set them in sunlight, and repeatedly twist caps, we hypothesized that these everyday conditions may significantly increase MP release into drinking water. This study quantified MP release from three water brands sold on the University of Memphis campus, each with varying compositions, wall thicknesses, and structural designs. Water bottles were subjected to heat, UV light, and mechanical stress treatments simulating typical daily use. MPs were tagged with ethanolic Nile Red dye and vacuum filtered through a 1-µm filter. These filters were then analyzed using a Nikon A1 confocal fluorescence microscope. Preliminary results indicate substantial variability in MP concentrations across treatments and suggest that routine handling multiplies particle release. This work identifies bottled water as a significant and previously overlooked source of microplastic exposure that can be mitigated through informed storage, handling, and consumer choices.

SOCIAL AND BEHAVIORAL SCIENCES

The Evolution Of Ink

Cyrsten Vann
Mentor: Pejman Javanmardi, English

In today's union, tattoos have altered from stigmatized markings into influential symbols of originality and cultural expression. This project analyzes how stars and influ-encers shape global tattoo culture by turning private ink into crazy visible trends across social media platforms like TikTok and Instagram. Tattoos are majorly seen not only as personal statements but also as considerations of societal weights, anxieties, and aesthetics. By exploring the crossing of celebrity influence, digital media, and cultural perception, this study highlights the ways in which tattoos operate as both a subjective art form and a social phenomenon. Eventually, the project underscores how self expression through tattoos mirrors larger conversations about authenticity, creativity, and conformity in modern society.

Framing the Market: Cognitive and Linguistic Mechanisms of Misinformation in Financial Decision-Making

Joshua Hackney
Mentor: Leah Windsor, Institute of Intelligent Systems & English

The rapid diffusion of information through digital and social media platforms has made financial markets increasingly vulnerable to misinformation and disinfor-

mation. Recent events—such as viral false reports that triggered abrupt stock swings and AI-generated content designed to manipulate investor sentiment—underscore the urgent need to understand how language itself drives economic behavior. While prior research has emphasized economic and behavioral responses to false information, less attention has been given to the linguistic features that enable misinformation to spread and persuade. This study investigates how the language of misinformation— its framing, emotional tone, and rhetorical strategies— shapes investor sentiment and stock market outcomes. Drawing on methods from computational linguistics and natural language processing, the project will analyze textual data from financial news, press releases, and social media events associated with abrupt market fluctuations. By linking linguistic patterns to short-term volatility and long-term valuation effects, this research seeks to uncover how narratives, rather than facts alone, influence financial decision-making. Conducted within the Language Across Cultures Lab at the University of Memphis, the project contributes to urgent interdisciplinary conversations about economic stability, information integrity, and the governance of emerging technologies in global markets.

Sourcing Ancient Stone Tools from Parsons, TN

Jacob Brown
Mentor: Ryan Parish, Earth Sciences

The current study examines the source of prehistoric stone artifacts to determine if past humans utilized local rock resources at the archeological sites located on the Townsend property. The Townsend property has several prehistoric sites which provide evidence that this area was used and occupied for millennia. The Townsend property would likely have been an appealing landscape due to its location near the Tennessee River and the abundance of natural resources including duck/wild game and chert, a rock similar to flint used to make stone tools. Reflectance spectroscopy is the method used to source the chert artifacts, and the results show that past humans were predominantly using local chert resources. The study provides insight into past human behavior and how ancient humans were using the resources in this area.

Does the Use of Jargon Affect Perceptions of Psychotherapists?

Kaitlyn Sjoblom
Mentor:Jeffrey Berman, Psychology

It is widely assumed that the use of jargon in psychotherapy can lead to confusion, reduced connection, and poor perceptions of psychotherapists. There has been little to no empirical research on this topic. Existing studies are primarily correlational, lacking the controlled experimental manipulation to establish causal effects. This highlights the fact that experimental research is necessary. Prior cor-relational studies indicate that clients' reactions and preferences toward psychotherapist language use are inconsistent. The purpose of this study is to provide concrete evidence on the effects of jargon on perceptions of psychotherapists in clinical practice. In this study, participants are randomly assigned to listen to short audio clips from two therapists. One psychotherapist employs technical or clinical jargon, while the other explains concepts in plain language. Then, participants will rate the psychotherapists on empathy, therapeutic alliance, and credibility/expec-tancy. A two-way analysis of variance will be conducted using repeated measures for jargon and a between-subjects factor for therapist sex. The results of the analysis will allow the exploration of perceptions of psychotherapists based on the use of jargon. If there is a statistically significant difference in the ratings of psychotherapists, the results could provide more evidence-based and accurate guidance and recommendations for psychotherapists regarding jargon, as well as increased patient success.

Perceptions of Artificial Intelligence and Human Therapists

Jasmine Blake
Mentor: Jeffrey Berman, Psychology

As artificial intelligence (AI) advances, its integration into mental healthcare offers new possibilities. Digital therapists like Woebot and Wysa have shown effectiveness in reducing anxiety and depression, yet skepticism remains about AI's ability to provide human-like empathy and authenticity. Research indicates that people often perceive human therapists as warmer and more trustworthy, but little is known about how audio-based AI shapes these perceptions. This study examined whether

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perceived therapist identity (AI/human) influenced participants' ratings of empathy, credibility, and expected treatment outcomes. Participants listened to therapist audio clips labeled as AI or human and completed validated measures. Results showed that participants distinguished clearly between AI and human therapists, rating human therapists significantly higher in empathy, credibility, and treatment expectations. The only factor affecting this difference was prior therapy experience when therapist sex was also considered. These findings suggest that believing a therapist is human enhances perceived therapeutic quality, revealing ongoing challenges for AI acceptance in psychotherapy.

Sex-Dependent Effects of Psychotomimetic and Antipsychotic Drugs on Risky Decision-Making

Julia Whitehead
Mentor: Nicholas Simon, Psychology

Schizophrenia is a chronic and debilitating illness that produces widespread disruption of mental functioning and decision-making. We aimed to disentangle the contributions of a psychosis-like state and antipsychotic drug exposure on risky decision-making. Rats were trained in the Risky Decision-making Task, which presents a choice between small, safe rewards and large rewards accompanied by a probabilistic risk of mild footshock. To induce a psychosis-like state and examine potential decision-making effects of schizophrenia, we tested the acute effects of two mechanistically distinct psychotomimetic drugs: The NMDA antagonist, MK-801, increased risk-taking behavior selectively in males, and the 5-HT2A agonist, DOI, decreased risk-taking behavior in males. We also assessed the effects of the atypical antipsychotic risperidone on risky decision-making and found sex- and dose-dependent decreases in risk-taking. Finally, we are examining the effects of joint antipsychotic and psychotomimetic administration on risky choice. Preliminary data suggests that joint treatment evokes increased risk-aversion without impacting punishment sensitivity. Collectively, these data suggest that risky decision-making is impacted in sex-specific fashion by both psychotomimetic and antipsychotic drugs, which has important implications for managing aberrant decision-making and risk processing in schizophrenia.

Fostering Belonging: Exploring the Link Between Teacher Cultural Humility and Student Well-Being

Sophia Gonzales
Mentors: Emily Srisarajivakul, School Psychology
Rane Ankney, Psychology

In a growing multiethnic society, school belonging is paramount to school climate, academic achievement, and mental health. Students who feel higher levels of belongingness tend to adopt healthier patterns and motivation towards academic achievement (Anderman & Freeman, 2004). Extant research explores how minoritized students whose identities are not affirmed tend to have higher rates of mental health issues (Skiba, 2011). This rising trend negatively impacts student perceptions of belongingness and provides unwanted space for children to experience cultural concealment and disconnection from peers (Reginal, 2021). Cultural humility, describing a teacher's ability to connect with students from diverse backgrounds in unassuming and unoppressive ways (Owen et al., 2011), could be one way to foster school belonging. Using correlational analyses on data from n = 215 racially minoritized adolescents, this study explores the relationships among teacher cultural humility, school belongingness and subjective well-being. Implications include diminishing ethnocentrism in school environments and improving well-being outcomes.

When Examined Among Subgroups of Participants Who Experienced Their Worst Trauma, which Categories Show the Highest Average PTSD Severity Within These Groups?

Sang Nguyen
Mentor: Meghan McDevitt-Murphy, Psychology

Posttraumatic stress disorder (PTSD) is characterized by re-experiencing, avoidance, and hyperarousal symptom clusters as evaluated by the DSM-5, is related to negative health outcomes such as functional impairment and co-morbid psychiatric disorders (Kessler et al., 2017; Lee & Park, 2018). Although most people experience at least one trauma in their lifetime, not all traumas carry equal PTSD risk; interpersonal traumas disproportionately account for PTSD (Kessler et al., 2017; Briere et al., 2016). Research

further suggests that PTSD risk may depend on the developmental timing of trauma exposure, with earlier trauma generally linked to greater symptom severity (Dunn et al., 2017; Ogle et al., 2013), though findings remain inconsistent. Few studies have examined whether the trauma that individuals consider their "worst" event is differentially associated with PTSD symptoms across age groups.
The present study seeks to address this gap in the literature by examining whether PTSD symptom severity differs by trauma category and whether these associations vary by age of exposure to their worst traumatic event, ranging from early childhood to adulthood. Participants were undergraduate students (N = 832, 77.1% female, Mage = 20.59, SDage = 4.60, 45.4% White, 41.8% Black) who completed an online assessment battery. Participants' worst traumatic event category was collected using the Life Events Checklist, and PTSD symptoms were assessed using the PTSD Checklist for DSM-5.

Individual and Community-level Factors Associated with Favorable Attitudes towards Crime among College Students

Mia Chambers
Mentor: Kathryn Howell, Psychology

Minimal research on the Code of the Street (COS), an informal code characterized by favorable attitudes toward crime, assesses COS factors among college students. Individual-level factors (community violence exposure (CVE) and weapon ownership) have been linked to COS beliefs. Community-level factors (community cohesion and disorder) are also pertinent in understanding COS beliefs as community disinvestment has been linked to crime. The current study investigated individual and community-level factors that may be associated with favorable attitudes of crime, measured by COS. Participants (N=744; Mage=21.48, SD=4.14; White=56.0%; Female=80.5%) were recruited from two mid-sized, Midsouth universities. A hierarchical linear regression was conducted to examine hypothesized associations. Block 1 consisted of individual factors while Block 2 added community factors. The final regression model was significant (F(5, 738)=14.02, p <.001, R2=.09). More CVE (β=0.03, p <.001), owning a weapon (β=1.07, p=.033), site (β=1.00, p=.003), and less community cohesion (β= -0.11, p=.046) were associated with higher COS endorsement. Notably, Block 2 produced a significant change (R2 change=.02, Sig. F change =.002). Findings show the importance of multidimensional research when assessing contributing factors to COS attitudes. Bolstering strengths, such as community cohesion, may reduce favorable attitudes toward crime and deleterious outcomes amidst exposure to violence, community deprivation.

Sex-specific Effects of Antipsychotic Drugs on Risky Decision-Making

Ella Dina
Mentor: Nicholas Simon, Psychology

Schizophrenia is a debilitating mental illness with a wide range of cognitive and motivational symptoms, included impaired cost/benefit decision-making. Patients show dysregulated responses to risk and consequences. However, it is unclear if this altered risk taking is a function of the disease itself or the sustained exposure to drug treatment. To determine if antipsychotic medications independently impact risky decision-making, I tested the effects of daily risperidone administration on the rat risky decision-making task (RDT). In RDT, rats choose between a safe, low- reward lever and a high-reward lever with increasing risk of mild shock. Risky decision making was unaffected by daily risperidone exposure in male rats but was starkly reduced in females. Risperidone had no effect on a shock threshold test in males or females, indicating that risperidone's effects on risk-taking were not regulated by physical sensitivity to punishment. Next, I used the progressive ratio task to determine whether reduced risk taking was linked to reduced reward motivation. Data indicated that risperidone reduced willingness to expend effort for reinforcement in both males and females, suggesting that risperidone's effects on risk-taking may be related to reduced reward motivation. Collectively, these data highlight critical sex differences in sensitivity to antipsychotic drugs and have important implications for both drug and behavioral interventions in the treatment of schizophrenia.

Abstracts

The role of ventral pallidum in decision-making with delayed and immediate punishment

Eshan Bhagat
Mentor: Nicholas Simon, Psychology

Effective decision-making requires weighing the rewards and punishments associated with each choice. Critically, these outcomes lose value when they are temporally dis-tant—a phenomenon known as delay discounting. Delay discounting contributes to maladaptive behaviors such as drug abuse, excessive drinking, and overspending on credit cards, where immediate gratification outweighs long-term consequences. To model this in rodents, rats were trained to choose between two levers: one delivering a small sugar pellet without punishment and another providing three pellets paired with a mild shock. While rewards were delivered immediately, the shock was progressively delayed across trials. This design tested whether rats discount delayed punishment similarly to humans, reflected by increased selection of the punished option as shock delay increased. My primary experiment examined the role of the ventral pallidum (VP)—a hub in both reward and punishment circuitry—in this task. When VP activity was suppressed using a GABA receptor agonist, rats were less likely to choose the larger punished reward under both immediate and delayed conditions, indicating VP involvement in enduring costs for greater reward. Furthermore, preliminary chemogenetic inhibition of orbitofrontal cortex projections to VP induced erratic, inflexible decision patterns, suggesting this circuit supports adaptive cost–benefit decision-making and may underlie dysfunction in disorders of impaired self-control.

A Comparative Analysis of Monetary Policies for Reducing Food Insecurity in Memphis

Anita Sadat
Mentor: Brooke Shannon, Political Science

Almost 50 million Americans are food insecure, even while millions of pounds of food are wasted by businesses every year. The food insecurity rate in Shelby County is 15.9%, which is higher than the national average (12.2%). Children, elderly, and low-income families are preferentially affected. While several governmental and community-based policies can impact food insecurity rates, not all policy solutions are equally practical or effective for every locale. This thesis will primarily be a comparative analysis of policy solutions for food insecurity in the United States. First, I will assess what policies to reduce food insecurity currently operate within Memphis and Shelby County (MSC), and whether their impact has been measured. Second, I will compare a range of policy solutions that have been implemented nationwide, including tax incentives for food donation, SNAP program expansion, free grocery stores, and school meal programs, in three dimensions: cost, how effective they were in reducing food insecurity, and compatibility with our politico-economic climate. I hypothesize that providing tax incentives for food businesses to engage in regular donation will be most feasible and effective in MSC. Preliminary findings will be presented. After concluding what policy solution is best suited for MSC, future work will focus on effective ways to strengthen collaborations among organizations, food businesses, and government to create a sustainable food donation system.

Chemical Mate Choice Copying in Drosophila Melanogaster – A Naturally Occurring Behavior?

Daja Key
Mentor: Philip Kohlmeier, Biology

Mate choice copying is a reproductive strategy that female Drosophila melanogaster utilize in order to guide their choice in a mating partner. This tactic reduces the costs associated with mating and assessing mates. Most research has focused solely on visual cues related to mate choice copying.Recent laboratory experiments have demonstrated that Drosophila melanogaster can engage in chemical mate choice copying, which is when they display preferences for males previously selected by other females based on chemical pheromones. These experiments were performed under extremely artificial conditions and raises questions on if this would occur in their natural environment. This project investigates whether chemical mate choice copying occurs under conditions that better mimic Drosophila melanogaster's natural environments. Using field-collected males and semi-natural cages containing food sources, observer females will be given the opportunity to choose between a male previously mated with a demonstrator female and an alternative male.

Abstracts

This study aims to determine whether female Drosophila melanogaster copy mate choices in natural settings. Findings will provide insight on the significance of mate choice copying and determine whether it occur naturally.

Drosophila Melanogaster Diet Comparison

Erenne Coats
Mentor: Philip Kohlmeier Biology

Diet and temperature have a significant impact on an organism's lifespan and overall health. This study examines the relationship between environmental temperature and diet composition and how it affects Drosophila melano-gaster health. Low (18°C) and optimal (30°C) temperatures will be used to maintain the flies on either a standard diet or a high-fat, high-sugar (HFHS) diet. Measures of general health and vitality will include lifespan, reproductive output, and activity level. In comparison to flies kept on a regular diet at either temperature, it is anticipated that flies exposed to both high temperatures and the HFHS diet will have shorter lifespans and reproductive success. The purpose of this study is to shed light on the combined effects of thermal stress and nutritional imbalance on Drosophila survival and metabolic health.

Aggression Influences Social Behaviors and Information Transfer in Drosophila Melanogaster

Emily Willis
Mentor: Philip Kohlmeier, Biology

Aggression is a fundamental social behavior influencing dominance , mating success and group interactions across species . The molecular and genetic mechanisms regulating the expression of aggression have been intensively studied in Drosophila melanogaster, while its broader organismal and social consequences remain less understood. In this study, we examined whether aggression occurs outside artificial lab settings and how it impacts information transfer through social networks. We first collected both lab and field caught D. melanogaster and compared their aggression levels using controlled behavioral assays recording the number of headbutts within a ten-minute period.

Here we see a clear difference in flies exposed to isolation conditions and social conditions. We then studied the effects of aggression on mate choice copying. Female flies utilize social information during mate choice by selecting males that were previously selected by other females. Our findings indicate that aggression significantly disrupts mate choice copying. When the mated demonstrator fly displays aggression, observer females fail to copy her preference. This disruption appears to result from the aggressive behavior itself rather than olfactory cues, suggesting that behavioral context and dynamics strongly shapes social learning in Drosophila melanogaster. These results demonstrate that aggression, even in natural settings, can alter fundamental social behaviors and decision-making processes.

Drosophila Melanogaster Diet Comparison

Ashmita Nauhria

Mentor: Deranda Lester, Psychology

Social environments are thought to play a role in regulating anxiety. Mice are commonly used to test aspects of anxiety. When mice cling to the walls and corners of an apparatus, they are thought to be exhibiting anxiety-related behavior. More time spent in the center indicates reduced anxiety. This study will test whether this behavior changes under different social environments. Two types of social interactions, novel and familiar, will be tested, with a control group that receives no social interaction. EthoVision software will be used to track behavior and measure the amount of time that the mice spent in the center of the apparatus. I hypothesize that the mice in the control group (no social interaction) will spend the least amount of time in the center, then the novel social interaction group, then the familiar social interaction group, indicating that familiar social interaction reduces anxiety in mice.

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