2024 WORKS IN PROGRESS SYMPOSIUM

THE UNIVERSITY OF MEMPHIS | Helen Hardin Honors College

Monday, November 11th | Maxine A. Smith University Center

Welcome to the 2024 Works in Progress Symposium

The Honors College is proud to sponsor the 2024 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.

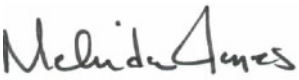
Thanks also to the faculty evaluators, who kindly provide feedback to the student presenters to better prepare their research projects for submission to professional conferences. We also thank our moderators for their assistance and support.

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 Heri Yusup, doctoral student in English who designed the Works in Progress Symposium 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 2024 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 Curry, Biomedical Engineering
Benjamin Graham, History
Carl Herickhoff, Biomedical Engineering
Charles Garner, Chemistry
Chrysanthe Preza, Electrical & Computer Engineering
Dama Cooley, Nursing
Daniel Foti, Mechanical Engineering
David Goodman, Communication & Film
Deranda Lester, Psychology
Eddie Jacobs, Electrical & Computer Engineering
Emily Puckett, Biological Sciences
Emily Srisarajivakul, Psychology
Farhad Jazaei, Civil Engineering
Jaime Sabel, Biological Sciences
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Rebecca Howard, Art History
Stephanie Ivey, Civil Engineering
Stephanie Huette, Psychology
Stephen Strain, Biomedical Engineering
Thomas Hagen, Mathematical Sciences
Timothy Brewster, Chemistry
Yuan Gao, Mechanical Engineering

Acknowledgments

Faculty Evaluators

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

Abena Asemanyi, Communication & Film
Abiodun Bello, CERI
Adedamola Aladese, Physics & Material Science
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Alexander Headley, Mechanical Engineering
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Amanda Savage, History
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Chidambaram Ramanathan, Health Sciences
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David Freeman, Biological Sciences
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Yang Zhou, Hospitality & Resort Management
Yongmei Wang, Chemistry
Yongsan Kwon, Earth Sciences
Zohreh Hafshejani, CERI

Session Moderators

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

Aaron David Bellamy, Education Abroad
Adriana Dunn, Art Museum
Amanada Rodino, Disability Resources
Angela Kuykendoll, UofM Global
Anastasia Vanderpool, Student Academic Success
Aniya Blair, Education Abroad
Asia Fench, College of Business & Economics
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If you have questions, contact us at ***quaesitum@memphis.edu***

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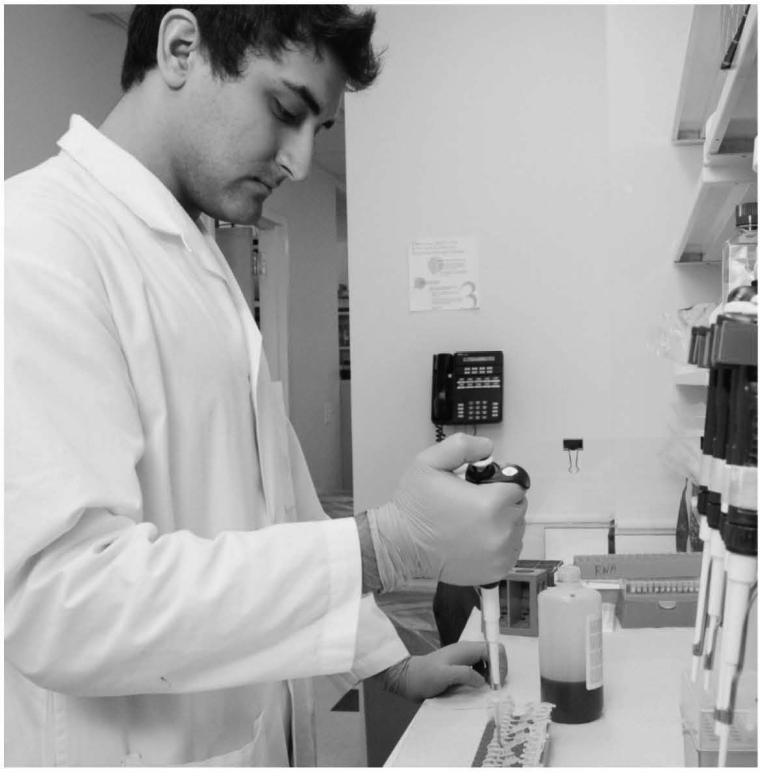

SPRING 2025

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THE UNIVERSITY OF MEMPHIS

Presentations (12:00 - 2:30)

	Memphis A 340A	Memphis B 308	Bluff 304
12:00	**Jason L. Martinez** Exploring The Impact of Atypical Antipsychotic and Psychotomimetic Drugs on Risky Decision-Making Mentor: Nicholas Simon, Psychology	**Blake Robinson** 3D Cell Culture Model Predicts Novel Drug Treatment for Recurrent High-Grade Meningioma Mentor: Manuel Ferreira, Neurological Surgery	**Aidan Espy & Jeffrey Rakestraw** Inspecting Root Influence on Microplastic Migration in Soil Mentor: Farhad Jazaei, Civil Engineering
12:30	**Elaine Mooney** Investigating Mental Simulation and Mental Imagery Using Sentence Picture Verification Mentors: Stephanie Huette & Rane Ankney, Psychology	**Osaretin Asemota** Chemical Mate Choice Copying in Drosophila Melanogaster Mentor: Philip Kohlmeier, Biological Sciences	**Nima Aflaki** Mechanistic Investigation of Substrate Docking in a Traceless Tether Catalyst Mentor: Timothy Brewster, Chemistry
1:00	**Tyras Watkins** Dopamine Functioning in Social versus Unsocial Mice Mentor: Deranda Lester, Psychology	**Regina Beach** Self-Employed Medical Professionals Mentor: John Rhodes, Admissions	**Madiha Syeda** Oxytocin Receptor Activation in the Nucleus Accumbens Differentially Mediates Phasic and Tonic Dopamine Release Mentors: Deranda Lester & Rebecca Crenshaw, Psychology
1:30	**Shaima Issa** Anxiety-Related Behaviors Induced by Social versus Drug Conditioned Place Preference Mentor: Deranda Lester, Psychology	**DaNesja James** Beetles on Ice: Understanding Cold Tolerance in Urban Enviroments Mentors: Leigh Boardman, Biological Sciences	**Malak Moustafa** The Effect of Coil Orientation on Transcranial Magnetic Simulation in the Dorsolateral Prefrontal Cortex Mentor: Amy Curry, Biomedical Engineering
2:00	**Sophia Gonzales** Racial Disproportionality in Schools Mentor: Emily Srisarajivakul, Psychology	**Majdal Issa** The Influence Cognitive Bias and Group Decision-Making Have on Socioscientific Issues Mentor: Jaime Sabel, Biological Sciences	**Elizabeth Matlock-Buchanan** Tosh Farms Sow Lameness Prevention Project: Using Biomedical Approaches in an Agricultural Setting for Intervention in Culling of Sows due to Lameness Mentor: Jessica Jennings, Biomedical Engineering

Presentations (12:00 - 2:30)

	Iris 338	Shelby 342	Conference Room 208
12:00	**Karma Rakow** Drag Performers and Identity the American North and South Mentor: Lindsey Feldman, Anthropology	**Tepher Ward** A Cable-Driven Parallel Robot for Flight Test Monitoring of Drones Mentor: Eddie Jacobs, Electrical & Computer Engineering	
12:30	**Don'Neka Hayslett** Seeing Life Through the Past: The Link Between Past and Present Through Ancient Art Mentor: Amanda Gaggioli, History	**Chinonso Okoli** Using Fairsim on Different Datasets Through ImageJ Mentor: Crysanthe Preza, Electrical & Computer Engineering	
1:00	**Tanya Prahalathan** Exploring Accoustic Wave Effects on Microbubble Patterning Mentor: Yuan Gao, Mechanical Engineering	**Gerrell Dabbs** Noise Analysis for Hyperspectral Unmixing Algorithmns Mentor: Crysanthe Preza, Electrical & Computer Engineering	**Cate VanNostrand** (on Zoom) Lady Locks: A Survey of Female Hair Adornment in the Ancient Mediterranean World Mentor: Benjamin Graham, History
1:30	**Joseph Perry** Chimaera; A Tethered UAV-UGV System for Agricultural Phenotyping Mentor: Eddie Jacobs, Electrical & Computer Engineering	**David Adaway** Acquiring and Processing 3D Structured Illumination Microscopy Images Using the ZEISS ApoTome Instrument Mentor: Crysanthe Preza, Electrical & Computer Engineering	**Gerrell Dabbs & Aryan Prajapati** Hyperspectral Imaging: Applications in Agriculture Mentor: Crysanthe Preza, Electrical & Computer Engineering
2:00	**Christopher Cicalla, Ali Alabadi, & Natania Middleton** Computational Simulations of the Kingâ€™s Plain Wind Farm and How We Burned 600000 CPU Hours (Roughly) Mentor: Daniel Foti, Mechanical Engineering	**Jacob Stewart** Barrier Effects on the Escape and Pursuit of an L1 Pursuer and L2 Target Mentor: Thomas Hagen, Mathematical Sciences	

Presentations (2:30 - 4:30)

	Memphis A 340A	Memphis B 308	Bluff 304
2:30	**Ayler Edmaiston** Effects of Social Dominance on Novels vs. Familiar Social Interactions in Mice Mentor: Deranda Lester, Psychology	**Katherine Harris** Assesing the Adaptive Potential of Ursus Americanus Mentor: Emily Puckett, Biological Sciences	**Nima Aflaki** 2nd Generation 180° Ultrasound Scanner Mentor: Carl Herickhoff, Biomedical Engineering
3:00	**Mia Chambers** Analyzing Associations Among Emotion Dysregulation, Coping Strategies, and Stress Levels in College Students Mentor: Kathryn Howell, Psychology	**Mira Umarova** Co-option of two n-alkanes as a brood pheromone modulating foraging preferences in Temnothorax ant workers Mentor: Philip Kohlmeier, Biological Sciences	**Grayson Kendall & Hafsa Khan** AI Transparency in Cardiovascular Diagnostics Mentors: Stephen Strain, Biomedical Engineering
3:30	**Ayden Bran** Evaluation of Chiral GC Columns for the Separation of Lactones Mentor: Charles Garner, Chemistry	**Amiya Taylor-Hill** Inner Partner Violence Mentor: Dama Cooley, Nursing	**Timothy McDaniel** Ultrasound Transducer Element and Fixture Design to Facilitate Transcranial Imaging Mentor: Carl Herickhoff, Biomedical Engineering
4:00	**Khawlah Almurisi** Optimizing Hydrogenation Reactions with Gas Chromatography Mentor: Charles Garner, Chemistry	**Anslee Billingsly, Eleanor Scott, & James TerBurgh** Systematic Review of Bicycle Level of Traffic Stress Analyses Mentor: Stephanie Ivey, Civil Engineering	**Onyinyechukwu Okoli** Histological Analysis of Contaminated Bum Wounds Treated with Antimicrobial Acylated Chitosan Dressings Mentor: Jessica Jennings, Biomedical Engineering

Presentations (2:30 - 4:30)

	Iris 338	Shelby 342	Conference Room 208
2:30	**Ta'lik Taylor** Defining Freight-Centric Neighborhoods and Implications for Livability Evaluation Mentor: Stephanie Ivey, Civil Engineering	**Aidan Espy, Anthony Bryant, & Jefferson Minton** Microplastic Analysis and Research in Natural Environments Mentor: Farhad Jazaei, Civil Engineering	
3:00	**Cierra Dennis** New Insights on Dyslexia in Mandarin Chinese Mentor: Leah Windsor, Institute for Intelligent Systems & English	**Caleb Turris** Distracted Driving Mentor: Stephanie Ivey, Civil Engineering	
3:30	**Avery Gray** Earth to Ayesha - Narrative Web Series Mentor: David Goodman, Communication & Film	**Drew Davis** Safe Routes to School Mentors: Stephanie Ivey, Civil Engineering	
4:00	**Kerri Bland** The (After) Life of Irtw-Irw Mentor: Rebecca Howard, Art History	**Angelin Favorito** Irradian Source Comparison for FLD-Based Solar-Induced Flourescence (SIF) Retrieval Using Hyperspectral Imagery Mentor: Eddie Jacobs, Electrical & Computer Engineering	

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EDUCATION

The Influence Cognitive Bias and Group Decision-Making Have on Socioscientifc Issues

Majdal Issa
Mentor: Jaime Sabel, Biological Sciences

By early adulthood, cognitive biases that are related to motivations and/or adaptations to an environment have impacted thought processes and can affect an individual's decision-making (Stapleton, 2019; Wilke & Mata, 2012). While there is evidence to support the impacts unconscious bias can have on decision-making, little research has been examined in the context of socioscientifc issues (SSIs) in undergraduate biology courses. SSIs are controversial topics made up of both social and scientific components that impact society (Zeidler & Nichlos, 2009). The SSI investigated here was biofuels which are sustainable forms of fuel that are an alternative to nonrenewable resources. Undergraduate students at two universities were asked to submit group projects and individual responses to decisions made about biofuels. University I was located in the Midwest and University II was located in the Midsouth. Results suggested that conflict between students' decisions may be a result of cognitive bias. Students at University I emphasized aspects of environmental impacts on the farming community. Students at University II emphasized aspects of economic impact on consumers. These differences suggest that cognitive bias may be influenced by environmental identification. Recognizing and understanding how cognitive bias can impact students may help educators understand how to better support students' scientific literacy by developing methods to alleviate the impacts of cognitive bias.

ENGINEERING

Acquiring and Processing 3D Structured Illumination Microscopy Images Using the ZEISS ApoTome Instrument

David Adaway
Mentor: Chrysanthe Preza, Electrical & Computer Engineering

Last summer, as part of the Honors Summer Research Fellowship, I worked in the Computational Imaging Research Laboratory reconstructing structured illumination microscopy (SIM) image datasets in the ImageJ program. At that time, I also began experimenting with a commercial microscope: the Axio Imager.Z1 from ZEISS Microscopy. I took my first two-dimensional acquisitions using the ZEN core software and a free trial license. After communicating with ZEISS customer support throughout the summer, my professor and I managed to obtain a demo dongle this semester that activated the ZEN pro software with full functionality including remote control of the microscope's motorized components. These include the focus (dependent on the vertical position of the stage), objectives (lenses of different strengths), reflectors (which create lights of different wavelengths), and the ApoTome (the device that creates the different phases, or structured illumination patterns), allowing us to more easily conduct experiments with different settings. This presentation will use ZEN pro to detail our current work-in-progress project: the process of acquiring and processing three-dimensional fluorescence SIM images.

2nd Generation 180° Ultrasound Scanner

Nima Aflaki
Mentor: Carl Herickhoff, Biomedical Engineering

It is difficult to obtain imaging scans of children because they struggle to stay still inside of the loud claustrophobic environment of an MRI. However, since imaging scans can be impactful to a diagnosis, we propose to develop a non-invasive imaging solution with ultrasound technology. By using two transducers, one sending a pulse through the torso, while a second transducer, moving in a 180-degree arc around the patient's torso, captures the resulting ultrasound signals. These signals will then be processed to generate cross-sectional images at various levels of the torso. Currently, we are working to develop a mechanical system that will provide precise movements of the transducers throughout the imaging process. We are using 2, 250-degree rings with rails and teeth around the perimeter. Each ring will have 2 carriages which ride along the rails and carry the transducers. Then a pinion, riding on the adjacent teeth, will couple a

Abstracts

stepper motor to the carriage to provide movement around the ring. I began by modelling all the parts in CAD software and looking for stepper motors and drivers. Then, I designed a shaft coupler which will translate the rotation of the motor's shaft to the movement of the pinion along the ring. Now we are designing different interfaces that will connect the motor to the cart, so the entire assembly moves as one. Once this is completed, we will move on to setting up control systems and clamping the transducers onto the carriage.

Systematic Review of Bicycle Level of Traffic Stress Analyses

Anslee Billingsley, Eleanor Scott, & James TerBurgh
Mentor: Stephanie Ivey, Civil Engineering

This study aims to develop an urban-centric approach to assess bicycle Level of Traffic Stress (LTS) and to inform future decision-making processes for the improvement of cyclist infrastructure. A systematic literature review was conducted to explore the impact of roadway characteristics and previous LTS applications on the perceived comfort and safety of cyclists. The results of the review were used to inform the methodological approach for this study. An integer-based classification system, ranging from 1 (minimal stress) to 4 (extreme stress), was applied to road segments to determine critical areas for improvement. By analyzing roadway characteristics such as speed limit, number of lanes, presence of medians, and facility type, this research provides a framework for evaluating cyclist stress levels in urban environments. This research contributes to the field of urban transportation planning by offering a structured approach to assessing cyclist infrastructure. The LTS framework can assist city planners and policymakers in identifying high-stress areas, prioritizing infrastructure investments, and contributing to the advancement of safety measures for vulnerable road users. It provides a standardized method for comparing cycling conditions across different urban contexts, facilitating best practice identification for the promotion of safe urban cycling.

Computational Simulations of the King's Plain Wind Farm and How We Burned 600000 CPU Hours (Roughly)

Christopher Cicalla, Ali Alabadi, & Natania Middleton
Mentor: Daniel Foti, Mechanical Engineering

The American Wake Experiment or AWAKEN is an ongoing landmark international wind turbine and farm wake validation campaign. We plan to show that the King's Plain wind farm can help be on the forefront for renewable energy. There are unanswered questions about the wake dynamics that hinder our ability to optimize wind energy production that can be addressed through targeted experimental and computational analysis. We plan to model the 88-turbine King's Plain wind farm, validate using the AWAKEN field measurements, and analyze the wake and its turbulence. We use large-eddy simulation (LES) combined with actuator disk model (ADM) to model wind turbines. LES is a high-fidelity computational tool. It captures the large-scale features in the atmosphere, which are crucial for understanding how wind behaves around turbines. The actuator disk model simplifies the representation of a wind turbine in simulations. The ADM represents the turbine as a porous disk that exerts a force on the flow. This force mimics the effect of the turbine extracting energy from the wind. The simulations are run on high-performance computers (HPC) using distributed memory processing. We will compare our expected results to the benchmarks from the AWAKEN project and investigate wake formation and interaction dynamics. HPC nodes have roughly 48 CPUS and the grid we are running will require at least 40 nodes.

Noise Analysis for Hyperspectral Unmixing Algorithms

Gerrell Dabbs
Mentor: Crysanthe Preza, Electrical & Computer Engineering

A hyperspectral image is a photo created by collecting information from the electromagnetic spectrum and has three axes: x, y, λ. "λ" represents a wavelength value and allows for images to be created at different wavelengths or 'bands.' By using the wavelength value from multiple bands, materials can be differentiated

from one another or classified, which makes hyperspectral imaging a very powerful tool for detection. Hyperspectral unmixing is the process of determining the weight or amount of a material that is in a particular pixel. To do this, abundance maps are created. Abundance maps are images that use a color scale to indicate the percentage of a material in each pixel with their being a map for each material in an image. Hyperspectral imaging and unmixing have many applications such as in agriculture, chemistry, and several more fields. One such use of hyperspectral techniques is anomaly detection for scenes. However, there is a particular pipeline that seems to perform better than others for generalizations. This pipeline was created with the intent to improve anomaly detection which led to some questions. The goal of the work being done is to find out how the pipeline handles unmixing noisy cases through analysis on some datasets. It was found that the pipeline in question had some benefits such as when it came to dealing with large bodies of materials, but also had a segment that could cause noisy abundances to be low in obtainable information.

Hyperspectral Imaging: Applications in Agriculture

Gerrell Dabbs & Prajapati Aryan
Mentor: Crysanthe Preza, Electrical & Computer Engineering

Hyper-spectral Imaging differs from other imaging techniques by using wavelengths to store data. These wavelengths can be used to classify different materials allowing for many different applications. A field that sees many applications of this imaging technique is agriculture. There is much value in the classification of different crops through hyper-spectral imaging as well trying to monitor plant health by using specific metrics for determining soil moisture or possibly the chlorophyll levels. An example use case of classifications is weed management to ensure healthy crops. As evident from applications such as weed management, advancements in the field could result in better yields, soil health, and harvesting efficiency. Advancements like the ones mentioned before can make use of crop maps which are often obtained through remote sensing. The primary imaging type used in crop mapping studies currently is satellite imaging, but there are problems with it such as low spatial resolution and unclear spectral signatures. Hyperspectral Imaging provides a solution to these issues along with allowing the use of sensors closer to ground level, granting flexibility and the ability to develop the sensors further. We are performing a literature review on Hyperspectral Imaging and its usage in agriculture to find software, algorithms and datasets and understand how the technology is applied. Our goal is to utilize the technology in useful applications such as the creation of crop maps using classification.

Safe Routes to School

Drew Davis
Mentor: Stephanie Ivey, Civil Engineering

This systematic literature review aims to investigate the reasons behind the shift away from active transportation for school commutes and to identify research-based solutions to this problem. The study explores the importance of safe and convenient routes for children's active transportation as a critical public health policy issue. A comprehensive review of the literature was conducted to examine the impact of active school commutes on childhood obesity rates and other health benefits, as well as the factors contributing to the declining trend in active transportation over recent decades. The research analyzes various elements influencing this shift, including the lack of safe infrastructure for cyclists and pedestrians, and parental awareness of health benefits and risks associated with different commute modes. This research contributes to the fields of transportation engineering, public health, and urban planning by offering insights into the complex issues surrounding children's active transportation to school. The review synthesizes existing knowledge on the benefits of active commutes, barriers to implementation, and potential solutions to increase adoption. The findings can inform evidence-based strategies to reverse the trend away from active commutes, potentially leading to improvements in childhood health outcomes and the overall well-being of communities.

Abstracts

Inspecting Root Influence on Microplastic Migration in Soil

Aidan Espy & Jeffrey Rakestraw
Mentor: Farhad Jazaei, Civil Engineering

As plant root systems develop, they create hollow channels which alter the soil structure. Microparticles in soil tend to migrate towards these channels, increasing their concentration around plant roots. Previous studies have suggested that this process accelerates microplastic (MP) movement through soil, but conclusive evidence is lacking in current literature. This project serves to fill the empirical gap by directly observing the vertical migration of MPs through soil in response to root development. Both the mechanic of movement previously described and the influence of capillary action will be observed. To accomplish this, three groups of plants will be raised in grow bags with MPs added into the potting soil at different times and positions. Each group will include two sub-groups that vary in where the MPs are added by height. Once the plants reach maturity, the distribution of MP in the soil according to height will be analyzed by separating samples by different heights.

Irradiance Source Comparison for FLD-Based Solar-Induced Fluorescence (SIF) Retrieval Using Hyperspectral Imagery

Angeline Favorito
Mentor: Eddie Jacobs, Electrical & Computer Engineering

Solar-Induced Fluorescence (SIF) is a type of fluorescence produced by plants as part of the photosynthetic process. Absorbed photosynthetically active radiation (PAR) not consumed during photosynthesis is re-released as fluorescence at longer wavelengths, with a peak at around 740nm. SIF is being pursued as a useful indicator of photosynthetic activity and plant physiology but is difficult to observe with traditional remote sensing methods due to high levels of background solar radiation. Existing methods of SIF retrieval typically involve two channels of data acquisition such as separate spectrometers or a combination of a spectrometer and a hyperspectral camera, which measure radiance and irradiance separately. The objective of this study is to review a method for SIF retrieval that uses a single push-broom hyperspectral camera to gather both upwelling and downwelling data. Irradiance is calculated from a reference panel present within the region of interest. The resulting SIF output is compared to SIF from the same data set paired with spectrometer-retrieved irradiance data. Calculations are conducted using the improved Fraunhofer Line-Depth (iFLD) method at the 760nm telluric O2 absorption band of the solar spectrum. Two experimental setups are used for data gathering: a ground-level set up providing close range imagery and aerial data retrieved from mounting the hyperspectral camera to a UAV.

AI Transparency in Cardiovascular Diagnostics

Grayson Kendall & Hafsa Khan
Mentor: Stephen Strain, Biomedical Engineering

The need for fast and reliable cardiovascular diagnostics is increasingly being met by AI applications, but the black-box nature of these systems makes it difficult for clinicians and patients alike to fully trust the reasoning behind the diagnoses. Modern convolutional neural networks (CNNs) can analyze large sets of EKG data to detect subtle abnormalities with accuracy rates that match or exceed those of trained cardiologists. Open-source CNN innovations like ResNet and DenseNet underpin many healthcare models, yet they are embedded in commercial products that prohibit transparency and erode patient trust. By integrating techniques like Grad-CAMs or 'heat mapping,' we are developing real-time visualizations that unpack the reasoning behind autonomous EKG assessments. We hypothesize that these methods, originally created by data scientists to interpret model classifications, can be adapted into practical and transparent UI/UX design for clinical applications.

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Tosh Farms Sow Lameness Prevention Project: Using Biomedical Approaches in an Agricultural Setting for Intervention in Culling of Sows Due to Lameness

Elizabeth Matlock-Buchanan
Mentor: Jessica Jennings, Biomedical Engineering

Sow lameness can be a cause of economic loss for pig producers as they are typically euthanized, resulting in loss of sow and current/future progeny. Sow loss can be in the millions of dollars, depending on the size of the operation. A primary cause of lameness is infection in lesions on the legs as well as cracked and overgrown skin on the hooves. Standard of care depends on early recognition and aggressive antibiotic medication before deep-seated abscessation has occurred. Hydrogels have demonstrated efficacy in preventing infection-causing biofilm formation and can form a barrier. The purpose of this study is to obtain preliminary data on the utility of hydrogel materials with and without antimicrobials. Technical staff will image and assess sows in farrowing crates. A sterile swab used to perform microbiological assessment. As a trial run at the end of September 2024, the gel was applied to a group of eight sows and four days later there was no trace of the previously applied therapeutic on any of the eight sows' hooves. Assessment of gel visibility through dye or marking may be necessary. Future studies will determine healing rates and antimicrobial properties of gel components as well as new formulations. Reduction of cull rates will also be an outcome measure.

Ultrasound Transducer Element and Fixture Design to Facilitate Transcranial Imaging

Timothy McDaniel
Mentor: Carl Herickhoff, Biomedical Engineering

The skull presents a significant barrier to ultrasound transmission, due to high reflection, attenuation, and aberration of wavefronts. In this work, we (1) investigate dual-frequency transducer designs to facilitate superharmonic microbubble signals, and (2) design mounting hardware for transcranial ultrasound measurements. Finite element modeling (FEM) simulated transducer behavior to determine resonance frequencies for various element geometries. Peaks in displacement vs. frequency plots revealed thickness- and lateral-mode resonances, which were tuned to 6.0 and 1.5 MHz, respectively. Results indicated that lateral dimensions of 0.8, 1.1, and 1.4 mm should be evaluated experimentally. For the design of the skull fixtures, 3D models of the samples were created from CT scans and imported into CAD. The models were then used to form mold outlines of the skull samples for 3D printing. Next steps include mounting the skull samples and 3D-printed mold outlines to a frame for acoustic transmission measurements in a water tank.

The Effect of Coil Orientation on Transcranial Magnetic Stimulation in the Dorsolateral Prefrontal Cortex

Malak Moustafa
Mentor: Amy Curry, Biomedical Engineering

Transcranial magnetic stimulation (TMS) is an effective treatment for drug-resistant depression, targeting the dorsolateral prefrontal cortex (DLPFC). While various protocols exist for determining the coil location, individual anatomical differences can affect treatment efficacy. This study investigates how different coil orientations influence the electric field (E-field) distribution and activation volume at four common DLPFC locations. Simulations were conducted using SimNIBS 4.0.1 with a Magstim 70 mm coil at three orientations: Nz (toward the nose), FCz (60Â° clockwise from Nz), and Oz (180Â° from Nz). Results show that coil orientation significantly affects the E-field and activation volume. The FCz orientation produced a lower maximum E-field but a higher activation volume compared to Nz and Oz. Percent differences in maximum E-field ranged from 5% to 14%, while activation volume differences ranged from 15% to 58%. These findings suggest that coil orientation should be personalized for optimal outcomes in TMS therapy.

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Using Fairsim on Different Datasets Through ImageJ

Chinonso Okoli
Mentor: Crysanthe Preza, Electrical & Computer Engineering

In this work, the authors set out to work on FairSim. FairSim is an ImageJ plugin that is used as a reconstruction software for structured illumination microscopy to create high resolution images from raw data. FairSim provides different slice reconstructions and parameter modifications to help carry out the process of image reconstruction. In my research, I am going to use FairSim to create high resolution images from the datasets through using the reconstruction process and its functions. This way, the images are visible and not blurry.

Histological Analysis of Contaminated Burn Wounds Treated with Antimicrobial Acylated Chitosan Dressings

Onyinyechukwu Okoli
Mentor: Jessica Jennings, Biomedical Engineering

Soldiers in the army are prone to burn wounds and injuries acquired on the battlefield. These types of wounds require immediate access to the nearest medical assistance which is limited. Pseudomonas aeruginosa is the most prominent burn wound infection causing bacteria. The current solution for pain is administering opioids, but they contribute to addictions and the opioid epidemic. Chitosan nanofibers resembling gauze have been engineered in the Jennings lab, as alternative treatments, with cis-2-decenoic acids (C2DA) and bupivacaine to release antimicrobial and anesthetic molecules over time. The rats received two burns on the dorsal area and inoculated with Pseudomonas aeruginosa. Each burn was treated with chitosan dressings, or silver-based therapeutics, and the other side with the control of gauze only. The purpose of this portion of the study is to determine the degree of burn in the tissue after treatment with dressings and whether dressings minimize inflammation. By using the BioQuant Program, I plan to analyze histology slides of rat tissue to observe the difference between inflammatory responses when chitosan is used versus when it is not used. Through careful analysis, I will be able to determine the degree of inflammation in the tissue and whether the antimicrobial and anesthetic delivered by the dressings prevent further tissue damage and promote faster healing.

Chimaera: A Tethered UAV-UGV System for Agricultural Phenotyping

Joseph Perry
Mentor: Eddie Jacobs, Electrical & Computer Engineering

Small Uncrewed Aerial Vehicles (sUAVs) are a commonly used tool for agricultural remote sensing due to their capability of carrying a variety of sensors including hyperspectral and LIDAR. Tethered Uncrewed Aerial Vehicles (tUAVs) offer theoretically infinite endurance while maintaining most of the flexibility of a UAV. Unmanned Ground Vehicles (UGVs) offer large payloads and increased endurance compared to UAVs. Combining UAVs and UGVs can be used to provide a flexible sensor mounting platform that is less dependent on the terrain, is flexible in height, and offers dynamic flexibility in positioning the sensors, all while increasing endurance. Chimaera is a marsupial tethered UAV-UGV system designed to carry a hyperspectral camera and work in either Tandem or Independently from the mother UGV. A specific focus is placed on the communication between the tUAV-UGV and its integration with the flight control software, including a system to reduce relative GPS error.

Exploring Acoustic Wave Effects on Microbubble Patterning

Tanya Prahalathan
Mentor: Yuan Gao, Mechanical Engineering

Acoustic waves are biocompatible, non-invasive, and contactless, making them ideal for various medical applications. Acoustofluidics, which combines ultrasonic waves and microfluidic systems, allows for the manipulation of microscale particles and fluids. One application of acoustofluidics is patterning, particularly of microbubbles. This study investigates acoustic patterning of air-filled microbubbles between 30 to 50 microns in diameter in a deionized water solution containing 1%

sodium dodecyl sulfate (SDS), a surfactant that helps stabilize the bubbles, using circular cavities. The primary objective is to determine the optimal acoustic wave parameters, including frequency and amplitude, for effective microbubble manipulation. Ultrasonic transducers operating in the 1 to 100 kHz frequency range were used to generate sine waves, and the microbubbles were generated using a microfluidic bubble generator chip. The experimental setup involved systematically varying wave parameters and observing resulting microbubble patterns using high-resolution imaging techniques. The results demonstrated that specific combinations of frequency and amplitude significantly influence the formation and stability of microbubble patterns. This study provides insights into the acoustic manipulation of microbubbles, has possible future applications in cell culturing, and can serve as a basis for determining effective patterning methods for bubbles filled with other fluids in different solutions.

Defining Freight-Centric Neighborhoods and Implications for Livability Evaluation

Ta'lik Taylor
Mentor: Stephanie Ivey, Civil Engineering

This study aims to establish a definition of a freight-centric neighborhood and present a framework for regional-level awareness to address related concerns, improve livability, and develop an adaptable design for delineating these neighborhoods. A literature review was conducted to identify effective methods for analyzing freight influence zones and addressing associated issues. Various techniques were explored and utilized to perform count analyses, including community mapping, pedestrian networks, administrative boundaries, and machine learning algorithms. These analyses determined areas with the greatest freight impact and identified which freight sources affected the largest areas and the most households. The research examined multiple negative externalities associated with increased freight activity, such as air pollution, water pollution, noise pollution, traffic congestion, vehicle accidents, and land use issues. This research contributes to the field of transportation engineering by identifying research that can inform the development of a standardized method for defining the physical boundaries of freight-centric neighborhoods, addressing historical complications in quantitative assessments of potential effects on residents. Planners, researchers, and policymakers can adopt the framework presented in this study to address freight-centric neighborhood concerns, improve livability in affected areas, and enhance regional-level awareness of freight-related issues.

Distracted Driving

Caleb Turris
Mentor: Stephanie Ivey, Civil Engineering

Distracted driving is a leading cause of road fatalities in the United States, resulting in severe human and economic consequences. Despite the substantial attention it has received from researchers and stakeholders, existing studies predominantly rely on single-modal data, particularly visual information, to detect this risky behavior. This approach overlooks the multifaceted nature of distracted driving, which involves manual, cognitive, and visual distractions, and limits the effectiveness of current detection systems. To address these limitations, this study proposes a deep learning framework that integrates multimodal data, including visual, auditory, and sensor-based inputs, to provide a more comprehensive understanding of driver distraction. By utilizing one of the largest naturalistic driving datasets, comprising over 3,000 drivers, the proposed framework aims to enhance detection accuracy and reduce false alerts in Advanced Driver Assistance Systems (ADAS). This research has the potential to significantly broaden the scope of distraction detection methodologies and contribute to improved road safety through more context-sensitive interventions.

A Cable-Driven Parallel Robot for Flight Test Monitoring of Drones

Tepher Ward
Mentor: Eddie Jacobs, Electrical & Computer Engineering

Studies on the effects of high winds, microbursts (sudden gusts), precipitation, and extreme temperatures seek to overcome these flying challenges, yet flyability times for standard, FAA-approved commercial drones

are still limited to 23.6% or just 5.7 hours per day of possible day-and-night flights. Wind walls and weather simulation chambers are used to observe the impact of these weather conditions on drones in flight often capturing high-resolution video from multiple fixed-point, high-speed cameras positioned at various angles. These configurations are not able to change position during the test flight to focus on areas of interest or on areas out of range of the camera's optimal field of view. The UMemCableBot is a cable-driven, parallel robot system intended to overcome these limitations by working in conjunction with the fixed-camera configurations. To design this, a winch and pulley system for controlling the cables is being designed to handle a 50 lbs. load of different camera gimbals and/or sensor mounts with a maximum acceleration of 15 mph. Next steps include torque testing on stepper motors with different cable types and on various torque-reducing pulley configurations to minimize the motor size requirements and hence cost. An Arduino microprocessor will control the wired, joystick-operated navigation and safety features. When completed, the UMemCableBot will follow and take images and readings at close range of any object within its 30 cu.ft. rigging system.

LIBERAL AND FINE ARTS

The (After) Life of Irtw-Irw

Kerri Bland
Mentor: Rebecca Howard, Art History

The University of Memphis is host to a Ptolemaic-era mummy, Irtw-Irw. Having been taken out of archeological context, and left undocumented until the 1900's, this research archives the known provenance of these human remains; examining the former owners [and their] activities, thus gaining insight into the mummy's current state of degradation. Further, using the texts located on Irtw-Irw's body and sarcophagus, we can interpret aspects of his daily life, family, health, and hygiene in Akhmim, Egypt, 300 BCE. This presentation showcases new findings of previously unarchived documents and combines them with the Art Museum of University of Memphis's files to chronologize the life and afterlife of Irtw-Irw.

New Insights on Dyslexia in Mandarin Chinese

Cierra Dennis
Mentor: Leah Windsor, Institute for Intelligent Systems & English

Due to our lack of understanding on dyslexia, we find it a challenge to comprehend its effect on a non-Latin language. In light of dyslexia being a more complex learning difference, we see its effect actually span further than the disorientation of letters to include energy and behavioral influence (ADHD), writing conditions (dysgraphia), and auditorial processing challenges. If we gather existing data on the subject, observe firsthand and secondhand sources, and perform test our knowledge so far to better understand dyslexia's effect on Mandarin Chinese, then we can come up with a solution to better address dyslexia, language acquisition, and overall education not only in Mandarin Chinese speakers, but for all language learners. If we do nothing about the problem, this means that we'll not only remain in the dark about another condition but will remain ignorant of education and misguided & ineffective in addressing means of language and education.

Earth to Ayesha - Narrative Web Series

Avery Gray
Mentor: David Goodman, Communication & Film

Oftentimes, we underestimate and downplay our true selves in order to be accepted in society. We do ourselves and others a disservice by not fully embracing our authentic selves. This narrative web series aims to explore the magic that emerges when we stay present and accept ourselves for who we are, and what happens when we are consumed by the desire to be someone else. This project will utilize the powerful medium of film, made up of both visual and nonvisual elements including cinematography, sound, and writing in order to create a cohesive and impactful story. The project will traverse themes such as gratitude, self-sabotage, and self-love. Through the lens of a young college student with an imagination that's out of this world, we will discover what it means to truly ground ourselves in the things that make us bloom.

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Lady Locks: A Survey of Female Hair Adornment in the Ancient Mediterranean World

Cate VanNostrand
Mentor: Benjamin Graham, History

The Roman Empire was one of the most widespread cases of European colonialism in the ancient era, as dictators and emperors colonized the entirety of the Mediterranean basin and beyond, from Scotland to Arabia. Many tribes and countries' traditions either shaped or were shaped by their encounter with the Romans and their imperial ambitions. Many elements of this encounter have been studied by scholars, but an important exception to this field of study is one of the most visible and evident to the people of the ancient world: hair. This thesis studies the differences in Roman hair versus other Roman-ruled provinces, analyzing how much of the outside cultures - such as the Britons, Egyptians, Greeks, and Babylonians - influenced Roman fashion and how many cultures were influenced by Rome. Through primary sources such as busts and paintings, and secondary sources from classicists and historians, this thesis seeks to prove that the Romans were lifestyle and fashion influencers just as much as they were impacted by outside cultures within the ancient Mediterranean world.

LIFE AND HEALTH SCIENCES

Chemical Mate Choice Copying in Drosophila Melanogaster

Osaretin Asemota
Mentor: Philip Kohlmeier, Biological Sciences

Mate choice is a critical decision for females, demanding substantial time and energy to evaluate potential partners' genetic quality. Consequently, many species have evolved mechanisms to leverage social information, often employing visual cues to copy the mate choices of others. However, chemical cues offer distinct advantages, particularly in situations where direct observation of mating is challenging or impossible. A previous study on the fruit fly Drosophila melanogaster demonstrated that females copy mate choice decisions of other females based on chemical cues alone. During copulation, the male leaves behind pheromonal marks on the female. Other females can detect these marks, memorize the information and develop a preference for this male themselves. To develop this preference, the student female has to detect some female cues as well as presenting her with male odor alone was not enough to make her develop a preference for this male. In this project, I aim at identifying those female pheromones that have to be detected simultaneously to the male odors to develop a preference for these males. Using chemical extracts of male and virgin females, I test the hypothesis that female pheromones specific for already mated females are necessary for chemical mate choice copying.

Assessing the Adaptive Potential of Ursus Americanus

Katherine Harris
Mentor: Emily Puckett, Biological Sciences

Adaptive potential is the genetic variation needed for a population to survive disruptions within its environment across generations. In terms of conservation biology, scientists are working to preserve adaptive potential, seeing as it is pertinent to a species long-term survival in the face of environmental disruptions. Effective population size (Ne) is a crucial metric for adaptive potential, specifying the number of individuals needed to maintain genetic diversity through the next generation. Theoretical work has shown Ne > 500 maintains adaptive potential. The American black bear (Ursus americanus) has a wide-range across North America. Similar to other species, its evolutionary history has been shaped through glacial cycles over time, and recent anthropogenic pressures including deforestation, habitat fragmentation, and carnivore persecution. These changes affected census size (Nc) differentially across the continent; thus, we expect variation in black bears' adaptive potential. This study quantified Ne for Ursus americanus populations in the U.S.A. and Canada. We identified higher Ne values in the northern populations of the U.S.A. Ne values for Ursus americanus populations exhibited varying results, with many exceeding the 500 threshold, maintaining their genetic

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diversity. By defining populations of Ursus americanus and observing the reported Ne values for the populations, we highlight how adaptive potential can be assessed to enhance the conservation of biodiversity.

Beetles on Ice: Understanding Cold Tolerance in Urban Environments

DaNesja James
Mentor: Leigh Boardman, Biological Sciences

As ectotherms, insects' body temperatures fluctuate with their environment, influencing their survival after cold conditions. Chill coma recovery time (CCRT) is a measure of how long it takes insects to regain mobility after cold exposure, with a faster CCRT indicating better cold tolerance. We aimed to determine the cold tolerance of several beetle species collected from the University of Memphis TIGUrS Urban Garden on campus and test whether prior cold exposure influenced this trait. Beetles from two families, Coccinellidae (ladybugs) and Chrysomelidae (leaf beetles), were collected between June and October 2024. Both native and introduced species were included. The beetles were kept overnight in individual containers at 25Â°C with plant material and water. The following morning, they were fasted for 6h, massed, and submerged in an ice slurry for 2h at 0Â°C. CCRT was recorded immediately after removal from the slurry. The experiment was repeated on day 2. Our results showed that species exhibited significantly different CCRTs, with the multicolored Asian lady beetle Harmonia axyridis recovering the slowest (mean = 674.7s); and the seven-spotted ladybug Coccinella septempunctata the fastest (mean = 109.5s). Prior cold exposure did not significantly affect CCRT overall, although species-specific differences were observed. These findings provide insights into beetle responses to cold exposure and may be useful in determining species responses to warming winters.

3D Cell Culture Model Predicts Novel Drug Treatment for Recurrent, High-Grade Meningioma

Blake Robinson
Mentor: Manuel Ferreira, Neurological Surgery

Meningiomas are the most common primary brain tumor. High-grade meningiomas(HGM) make up 20% of all meningiomas and have a 33% chance of recurrence after surgery. In order to circumvent the need for surgery with each recurrence, we sought to develop a new treatment option for patients with HGMs through pharmaceuticals. After collecting a patient-derived meningioma from the operating room, the tumor was sliced into 400Î¼m cuboids to preserve the various cell types within the tumor microenvironment to simulate accurate drug response data. After plating the cuboids into a 96 well plate, cell viability was measured using a luminescence assay and then two wells with similar cell viability were paired together for each of the 31 FDA-approved drugs tested. After monitoring the cell viability for five days, the percent change in viability was calculated where AZD3463, an ALK inhibitor, showed an 85% reduction in tumor cell viability, indicating promise to minimize the chance of tumor recurrence. AZD3463 will then be prescribed directly to the patient for treatment.

Co-option of Two N-alkanes as a Brood Pheromone Modulating Foraging Preferences in Temnothorax Ant Workers

Mira Umarova
Mentor: Philip Kohlmeier, Biological Sciences

In social insects, specialized foragers fulfill the nutritional needs of all colony members. This study investigates the chemical cues used by Temnothorax longispinosus ant larvae to increase protein-foraging in foragers. Based on previous chemical analyses, we tested whether two larva-biased n-alkanes function as brood pheromones. Colonies lacking brood were exposed to synthetic versions of n-C27 and n-C29, which are more abundant in larvae than in workers. A combination of n-C27 and n-C29 increased protein-foraging to the same level as full larval Cuticular hydrocarbon extracts, while n-C27 and n-C29 individually did not elicit the same response. n-alkanes can be found across insects and are involved in waterproofing the cuticle. Our findings provide the first evidence that a combination of two specific n-alkanes has been co-opted to additionally function as a brood pheromone in ants,

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influencing worker behavior to meet larval nutritional needs. This suggests a quantitative mechanism where the relative abundance of these compounds plays a key role. Understanding these chemical communications offers insights into colony homeostasis and social behavior evolution in ants. Our findings contribute to a broader understanding of how chemical signals mediate complex social interactions in eusocial organisms, providing a foundation for future studies on chemical communication.

Self-Employed Medical Professionals

Regina Beach
Mentor: John Rhodes, Admissions

Self Employed as Medical Professionals with medical transcription services with billing and coding services.

Inner Partner Violence

Amiya Taylor-Hill
Mentor: Dama Cooley, Nursing

It will be a presentation over what inner partner violence is, and the key signs of it.

MATH AND COMPUTER SCIENCES

Barrier Effects on the Escape and Pursuit of an L1 Pursuer and L2 Target

Jacob Stewart
Mentor: Thomas Hagen, Mathematical Sciences

In mathematical pursuit and escape games a pursuer (agent 1) tries to catch a target (agent 2) by closing the distance between them, provided their path is unobstructed. The distance in traditional pursuit and escape games is taken as the Euclidean distance given in terms of the so-called L2-norm where the Pythagorean Theorem holds true. The effects of limiting one of these agents to movement measured in the L1 norm and the addition of a finite, straight-line barrier were investigated, both analytically and numerically. The earliest time in which the pursuer and target can meet defines their dominance regions. It was found that even with lower speed (up to a ratio of 50%), an L2 target can escape from an L1 pursuer if the target takes the 'optimal' path within its dominance region. Escape is defined when the target's dominance region becomes unbounded, meaning that it has freedom of movement in an infinite region. When introducing the barrier, there are three cases for the L1 pursuer's path: one axis of movement (AoM) blocked, both AoM blocked, and no AoM blocked. The cases with single and both AoM being blocked result in global change of the dominance regions, whereas the case with no AoM blocked only results in local change. Models of pursuit and escape are used to describe and explain real-world phenomena, including predator-prey interactions, and find applications in unmanned ground vehicle (UGV) to unmanned aerial vehicle (UAV) pursuit and target-tracking algorithms.

PHYSICAL AND APPLIED SCIENCES

Mechanistic Investigation of Substrate Docking in a Traceless Tether Catalyst

Nima Aflaki
Mentor: Timothy Brewster, Chemistry

Our lab has designed a novel, regioselective dock and release system for one-pot C-H functionalization, aimed at producing polysubstituted aromatics more efficiently. We designed a 'traceless tether' based on triazolopyridine (tripy) to provide catalyst stability and the correct geometric alignment for substrates to react. Designed catalysts were synthesized and tested for activity under a variety of conditions. In nearly all cases, the desired catalytic reaction was not observed. We then sought to determine the reason for catalyst failure. Equilibrium and kinetic properties of our dock and release system were measured via Flourine-19 NMR reaction monitoring. We were successfully able to determine the concentrations of our reactants and products at different times during the reaction. Results indicate that the dock/release step of the reaction proceeds successfully with sufficient yields and rates. However, using a pre-formed palladium catalyst, we observe large amounts of metallic palladium even at low temperatures indicating that tripy ligation was not stable enough. Results obtained in this study have pointed us to second-generation systems with more robust metal-ligand binding modes.

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Optimizing Hydrogenation Reactions with Gas Chromatography

Khawlah Almurisi
Mentor: Charles Garner, Chemistry

This project examines the hydrogenation of aromatic compounds, including tetralin, cyclohexylbenzene, and azulene, inside a gas chromatograph (GC) injection port, which allows for simultaneous tracking of reaction progress and product distribution. Hydrogenation is important for converting unsaturated compounds into their saturated forms, which are widely used in different industries. In the initial phase of the project, platinum (Pt) was used as the metal catalyst due to its effectiveness in hydrogenation reactions, with future experiments planned to include palladium (Pd) and rhodium (Rh) to compare their catalytic performance. The hydrogenation reactions were monitored through GC, with decane serving as the internal standard, to ensure accurate quantification. The GC setup included a liner containing the catalyst with glass wool positioned before and after the catalyst to keep it in place during the reaction. Correction factors were applied to ensure the reliability of the data. Initial results showed that Pt was highly efficient in fully hydrogenating tetralin into decalin, with GC data providing insights into reaction kinetics and conversion. Moving forward, the study will explore Pd and Rh, and possibly mixtures with Pt, to investigate their catalytic behavior. This research aims to deepen understanding of how different catalysts influence reaction outcomes, offering insights for optimizing hydrogenation processes in various industrial applications

Evaluation of Chiral GC Columns for the Separation of Lactones

Ayden Bran
Mentor: Charles Garner, Chemistry

Chiral lactones and 1,4-diols play an important role in pharmaceuticals and as a synthetic structure, necessitating efficient synthesis and enantiomeric separation. This study presents a simple and efficient two-step process for synthesizing 1,4-diols from readily available and inexpensive aldehydes and ketones, such as pinacolone, pivaldehyde, 2-fluorobenzaldehyde, norcamphor, and cyclopropyl methylketone, followed by their conversion into chiral lactones. The method employs a Grignard addition using allyl magnesium chloride, followed by hydroboration with borane-methyl sulfide complex (BMS). Subsequent TEMPO-mediated oxidative lactonization yields the target lactones. The effectiveness of various chiral gas chromatography (GC) columns, including bespoke and commercial alternatives, was systematically assessed for their ability in separating these lactones. The findings contribute to the development of more effective chiral separation methodologies and have potential applications in asymmetric synthesis and quality control of enantiomerically pure compounds.

Microplastic Analysis and Research in Natural Environments

Aidan Espy, Anthony Bryant, & Jefferson Minton
Mentor: Farhad Jazaei, Civil Engineering

Microplastics research has become one of the most hot and discussed topics of environmental research in the last 10 years. With it, has come ideas that may now be seen as inaccurate or misleading. The Microplastic Analysis and Research in Natural Environments seeks to distinguish a more accurate model of aqueous microplastic transport. Many researchers may find themselves thinking or experimenting under possible erroneous conclusions about microplastic behaviors in dynamic water systems. An idea of uniform-flow of plastic residuals is commonly seen as the main interpretation of many microplastic literature. MARINE seeks to verify the non-uniform model of microplastic transport within the local Wolf River by use of manufactured steel microplastic catching nets.

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SOCIAL AND BEHAVORIAL SCIENCES

Analyzing Associations among Emotion Dysregulation, Coping Strategies, and Stress Levels in College Students

Mia Chambers
Mentor: Kathryn Howell, Psychology

Exposure to high levels of stress can contribute to heightened emotion dysregulation, which when prolonged, may lead to psychopathology. Coping skills can relieve stress and improve emotion regulation; however, associations between emotion regulation, coping, and stress have not been thoroughly explored in college students. The current study examined how three coping strategies (i.e., problem focused, emotion focused, avoidance) and emotion dysregulation were directly and indirectly related to stress levels. Participants included 241 college students (Mage=19.39, SD=1.56; Female=81.3%; White=49.4%) who were recruited from a university in the MidSouth, United States. The linear regression model examining direct effects was significant ($F(4, 234)=55.58$, $p<.001$, $R2=.49$), with more emotion dysregulation ($\hat{I}^2=.440$, $p<.001$), more emotion focused coping ($\hat{I}^2=2.82$, $p=.046$), and more avoidance coping ($\hat{I}^2=2.31$, $p=.049$) related to higher stress levels. Potential indirect effects were also examined; unexpectedly, none of the coping strategies moderated the relation between emotion dysregulation and stress levels. Contrary to what was expected, emotion focused coping, which is typically viewed as an adaptive strategy, was related to higher stress levels, and problem focused coping was not related to stress in this sample. Future research should continue to explore underlying factors that may reduce stress in college samples to improve the mental health and wellbeing of these emerging adults.

Effects of Social Dominance on Novel vs Familiar Social Interactions in Mice

Ayler Edmaiston
Mentor: Deranda Lester, Psychology

The proposed study aims to investigate how social dominance in mice affects social interactions with novel and familiar social partners. Male and female mice will be pair-housed with mice of the same sex and age for at least 6 weeks. The tube test will be used to measure social dominance over 4 trial sessions. The mouse that pushed the other out of the tube at least 75% of the time (at least 3 out of 4 trials) will be considered 'dominant' while the other mouse will be considered 'submissive'. One week later, social interaction tests will start. For the novel social interaction test, each mouse will be paired with a sex-, age-, and weight-matched novel conspecific (stranger mouse) in an open-field setting for 15 min. Using video recordings and tracking software, we will quantify the number of bodily contacts, duration of bodily contacts, and the average distance between the two mice during the interaction. This social interaction test will be conducted 4 times with 48 hours between testing sessions. Mice will get more familiar with their conspecific with each testing session. The fourth interaction test will be considered the familiar social interaction test. We hypothesize that socially dominant mice will show more social interaction behaviors in the novel setting compared to the familiar setting, and that socially submissive mice will show less social interaction behaviors in the novel setting compared to the familiar setting.

Racial Disproportionality in Schools

Sophia Gonzales
Mentor: Emily Srisarajivakul, Psychology

Racial disciplinary disproportionality refers to the overrepresentation of Black and Brown students who receive harsher and more frequent exclusionary discipline compared to their White peers (Macmillian & Reschly, 1998). Discrepancies are often associated with teacher and administrator implicit bias rather than a true higher rate of problem behaviors among these minoritized students (Dovidio & Gaertner, 2000). However, extant research has largely ignored the perspectives of school-aged youth who either witness disciplinary disproportionality or have been victims themselves (Sanders et al., 2023). Further, perspectives from teachers and administrators have not been investigated within the context of the students with which they work. Using a mixed-methods approach, this study aims to identify how perspectives of school climate, safety, and disciplinary practices affect the

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well-being of teachers, students, and administrators in the Memphis-Shelby County School District. Data collection is currently ongoing; approximately 250 middle and high school students, teachers, and administrators will participate in focus group interviews and complete individual surveys. This study aims to provide insight on how to improve school climate, which has cascading effects on emotional and academic well-being (Kutsyuruba et al., 2015). Implications include improving fairness in disciplinary practices and reducing bias to achieve positive and inclusive educational environments.

Seeing Life Through the Past: The Link Between Past and Present Through Ancient Art

Don'Neka Hayslett
Mentor: Amanda Gaggioli, History

This analysis examines how early Christian fourth-century mosaics and wall paintings from Cyprus show human values that resonate with today's culture. Focusing on 3 major archaeological sites in Cyprus, the study posits that these art forms serve as a "window" into the beliefs and priorities of their time, much like the windows in modern American homes that provide light and beauty. Despite the evolution of things like social media, the themes of respect for nature, family, and cultural legacy remain central to human experience. Drawing from personal insights gained at the Kourion field school, this research argues that the moral and ethical ideals expressed in these ancient frescoes continue to reflect core values that endure across generations, highlighting the continuity of human thought and expression.

Anxiety-related Behaviors Induced by Social versus Drug Conditioned Place Preference

Shaima Issa
Mentor: Deranda Lester, Psychology

Reward processing is dysfunctional in various psychiatric disorders like addiction and depression. By understanding the neural and behavioral mechanisms of reward and motivation, we can help improve therapeutic interventions. Animal models play a pivotal role in this research, offering insights that are often hard to grasp just from human studies alone. Conditioned place preference (CPP) is used to assess the rewarding effects of stimuli by measuring the amount of time an animal spends in an environment associated with that stimuli. In this study, the rewarding stimuli will either be drug (cocaine 10 mg/kg, ip) or social interaction (with a novel age- and sex-matched conspecific). In this study, we specifically aim to understand how animals behave in the absence of a reward, known as off-days. We will measure several anxiety-related behaviors during the non-reward conditioning days of CPP, including time spent in the center of the chamber, freezing behavior, and the amount of fecal matter in each chamber. We hypothesize that mice will display heightened anxiety-like behaviors on non-reward days to a greater degree during cocaine CPP compared to social CPP, which may influence their subsequent place preference and reward sensitivity for these stimuli. By analyzing these anxiety-related behaviors, this study aims to clarify the relationship between anxiety and reward processing. This research could provide new insights into the mechanisms underlying reward-related disorders.

The impact of Atypical Antipsychotic and Psychotomimetic Drugs on Risky Decision-Making

Jason Martinez
Mentor: Nicholas Simon, Psychology

Atypical antipsychotics are used to treat several disorders associated with psychosis or mania, including schizophrenia and bipolar disorders. Aberrant risky decision-making is a common symptom of these disorders; however, little is known about how repeated exposure to antipsychotics affects risk-taking. We tested the impact of a chronic, escalating dose regimen of the atypical antipsychotic risperidone on risky decision-making in male and female adult Long Evans rats. Risk-taking was measured with the Risky Decision-making Task (RDT), which presents rats with a choice between a single sugar pellet and three pellets accompanied by increasing risk of mild footshock. With lower doses of risperidone (.1mg/kg), there was no significant effect of drug. However, when the dose was

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elevated to (.2 mg/kg), this caused a significant drop in risky decision-making. Notably, female rats showed a greater increase in risk aversion than males. These data suggest that higher dose atypical antipsychotics cause sex-specific effects on punishment-driven risky decision-making. Follow-up experiments are in progress measuring the influence of two mechanistically distinct psychotomimetic drugs (DOI and MK-801) on RDT, followed by co-administered risperidone and psychotomimetics.

Investigating Mental Simulation and Mental Imagery Using Sentence-Picture Verification

Elaine Mooney
Mentors: Stephanie Huette & Rane Ankney, Psychology

What is the difference between the visual mental representations that occur automatically during reading and the mental imagery that results from effortfully visualizing what is read? This research leverages the fundamental differences between these two processes to investigate the mechanisms involved in each. University of Memphis Psychology students will participate in a sentence-picture verification (SPV) study that explores how task instructions and trial time structure affect behavioral measures. SPV involves participants reading a sentence that implies the visual features of an item before viewing a picture and verifying if the item in the picture was mentioned in the previous sentence. Responses are fastest and most accurate when the pictured item's visual configuration agrees with the implications of the sentence. This experiment will be completed in two blocks, one without and one with explicit instructions to visualize the sentence content before viewing the picture. Each block has different pseudo-randomized times between sentence offset and picture onset. This will be the first study to investigate maintainability and timescale, key differences between these processes, in a within-subjects design. We predict responses will be fastest in shorter trial structures in conditions without instructions and responses will be fastest in longer trial structures in conditions with instructions. This study will refine our understanding of language processing and imagination.

Drag Performers and Identity in the American North and South

Karma Rakow
Mentor: Lindsey Feldman, Anthropology

In 2023 the state of Tennessee passed the adult cabaret act more colloquially known as the 'drag ban'. This law prevented so-called 'adult' performances from taking place in public, in the presence of children, within 1000 feet of a school, public park, or place of worship. Violations of this law were subject to a $2,500 fine and up to a year in jail. The drag ban was repealed mere months after originally being signed into law, but its consequences have lingered. Drag performances have always been political. Drag symbolizes queerness, serving as not only an open declaration, but a celebration of said queerness as an immutable aspect of self and foundation of personal identity. Drag performers operate from across the wide gender spectrum to perform a heightened and exaggerated display of femininity. By subverting traditional notions of masculinity and femininity, drag performers destabilize the assumed naturalness of gender identity and expression. Utilizing Grand Rapids, Michigan, and Memphis, Tennessee as two operating field sites, this research takes a comparative ethnographic approach to analyze how the changing political landscapes in the American north and south affects the identities of drag performers. Findings from the initial question show that during this time of political contention, drag performers were asserting their individual identities through their performances while prioritizing a collective drag identity to serve as a site of resistance to persecution.

Oxytocin Receptor Activation in the Nucleus Accumbens Differentially Mediates Phasic Dopamine Release

Madiha Syeda
Mentors: Deranda Lester & Rebecca Crenshaw, Psychology

Oxytocin is being researched as a new treatment method for substance use disorder. Oxytocin likely alters the rewarding properties of stimuli with its effects on mesolimbic dopamine release. Our lab previously showed that oxytocin infused directly into the nucleus

accumbens (NAc) reduces stimulation-evoked phasic dopamine release. The current study expands on using in vivo fixed potential amperometry with carbon fiber recording electrodes in the NAc of anesthetized C57Bl/6J mice. Given oxytocin can act on varying receptors, we infused the oxytocin receptor agonist [Thr4, Gly7]-oxytocin (TGOT) (25 ng in 1 Âµl volume over 1 min) into the NAc during dopamine recordings. Dopamine release was elicited with electrical stimulations in parameters set to mimic phasic (20 pulses at 50Hz) and tonic (4 pulses at 5Hz) activity patterns. We observed intra-NAc TGOT reduced dopamine release elicited by phasic stimulations (-22.5%) with no significant differences between males and females. Intra-NAc TGOT infusions did not significantly alter dopamine release elicited by tonic stimulations (-3.5%). Phasic dopamine release in the NAc drives drug-related reward and learning, with phasic firing highlighting salient environmental stimuli. Oxytocin has previously shown to reduce reward effects but promote the salience of social stimuli. Current findings support oxytocin's opposing influence on drug vs social reward may be related to its differential mediation of phasic vs tonic dopamine release.

Dopamine Functioning in Social vs Unsocial Mice

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Dysfunctional social behaviors are present in many psychiatric disorders, including addiction, anxiety, and depression. Understanding how social interactions influence brain reward systems may be helpful for developing targeted treatments. The mesolimbic dopamine system plays a critical role in mediating reward behaviors. Recent findings from our lab demonstrate that social reward preference negatively correlates with the dopaminergic effects of cocaine. Specifically, as an animal's preference for social rewards increases, its dopaminergic response to cocaine decreases. This suggests a potential interaction between social behavior and drug reward processing within this dopamine system. In this project, we aim to further investigate how social interaction levels influence dopamine release in male and female mice. Social interaction will be quantified by both the number and duration of bodily contacts during social interaction testing. We have measured social interactions in over 40 male and 40 female mice. For this study, we will select the top 8 males and 8 females showing the highest levels of social interaction (social mice) and the bottom 8 males and 8 females with the lowest levels of social interaction (unsocial mice). Dopamine release will be measured using in vivo fixed potential amperometry before and after cocaine administration. We hypothesize that social mice will exhibit a decreased dopaminergic response to cocaine compared to unsocial mice.

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